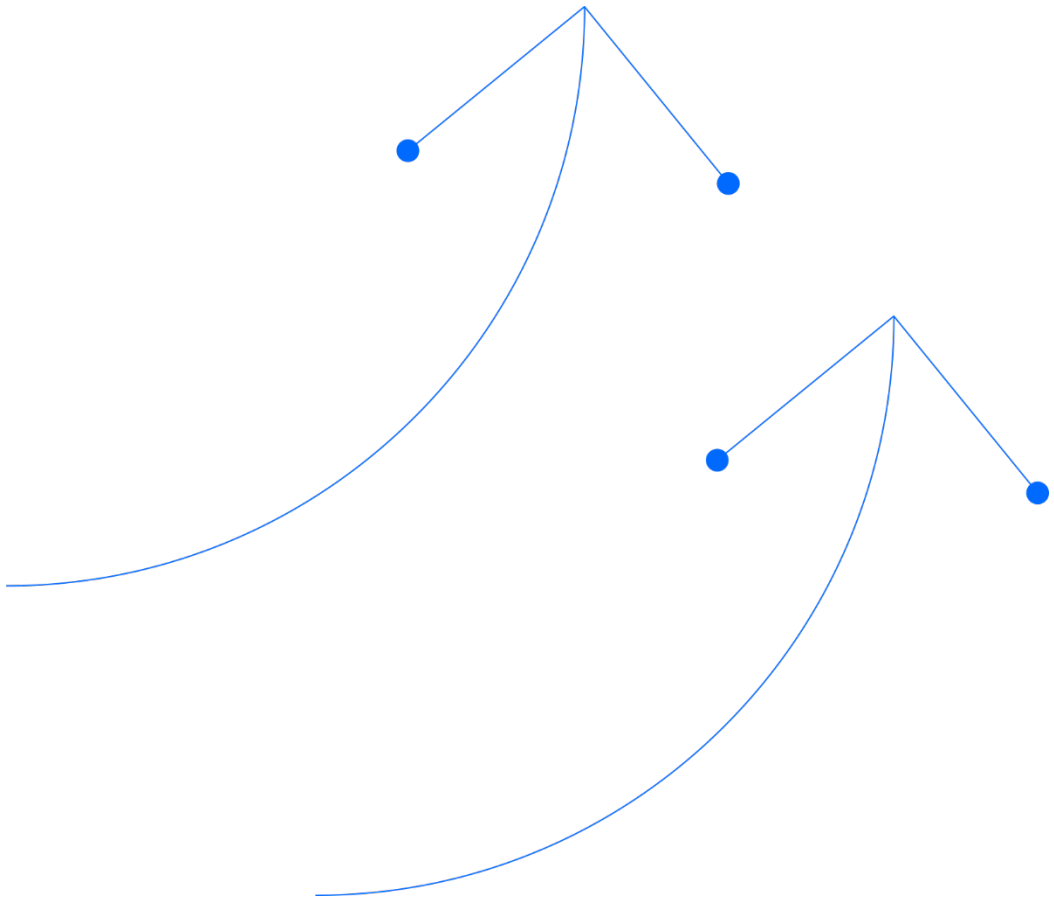
Santos

Operational and Scientific Monitoring

Bridging Implementation Plan: Northern Australia

03 April 2025



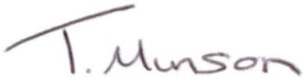
Santos

Operational and Scientific Monitoring

Bridging Implementation Plan: Northern Australia

Document No.: 7715-650-ERP-0003

Project / Facility	NA
Review interval (months)	12 Months
Safety critical document	No

Rev	Owner	Reviewer(s) *Managerial/Technical/Site*	Approver
	Lead Oil Spill Risk & Planning Coordinator	**Manager Environment (WANATL)** **Principal Oil Spill and Emergency Response Coordinator**	**Senior Manager Environmental Approvals (WANATL)**
2		 p.p. 	

Any hard copy of this document, other than those identified above, is uncontrolled. Refer to the Santos Offshore Business Document Management System for the latest revision.

Rev	Rev Date	Author / Editor	Amendment
0	7 August 2024	BlueSands Environmental / Santos	Issued for use
1	12 September 2024	BlueSands Environmental / Santos	Issued for use
2	11 October 2024	BlueSands Environmental / Santos	- Additional baseline locations added to Table 2-2 for EOS and Tern-2 activities. - Revised EMBA figure. - Inclusion of EOS scenario in Table 2-1. - New baseline information sources for revised EMBA (Joseph Bonaparte Gulf, Kimberley Marine Park + others). - Minor revision to Appendix A, Step 3.
	14 January 2025	BlueSands Environmental / Santos	- Additional baseline locations added to Table 2-2 for Barossa Gas Export Pipeline (GEP) NT Waters Operations activities - Inclusion of Barossa GEP NT Waters Operations OPEP document number in Table 2-1 - Added additional receptor groupings to Table 4-3 that are relevant to Barossa GEP NT Waters Operations activities - New Call-off Order Form added to Appendix E
	3 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)

Santos

Contents

Tables

Figures

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
DEPWS	Department of Environment, Parks and Water Security
DWER	Western Australian Department of Water and Environmental Regulation
DPD	Darwin Pipeline Duplication
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
KEF	Key Ecological Feature
LEL	Lower Explosive Limits
LOWC	Loss Of Well Control
MDO	Marine Diesel Oil
MoC	Management of Change

Term	Definition
Monitoring Service Providers	The subcontracted specialist monitoring service providers subcontracted by OSRL to perform certain operational and scientific monitoring services
NATA	National Association of Testing Authorities
NEBA	Net Environmental Benefit Analysis
NT	Northern Territory
NT IMT	Northern Territory Incident Management Team
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 DoT	Western Australian Department of Transport
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

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 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 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.

Use of the Joint Industry OSM Framework requires each Titleholder to develop a Bridging Implementation Plan (this plan) which fully describes how the Framework interfaces with the Titleholder's own activities, spill risks and internal management systems.

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
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.
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 Greenhouse Gas Storage (Environment) Regulations 2023 for all Santos activities within the Northern Australia Region (Figure 1-1), and has been submitted with the Barossa Production Operations EP (BAA-200 0637) and OPEP (BAS-210 0134). This BIP applies to all Santos activities which have an EP accepted by Commonwealth and Territory/State regulators in the Northern Australia region. 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 A:

1. Determine if the new activity Environment that May be Affected (EMBA) fits within the Northern Australia OSM-BIP Combined EMBA, as outlined in Section 2.1.
2. Determine the locations requiring a baseline review (as described in Section 2.2) and whether these locations are currently included in Table 2-2.
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 document 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 North West Shelf Region of Western Australia are addressed by the Santos North West Shelf OSM-BIP (7715-650-ERP-0002).

Santos will implement OSM, as applicable, for oil spills across both Territory/State and Commonwealth waters. For oil spills that contact Northern Territory (NT) shorelines, Santos will liaise directly with the NT IMT and provide all of the required support to implement scientific monitoring on NT shorelines. In the event that control of scientific monitoring in State waters is taken over by the Western Australian Department of Transport (WA DoT) under advice from the State Environmental Scientific Coordinator (ESC), Santos will follow the direction of WA DoT as Control Agency and provide all necessary resources (monitoring personnel, equipment and planning) to assist as a supporting agency.

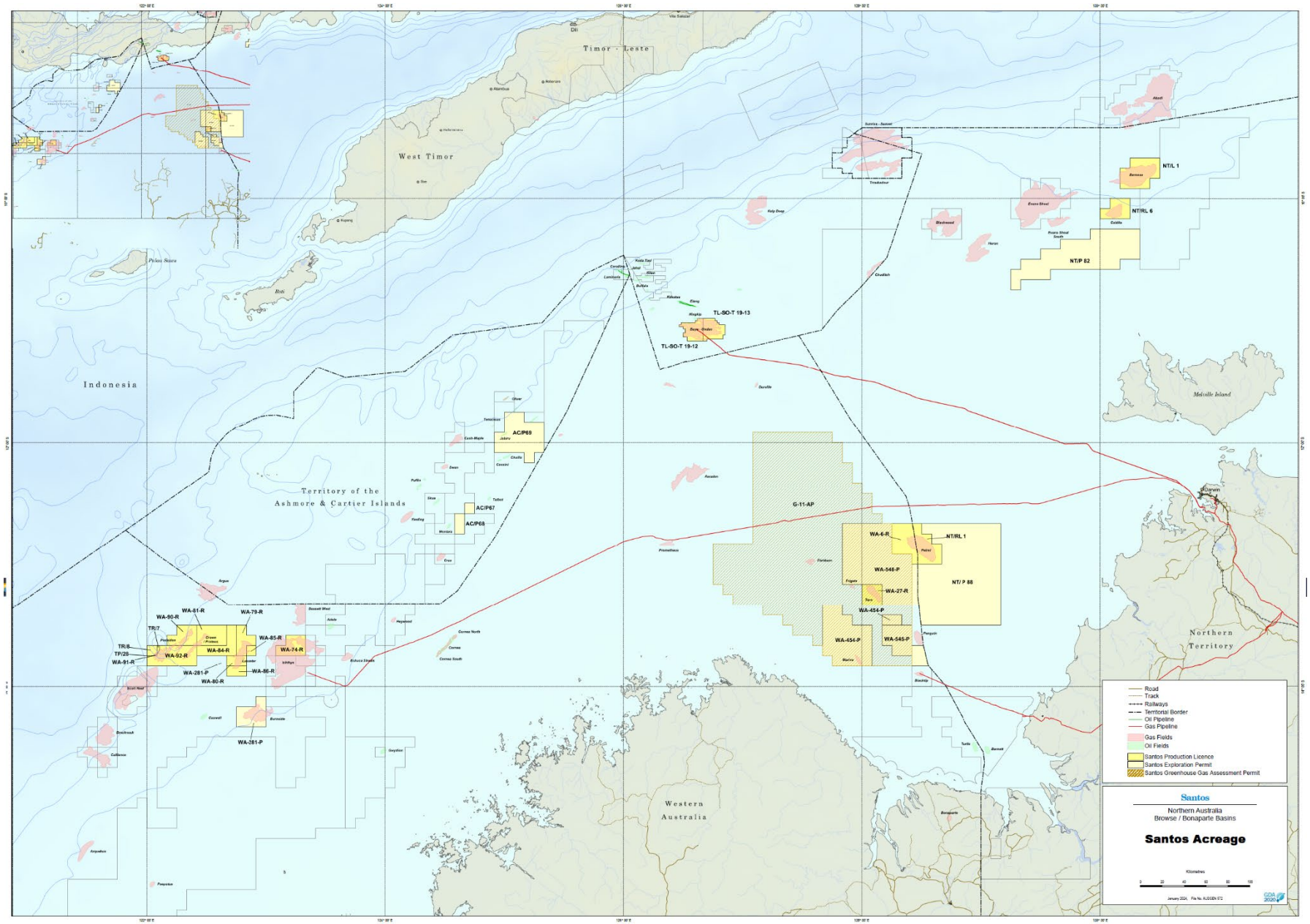


Figure 1-1: Santos acreage Northern Australia – Browse / Bonaparte Basins (January 2024)

2. EMBA and Identification of Locations for Baseline Review

2.1 Consolidated EMBA

This OSM-BIP provides monitoring guidance and arrangements for all Santos activities referred in the Northern Australia Region. Therefore, a single consolidated EMBA has been prepared to represent all of these activities and the resultant geographical extent of this OSM-BIP (Figure 2-1). The Consolidated EMBA 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[1] represents the low exposure zone and corresponds generally with potential for exceedance of water quality triggers.

The Consolidated EMBA 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 EMBAs, hydrocarbon type, proximity to receptors, minimum time to contact and their representation of Santos' activity locations within the Northern Australia Region.

For a description of the environment within each 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 Locations requiring a baseline review

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

Locations that are ecologically significant and require a baseline data review have been drawn from the worst-case spill scenarios listed in Table 2-1 and based on the stochastic modelling results of each activity, provided in the activity specific OPEPs. Locations and associated receptors requiring a baseline data review were identified as those sensitive 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 first-strike monitoring response) at a probability >5%. Table 2-2 provides a cumulative list of all the locations identified and Appendix B lists the background information on key receptors/sensitivities associated with each of these locations.

Monitoring priorities are subsequently identified as those locations and associated 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).

[1] *Note that Santos will use the threshold of 1,000 ppb for entrained hydrocarbons as the low threshold when finalising monitoring design. However, OSM planning and capability assessments have used 10 ppb in the absence of historical modelling reports having data available on 1,000 ppb entrained hydrocarbons.*

Table 2-1: Santos worst-case spill scenarios used to determine the planning area for operational and scientific monitoring for the Northern Australia Region

Environment Plan / OPEP	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)
Barossa Drilling and Completions (BAA-200 0327)	Barossa Condensate (Group 1)	Subsea release from a loss of well control (LOWC)	90 days	129,000
Barossa Subsea Infrastructure Installation (BAS-210 0109)	Marine Diesel Oil (MDO) (Group 2)	Vessel collision and rupture of a fuel tank	1 hour	500
Barossa Production Operations (BAA-200 0637)	Barossa Condensate (Group 1)	Surface release from the FPSO or offtake tanker from an external impact (vessel collision), which ruptures a condensate storage tank	1 hour	16,700
	MDO (Group 2)	Surface release from the FPSO from an external impact (vessel collision), which ruptures an FPSO MGO / MDO tank	1 hour	2,418
	MDO (Group 2)	Surface release from a tank onboard the inspection, maintenance and repair (IMR) vessel because of an external impact (vessel collision)	1 hour	500
	Heavy Fuel Oil (HFO) (Group 4)	Surface release from the offtake tanker from an external impact (vessel collision), which ruptures an HFO tank on the offtake tanker	1 hour	460
Barossa Gas Export Pipeline Installation (BAA-100 0330_1.2)	MDO (Group 2)	Vessel collision and the rupture of a fuel tank from a pipeline installation vessel	6 hours	700
Barossa Darwin Pipeline Duplication (DPD) (Construction) Commonwealth waters (BAS-210 0131)	MDO (Group 2)	Vessel fuel tank rupture	6 hours	700
Barossa DPD (Construction) Territory waters (BAS-210 0026)	MDO (Group 2)	Offshore pipelay vessel fuel tank rupture at KP91.5	6 hours	700
Barossa DPD (Operations) Territory waters (BAS-210 0226)	MDO (Group 2)	Vessel fuel tank rupture (at locations KP23, KP91.5 and KP114)	1 hour	300
Bayu Undan Gas Export Pipeline Decommissioning (in draft)	MDO (Group 2)	Vessel fuel tank rupture (at locations KP30, KP200, KP300 and KP420)	1 hour	361
EOS 3D Marine Seismic (7710-650-ERP-0004)	MDO (Group 2)	Vessel fuel tank rupture	1 hour	1,065

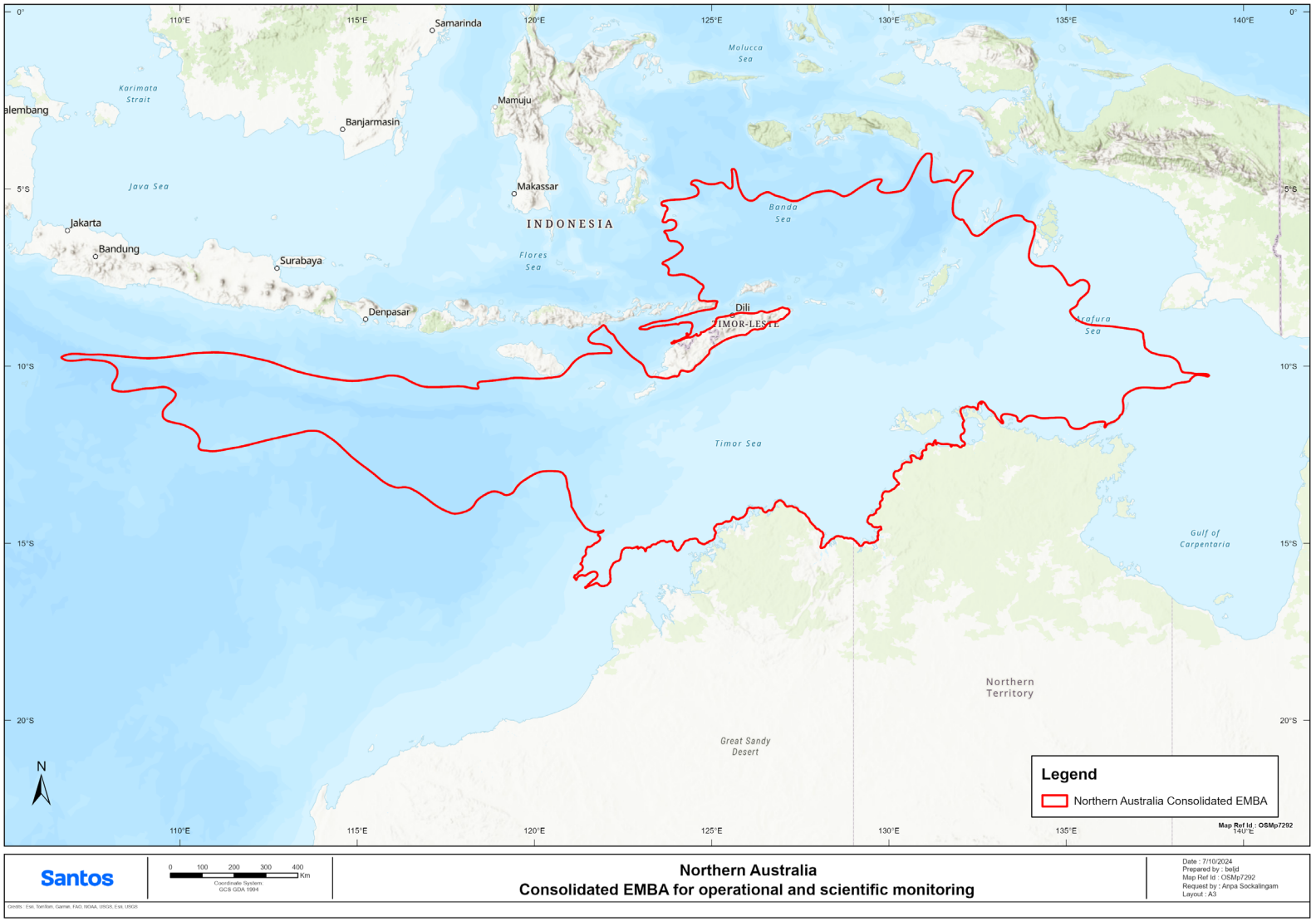


Figure 2-1: Consolidated EMBA for Santos Northern Australia OSM-BIP

Table 2-2: Locations in the Northern Australia OSM-BIP Combined EMBA requiring a baseline review (all locations predicted by stochastic modelling to be contacted within 7 days at the low thresholds and a probability > 5% from all worst-case scenarios presented in Table 2-1)

Location
Australian Marine Parks (AMP)
Outer Oceanic Shoals AMP
Kimberley AMP
Joseph Bonaparte Gulf AMP
Coastlines[2]
Beagle Gulf-Darwin Coast (Includes RPS oil spill modelling default receptor locations of Cox-Finniss [Including Charles Point Wide], Darwin and Litchfield)
Darwin Harbour (Including East Arm, West Arm, Wickham Point, Middle Harbour, Shoal Bay, Outer Harbour, Outer Harbour East, Outer Harbour West)
Djukbinj (Includes western section of RPS oil spill modelling default receptor location South Alligator, also includes the geographical area known as Cape Hotham)
Van Diemen Gulf Coast (includes eastern section of RPS oil spill modelling default receptor locations South Alligator and western section of West Arnhem)
Joseph Bonaparte Gulf – East Coast (Include RPS oil spill modelling default receptor locations of Daly and Thamarrurr)
Islands
Tiwi Islands (Bathurst Island and Melville Island)
Vernon Islands
Nature Reserves
Vernon Islands Conservation Reserve
Reefs, Shoals and Banks
Afghan Shoal
Blackwood Shoal
Echo Shoals
Evans Shoal
Flat Top Bank
Flinders Shoal
Foelsche Bank
Franklin Shoal
Hancox Shoal
Harris Reef
Lowry Shoal
Loxton Shoal
Lyne Reef
Lynedoch Bank
Marsh Shoal
Moresby Shoals
Margaret Harries Bank
Newby Shoal

[2] *Coastline locations are listed in accordance with the Santos defined receptors provided in Santos' Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003). It should be noted that not all available oil spill modelling reports list receptor locations in accordance with the Santos defined receptors. Where sectors have alternative names, these are included here for cross reference.*

Location
Shepparton Shoal
Skottowe Shoal
Sunrise Bank
Tassie Shoal
The Boxers Area
Unnamed Shoal
Van Cloon-Deep Shoals
Van Diemen Gulf Shoals
Shipwrecks
Refer to Santos OSM Baseline and Monitoring Assessment Matrix (7715-650-DAS-0002) for full list and locations
Water Quality Zones
Submerged receptors within Darwin Harbour extents (Refer to Santos OSM Baseline and Monitoring Assessment Matrix [7715-650-DAS-0002] for full list and locations)
Restricted Areas
Submerged receptors within Darwin Harbour extents (Refer to Santos OSM Baseline and Monitoring Assessment Matrix [7715-650-DAS-0002] for full list and locations)

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 Northern Australia OSM-BIP Combined EMBA. These include the Santos Energy 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 DoT 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 EMBA. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy and is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

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 locations and associated receptors predicted to be contacted within 7 days is an important preparatory measure for OSM first strike. During a spill event, the first strike monitoring capability will be prioritised to those receptors with insufficient baseline data (deemed first-strike monitoring priorities) to collect baseline data post-spill pre-impact. An overview of the process used to identify first-strike monitoring priorities is outlined in Figure 4-1: , with additional detail provided in the steps below. 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).

The baseline data assessment includes the following steps:

1) **Identification of locations requiring a baseline review:** Receptor locations predicted to be contacted within 7 days, at a probability greater than 5%, are identified (Table 2-2) and aligned with OMPs and SMPs
2) **Collection of baseline data:** Environmental baseline monitoring data relevant to the locations and receptors is located (as per sources outlined in Section 3)
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:** An 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 location and associated receptors 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 B) 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 location?

5) **Assessment outcome:** Each location and associated receptor is then categorised as either 'First-Strike Monitoring Priority' or 'Lower Priority for First-Strike Monitoring', as outlined below, and summarised in Table 4-3:

    a) **First-Strike Monitoring Priority -** current baseline data is not in place, not suitable or not sufficient; and post-spill pre-impact baseline data collection should be prioritised; and

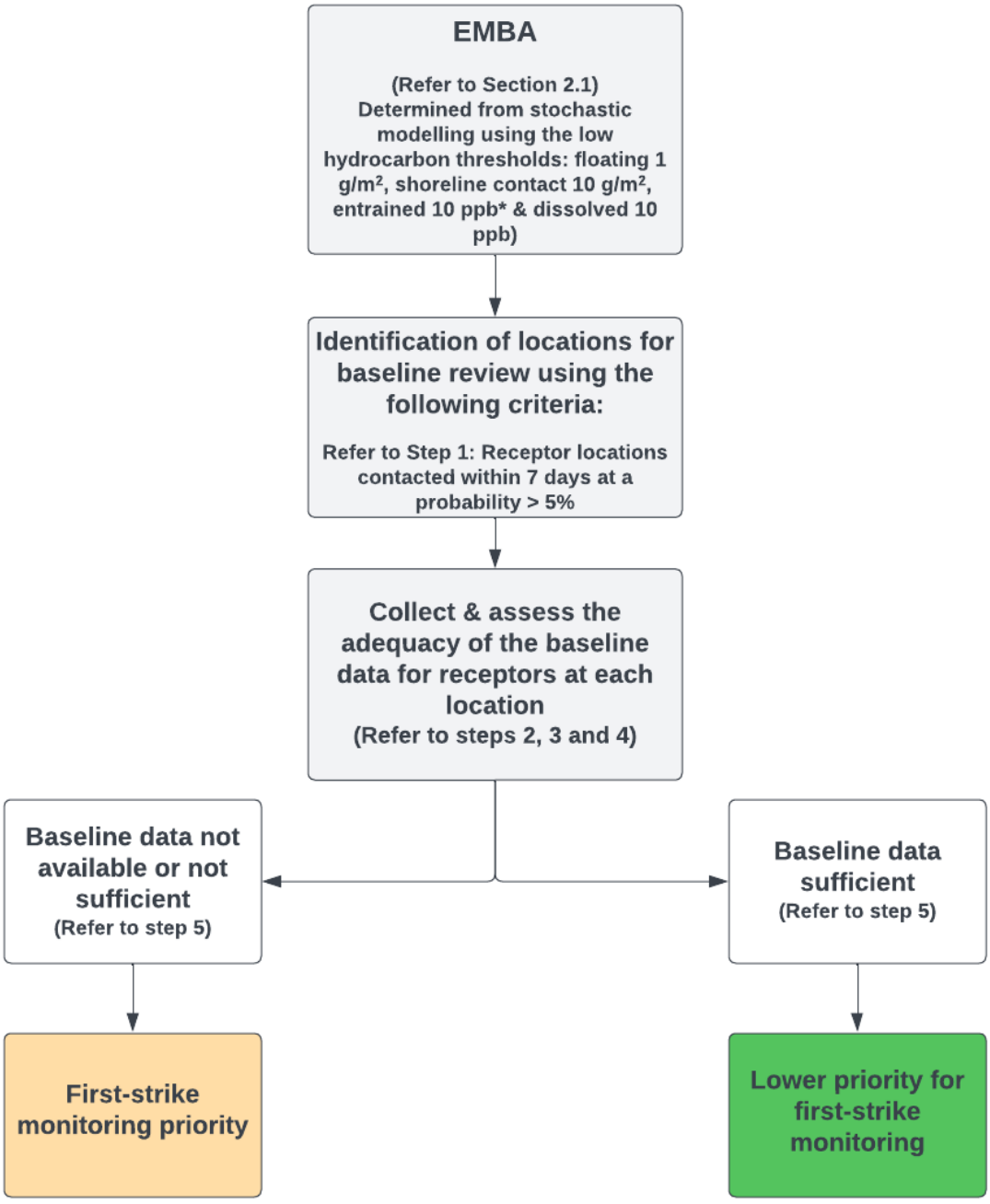
    b) **Lower Priority for First-Strike Monitoring –** collectively there is substantial baseline data or on-going monitoring from within the last 5 years. This data aligns with the key parameters and methodologies of the relevant Joint Industry SMP, encompasses the required species/biological communities, 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.

During an actual spill, the monitoring priorities will vary according to the spill event and it should be noted that the monitoring priorities provided in Table 4-3 are listed for planning and guidance purposes (note: the first-strike monitoring priorities listed are a cumulative list based on all the worst-case spill scenarios outlined in Table 2-1). There was a paucity of baseline data for all of the reefs, shoals and banks listed in Table 2-2. Monitoring should focus on locations most at risk of consequences, such as in shallow waters, in sensitive habitats, and in areas with protected species. Consequently, shorelines and adjacent nearshore areas will generally take priority over reefs, shoals and banks, unless they are the main locations impacted by a spill event.

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.

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.

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).



** Note that Santos will use the threshold of 1,000 ppb for entrained hydrocarbons as the low threshold when finalising monitoring design. However, OSM planning and capability assessments have used 10 ppb in the absence of historical modelling reports having data available on 1,000 ppb entrained hydrocarbons.*

Figure 4-1: Summary of the process for identifying first-strike monitoring priorities

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

SMP	Key parameter	Key methodology
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
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
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
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 • Remotely Operated Vehicle (ROV) camera • Diver-based camera surveys • Remote sensing (coral & seagrass broad scale survey) • Sediment grab for infauna
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
Fisheries impact assessment	At least one key parameter: Abundance, catch-rate, stock structure, size structure	Catch and effort for stock assessment
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
Marine megafauna- whale sharks, dugong and cetaceans	At least one key parameter: species identification, abundance / counts, key behaviour	Aerial or vessel surveys, acoustic monitoring

SMP	Key parameter	Key methodology
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

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 = 2019–2024	High = > 4 years	High = 4+ sampling trips per year	High	High
Medium = 2013–2018	Medium = 2–4 years	Medium = 2–3 sampling trips per year	-	-
Low = <2012	Low = <2 years	Low = one-off sampling trip	Low	Low

Table 4-3: Proposed priority monitoring locations versus SMPs for the worst-case spill scenarios in the Northern Australia OSM-BIP Combined EMBA

Grouping / Location	SMP									
	Water quality impact assessment	Sediment quality impact assessment	Intertidal and coastal habitat assessment	Seabirds and shorebirds	Marine mega-fauna assessment – reptiles	Marine mega-fauna assessment – whale sharks, dugong and cetaceans	Benthic habitat assessment	Marine fish and elasmobranch assemblages assessment	Fisheries impact assessment	Heritage and social impact assessment
Darwin Harbour			Mangroves							
Beagle Gulf-Darwin										
Djukbinj										
Van Diemen Gulf Coast										
Joseph Bonaparte Gulf – East Coast										
Tiwi Islands										
Vernon Islands										
Reefs, shoals and banks										
Water Quality Zones (Darwin Harbour only)										
Shipwrecks and Restricted Areas										

Key	
	First-strike monitoring priority
	Lower priority for first-strike monitoring

Note: Marine parks have not been included as a specific grouping/location because priority monitoring locations within marine parks are encompassed by specific islands, shorelines, reef, shoals and banks which fall within the boundaries of a marine park.

5. OSM organisational structure

Santos uses 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 NT IMT and/or WA DoT is the Control Agency, the IMT will be managed through coordinated command and Santos will still be expected to continue monitoring activities in Territory/State waters, with oversight from the NT IMT and/or WA DoT.

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.

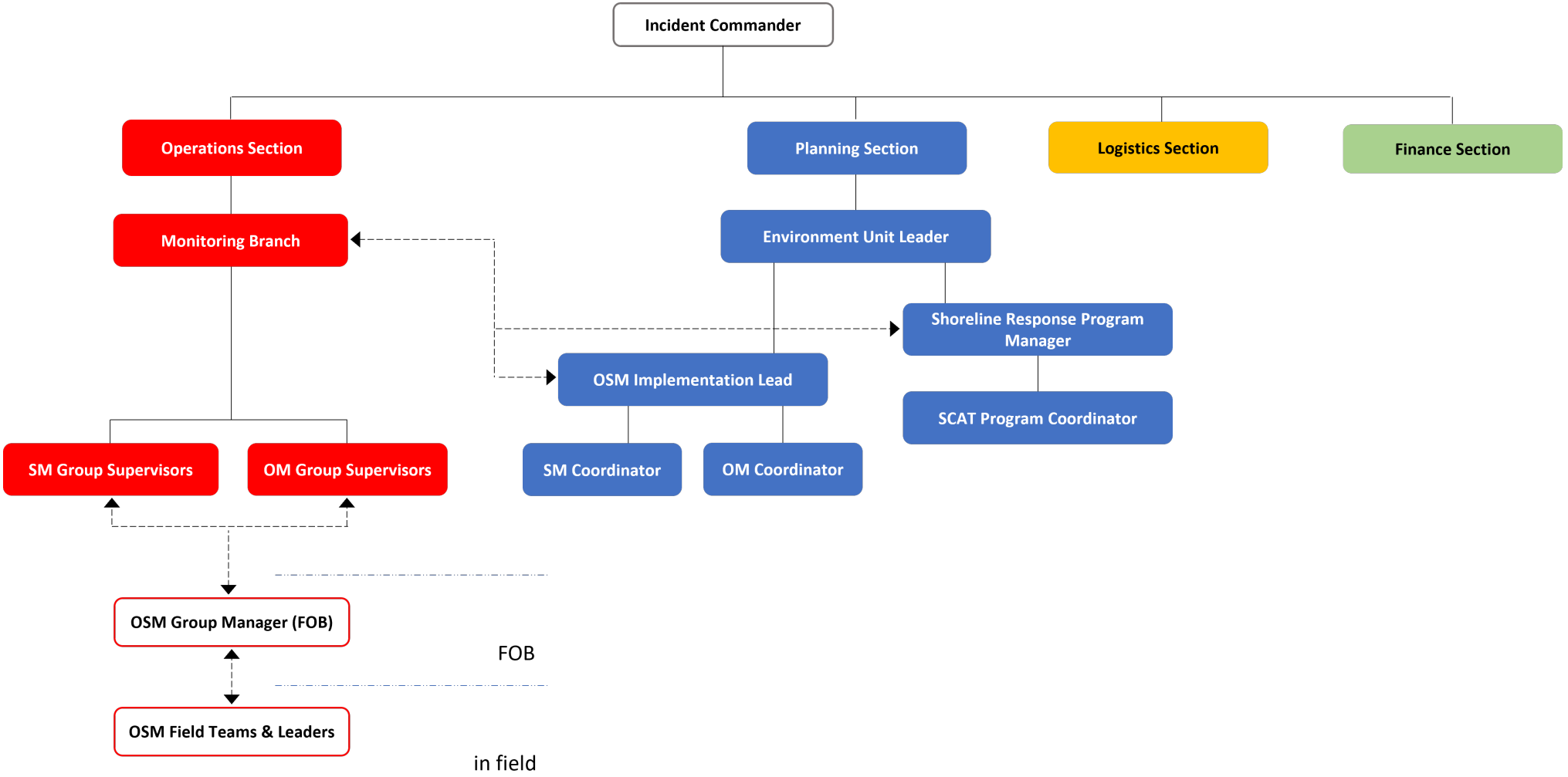


Figure 5-1: Santos IMT structure with key OSM roles

6. OSM roles and responsibilities

OSM roles and responsibilities are listed in Section 10.13.2 of the Joint Industry OSM Framework. 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 / OSM Services Provider
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 Northern Australia OSM-BIP Combined EMBA and adjacent waters. 'Implementation' of an OMP/SMP is defined as being ready, at the point of staging or departure, to mobilise for monitoring. 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 locations will likely be contacted during a spill event).

Due to short contact times, there may be instances where post-spill pre-impact monitoring is not feasible. For these locations, 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).

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. Commence activation and mobilisation of OM personnel.	• OMP: Hydrocarbon Properties And Weathering Behaviour, where resources are available (e.g. Supply Vessel with onboard sampling equipment). • OMP: Water Quality Assessment • OMP: Sediment Quality Assessment • OMP: Air Quality Modelling • OMP: Marine Fauna Assessment • OMP: Surface Chemical Dispersant Effectiveness (commencing with Tier 1 SMART Protocol) • 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.	• SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Benthic Habitat Assessment • SMP: Marine fish and elasmobranch assemblages assessment	Continued	Continue SMP monitoring until termination criteria are met
Sensitive receptors (including	OM	Activation of OMP Team Leads.	• OMP: Hydrocarbon properties and	Continued (as per on-going arrangements)	Continued (as per on-going arrangements)	As results from implemented OMPs are available, data are

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
shorelines, reefs, banks and shoals) predicted to be contacted within 7 days		Finalise OMPs. Commence activation and mobilisation of OM personnel.	weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment OMP: Shoreline clean-up assessment • OMP: Marine fauna assessment • Continue to finalise OMPs. • Continue to activate and mobilise OM personnel.			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	Activation of SMP Team Leads and finalisation of SMPs	Continue to activate and mobilise personnel. Work on finalising SMPs.	• SMP: Water Quality Impact Assessment • SMP: Sediment Quality Impact Assessment • SMP: Benthic Habitat Assessment • SMP: Intertidal and Coastal Habitat Assessment • SMP: Seabirds and Shorebirds • SMP: Marine Mega-fauna Assessment-Reptiles • SMP: Marine Mega-fauna Assessment-Cetaceans, Whale Sharks, Dugong • SMP: Marine Fish and Elasmobranch Assemblages 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
				• SMP: Commercial and recreational fisheries impact assessment • SMP: Heritage Assessment • SMP: Social Impact Assessment		
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. • OMP: Hydrocarbon properties and weathering behaviour at sea • OMP: Water quality assessment • OMP: Sediment quality assessment • OMP: Shoreline clean-up assessment • OMP: Marine fauna 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.	• SMP: Water quality impact assessment • SMP: Sediment quality impact assessment • SMP: Marine mega-fauna assessment - reptiles • SMP: Marine fish and elasmobranch assemblages assessment • SMP: Intertidal and coastal habitat 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
					• SMP: Seabirds and shorebirds • SMP: Benthic habitat assessment • SMP: Commercial and recreational fisheries impact assessment • SMP: Heritage Assessment • SMP: Social Impact Assessment	

8. Resourcing requirements

To guide resourcing requirements, the spill scenario most likely to require the greatest first-strike and on-going capability was selected from those informing the Northern Australia OSM-BIP Combined EMBA. Selection was based on stochastic modelling results (refer to Table 2-1), focussing on the scenario with the greatest predicted number of locations contacted at the low thresholds (Section 2.1) within 7 days; followed by the greatest number of locations contacted within 7-14 days; and at the highest contact probabilities. 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 Barossa DPD (Construction) MDO release of 700 m^3 of MDO over 6 hours was determined to be Santos' worst-case spill scenario requiring the greatest OSM capability in the Northern Australia Region. This scenario was selected as having the greatest resourcing demand on OSM capability as it had the highest number of shoreline locations predicted to be contacted within the first 7 days (first-strike) and 7-14 days. Shoreline locations typically require activation of more OMPs and SMPs to assess impacts to emergent features and receptors, whereas submerged receptors (e.g. banks, reefs and shoals) have an absence of emergent features and therefore will not require the corresponding OMPs and SMPs (e.g. SCAT, intertidal and coastal habitats, shorebirds) to be monitored.

To further guide first-strike resource requirements for OSM, deterministic modelling was undertaken and the run with the most receptors contacted where shoreline accumulation exceeded 10 g/m^2 within 7.0 days was selected. Run 75 had the most receptors contacted by shoreline accumulation ≥10 g/m^2 within 7 days, including Vernon Islands and South Alligator; and one additional receptor (Litchfield) contacted within 7-14 days (Table 8-1).

The resources required to assist the IMT in the coordination and management of OSM for this worst-case scenario (Barossa DPD run 75) are outlined in Table 8-2. The resources required to commence OM and SM components during weeks 1-2 are presented in Table 8-3 and Table 8-4 respectively, which are based on the locations requiring baseline review in Section 2.2, the implementation schedule outlined in Table 7-1, and the worst-case deterministic trajectory (Barossa DPD run 75) outlined in Table 8-1. If required, additional resources will be mobilised from weeks 2-3 onwards via the OSM Services Provider Contract, which includes provision of scale-up resources.

Note: Each new activity will be assessed, as outlined in Section 1.1 and Appendix A, to determine whether their spill scenario(s) exceed the resourcing requirements of Barossa DPD deterministic modelling run 75.

Table 8-1: Deterministic modelling results (Run 75) – Barossa DPD Spill of 700 m^3 of MDO over 6 hours (RPS, 2024)

Location	Arrival time (days) for deterministic run No. 75			
	Shoreline Accumulation ≥10 g/m^2	Floating oil ≥1 g/m^2	Total Entrained ≥10 ppb	Dissolved Hydrocarbons ≥10 ppb
Vernon Islands	3.3	NC	2.3	5.3
Djukbinj (Includes South Alligator)	5.0	NC	3.4	NC
Beagle Gulf-Darwin Coast (Includes Litchfield)	9.1	NC	2.7	NC
Darwin (includes Darwin Harbour)	NC	NC	4.6	NC
Lyne Reef*	NC	NC	2.3	NC
Marsh Shoal*	NC	NC	2.3	7.1
Unnamed Shoal*	NC	NC	0.75	NC

**Submerged receptor that has no features above the sea surface. Modelling indicates '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 8-2: 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 8-3: Resources required for implementing operational monitoring plans for the identified worst-case scenario from the Northern Australia OSM-BIP Combined EMBA

OMP	Week 1 (total)	Week 2 (total)	Arrangement
Hydrocarbon properties and weathering behaviour at sea)*	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 2 sites [Vernon Islands and South Alligator[#]]) Total 3 teams	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 3 sites [Vernon Islands, South Alligator and Litchfield]) Total 4 teams Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangements
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
Surface chemical dispersant effectiveness and fate^	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 OMP: Water quality assessment		OSRL OSM Supplementary Service Agreement AMOSC Participant Member Agreement Santos Contracted Vessel Providers
Subsea dispersant injection monitoring^	No subsea dispersant injection until week 2 due to transportation requirements	1 team	OSRL OSM Supplementary Service Agreement

OMP	Week 1 (total)	Week 2 (total)	Arrangement
			AMOSC Participant Member Agreement Santos Contracted Vessel Providers
Water quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)		OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea resourcing* (all sites)		OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers
Marine fauna assessment	1 team to conduct initial aerial surveys for all sites (2 observers per aircraft) Note: these resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.		OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Aviation contractors
Air quality modelling (responder health and safety)	1 model	1 model	RPS via Santos contract

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

 # Specific locations 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.

^ Surface and subsea dispersant injection monitoring are not included as applicable response strategies in the Barossa DPD (Construction) OPEP (BAS-210 0131), however, they are included in this resourcing analysis as they are suitable secondary response strategies for other activities listed in Table 2-1.

Table 8-4: Resources required for implementing scientific monitoring plans for the identified worst-case scenario from the Northern Australia OSM-BIP Combined EMBA

SMP	Week 1 (total)	Week 2 (total)	Arrangement
Water quality impact assessment	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 2 sites [Vernon Islands and South Alligator#]) Total 3 teams Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 3 sites [Vernon Islands, South Alligator and Litchfield]) Total 4 teams Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement

SMP	Week 1 (total)	Week 2 (total)	Arrangement
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)	Refer to SMP: Water quality impact assessment* (all sites)	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Intertidal and coastal habitat assessment	1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 2 sites [Vernon Islands and South Alligator]) Total 3 teams	1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 3 sites [Vernon Islands, South Alligator and Litchfield]) Total 4 teams	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Seabirds and shorebirds	1 team to conduct initial aerial surveys for Vernon Islands and South Alligator (2 observers per aircraft) Total 1 team Note: can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered	1 team to conduct aerial surveys for Vernon Islands and South Alligator (2 observers per aircraft) 1 team to conduct initial aerial surveys for Litchfield (2 observers per aircraft) Total 2 aerial teams 1 team to conduct vessel-based surveys per site (Vernon Islands, South Alligator and Litchfield) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) Total 3 vessel-based teams 1 team to conduct ground-based surveys per site (Vernon Islands, South Alligator and Litchfield) (1 experienced ornithologists per team) Total 3 ground-based teams	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Marine mega-fauna assessment (whale shark, dugong and cetaceans)	Aerial surveys refer to SMP: Seabirds and shorebirds This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	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
Marine mega-fauna assessment (reptiles)	Aerial surveys refer to SMP: Seabirds and shorebirds	Aerial surveys refer to SMP: Seabirds and shorebirds	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement

SMP	Week 1 (total)	Week 2 (total)	Arrangement
	This SMP may replace the relevant OMP: Marine fauna assessment if the OMPs termination criteria are triggered	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)	
Benthic habitat assessment	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 2 sites [Vernon Islands and South Alligator]) Total 3 teams	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 3 sites [Vernon Islands, South Alligator and Litchfield]) Total 4 teams	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Marine fish and elasmobranch assemblages assessment	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 2 sites [Vernon Islands and South Alligator]) Total 3 teams	1 team (spill site and surrounds) 1 team per site (e.g. for worst-case estimating as per Table 8-1 this amounts to 3 sites [Vernon Islands, South Alligator and Litchfield]) Total 4 teams	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Fisheries impact assessment	Total 2 teams to cover all relevant Commonwealth and State fisheries.		OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Heritage features assessment	1 team	1 team	OSRL OSM Supplementary Service Agreement Santos Contracted Vessel Providers Laboratory arrangement
Social impact assessment	1 team	1 team	OSRL OSM Supplementary Service Agreement

[#] *Specific locations 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 SMP: Water quality impact assessment and SMP: Sediment quality impact assessment.*

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 and internationally (who will report through OSRL) to deliver monitoring capability.

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

OSRL (referred to as the OSM Services Provider in this BIP), via the OSM Supplementary 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[3]
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[4]
Provision of an OSM Implementation Lead to the Santos IMT within 12 hours of notification
Provision of a first-strike 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 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).

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.

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

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

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)	AMSA (2 x test kits in Darwin)
Oil sampling kits (full kit) – 1 located in Darwin	Santos
Oil sampling kits (rapid kit) – 5 located in Darwin / Tiwi Islands	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	Description	Frequency
Assurance Program Workshop	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	Test procedures to notify and activate the OSM Services, including subcontracted Monitoring Service Providers.	Annually
Tabletop exercise	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	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 8-3 and Table 8-4) 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 the OMP for Hydrocarbon Properties and Weathering Behaviour at Sea can also carry out the OMPs for Water Quality Assessment and Sediment Quality Assessment concurrently.

Table 10-1: OSM capability

Component	Total personnel required (Weeks 1–2) [5]	Personnel available via OSM Services Provider	Personnel available via OSROs	Santos	Total personnel available
OSM Personnel embedded in IMT	1 OSM Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 2 Group Supervisors 2 Group Managers	1 OSM Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 1 OM/SM Group Manager	-	1 OSM Implementation Lead (initial) 3 x Group Supervisors and/or Group Managers	2 OSM Implementation Leads 1 OM Monitoring Coordinator 1 SM Coordinator 2 Group Supervisors 2 Group Managers
OMPs					
Hydrocarbon properties and weathering behaviour at sea*	4 teams	4 teams#	-	Initial sampling kits (Darwin) and procedures for untrained personnel to obtain samples[6]	4 teams
Shoreline clean-up assessment	As per activity-specific OPEP				
Surface chemical dispersant effectiveness and fate	Visual observations: 1 team Water quality assessment – refer to OMP: Water quality assessment	1 visual observation team# Refer to OMP: Water quality 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
Subsea chemical dispersant injection monitoring	1 team (week 2 onwards)	1 team#	-	-	1 team
Water quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea				
Sediment quality assessment*	Refer to OMP: Hydrocarbon properties and weathering behaviour at sea				
Marine fauna assessment	1 aerial team	1 team#	N/A	N/A	1 aerial team

[5] *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*

[6] *For Hydrocarbon properties and weathering behaviour at sea only*

Component	Total personnel required (Weeks 1–2) [5]	Personnel available via OSM Services Provider	Personnel available via OSROs	Santos	Total personnel available
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					
Water quality impact assessment	4 teams Note: can initially be performed by the same team as OMP: Water quality assessment. This SMP may replace OMP: Water quality assessment if the OMPs termination criteria are triggered	4 teams#	-	-	4 teams
Sediment quality impact assessment	Refer to SMP: Water quality impact assessment* (all sites)				
Intertidal and coastal habitat assessment	4 teams	4 teams#	-	-	4 teams
Seabirds and shorebirds	2 aerial teams Note: can initially be performed by the same team as OMP: Marine fauna assessment – seabirds and shorebirds. This SMP may replace OMP: Marine fauna assessment – seabirds and shorebirds if the OMPs termination criteria are triggered 3 vessel teams (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) 3 ground-based teams	2 aerial teams# 3 vessel teams# 3 ground based teams# (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])	-	-	2 aerial teams 3 vessel teams 3 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])
Marine mega-fauna assessment (whale shark, dugong and cetaceans)	Refer to SMP: seabirds and shorebirds				

Component	Total personnel required (Weeks 1–2) [5]	Personnel available via OSM Services Provider	Personnel available via OSROs	Santos	Total personnel available
Marine mega-fauna assessment (reptiles)	Aerial and vessel - Refer to SMP: seabirds and shorebirds Ground surveys - Refer to SMP: seabirds and shorebirds (plus 1 team member per team experienced with ground turtle surveys)				
Benthic habitat assessment	4 teams	4 teams[#]	-	-	4 teams
Marine fish and elasmobranch assemblages assessment	4 teams	4 teams[#]	-	-	4 teams
Fisheries impact assessment	2 teams	2 teams[#]	-	-	2 teams
Heritage features assessment	1 team	1 team[#]	-	-	1 teams
Social impact assessment	1 team	1 team[#]	-	-	1 team

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

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

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 NT waters and/or WA State Waters and along NT and WA shorelines. Where the Department of Environment, Parks and Water Security (DEPWS) or WA DoT are the Control Agency, OMP: 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.

The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) are the designated Jurisdictional Authority for all spills that contact the shorelines within Ashmore Reef AMP and Cartier Island AMP; the Santos IMT (as Control Agency for Commonwealth waters) will liaise with DCCEEW to direct resources for the purposes of shoreline assessment (and clean-up) 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	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 D	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 E) and submit to OSM Services Provider[7] 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	☐
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	☐

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

Responsibility	Task	Timeframe	Complete
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 first-strike 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 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); • 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); • Nature of hydrocarbon spill (i.e. subsea blow out, surface release, hydrocarbon characteristics, volume, expected duration of release); • Monitoring priorities identified in Section 2; and • Existing literature, baseline data, and monitoring programs.	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Using the results of the baseline data analysis in Table 4-3 and the information above, determine priority locations for post-spill, pre-impact monitoring	Within 12 hours of monitor and evaluate data being received from IMT	☐
	Confirm the need for any additional reactive baseline monitoring data for SMPs and determine suitable locations, noting that suitable control or reference sites may be outside of the EMBA	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 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 B 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 Environment Unit Lead and OSM Implementation Lead will be responsible for approving the finalised monitoring design used in the OMPs and SMPs.

Table 15-1: Checklist for finalising monitoring design

Responsibility	Task	Timeframe	Complete
Santos Environment Unit Lead and OSM Implementation 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	Prior to the finalisation of monitoring designs	☐
	Liaise with the Santos Environment Unit Lead to review the Environmental Performance Standards listed in the activity-specific OPEP and integrate checks into the	Prior to the finalisation of monitoring designs	☐

Responsibility	Task	Timeframe	Complete
	monitoring design that will help determine if relevant Environmental Performance Standards are being met		
	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 OMP: 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: OMP: 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	☐
	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	☐
	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 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	☐

Responsibility	Task	Complete
	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 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 .

Table 17-1: Permits required in EMBA

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 Reginal 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 Ordanances (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 OMP: 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[8]	IMT Section requiring data	How data may be used by IMT
Hydrocarbon properties and weathering behaviour at sea	Hydrocarbon physical characteristics (e.g. viscosity, asphaltene content, fingerprinting, weathering ratios of hydrocarbon chains)	Planning Section to aid in response option selection / modification	Changes to the hydrocarbon properties will affect the window of opportunity for particular responses and the associated logistical requirements of these responses, such as use of chemical dispersants, recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements
Shoreline clean-up assessment	Assessment of shoreline character; assessment of shoreline oiling; recommendations for response activities; post-treatment surveys	Planning Section to aid in IAP development and response option selection / modification	• Confirmation of shoreline character, habitats and fauna present which may influence selection of response tactics (e.g. no mechanical recovery if turtles are known to be nesting); • Oil deposition and/or removal rate for a shoreline sector will help determine effectiveness of relevant tactics (e.g. shoreline protection and/or clean-up operations); • Assessment teams provide ground truthing of sites that are not possible via satellite imagery, therefore the IMT can rely on the recommendations of Assessment Teams (e.g. flagging access issues, suitable tactics, likely resourcing needs)
Surface chemical dispersant effectiveness and fate	Visual observations of dispersant efficacy; 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)
Subsea dispersant injection	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)
Water quality assessment	Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BETEXN, PAH), physio-chemical parameters and dispersant detection	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.

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

OMP	Data generated[8]	IMT Section requiring data	How data may be used by IMT
Sediment quality assessment	Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BETEXN, PAH)	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
Marine fauna assessment	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 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)
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 OMP: Shoreline Clean-up Assessment will involve assessment teams determining suitable access routes, including utilisation of existing roads and tracks and establish 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	OMP: Sediment Quality Assessment will involve a soil profile assessment being conducted prior to earthworks taking place
[EPS-SCU-024] Unless directed otherwise by the 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 OMP: 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 OMP: 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.

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 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

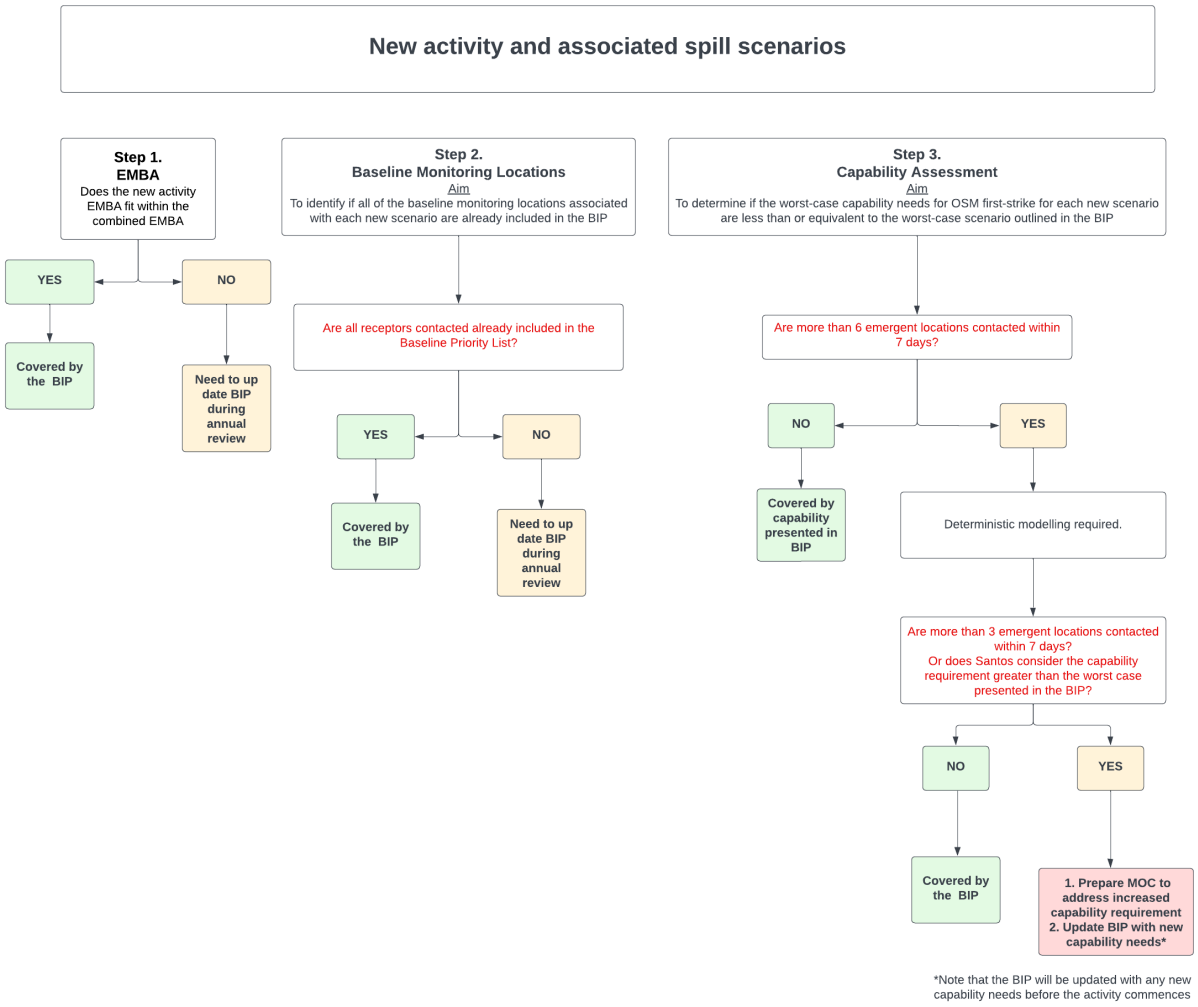
Responsibility	Task	Complete
Santos Environment Unit Lead / Environment Advisor with input from OSM Services Provider	Review termination criteria of OMPs and SMPs (provided in Table 9-1 (OMPs) and Table 9-2 (SMPs) of the Joint Industry Operational and Scientific Monitoring Framework) to ensure OMPs and SMPs are terminated in accordance with these criteria	☐
	Ensure all 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.

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 Process for assessing new activities against OSM-BIP first-strike capability



Appendix B Background information for key sensitivities

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

Location	Receptor	Background	Key locations	Seasonality
Beagle Gulf-Darwin Coast	Mangroves	Extensive mangroves in this region (AMOSC 2019).	Along estuaries, inlets and large protected bays in the region- such as Bynoe Harbour (Chatto and Baker 2008).	-
	Cetaceans	BIA for Indo-pacific Humpback Dolphin (*Sousa chinensis*) near Cox Peninsula (DCCEEW 2024).	-	-
	Birds	Shorebirds are widely distributed throughout this area. However as much of the coast is lined with thick mangroves, overall densities of shorebirds is generally not high (Chatto 2003) Fog Bay has historically recorded high numbers of shorebirds (>38,000 February 1995 [Chatto 2003]).	The coast between Lee Point and Tree Point (east of Darwin) Bare Island Fog Bay (southern section) (Chatto 2003)	-
	Crocodile	Saltwater crocodile (*Crocodylus porosus*) (Fukuda and Cuff 2013)	-	-
Darwin Harbour	Cetaceans	Australia Snubfin Dolphin (*Orcaeila heinsohni*) have frequently been observed feeding in turbid shallow areas near river mouths where the water is less than 20 m deep (Parra 2006). The Australian snubfin forages in a variety of habitats, ranging from mangrove communities to seagrass beds, sandy bottom communities and open coastal areas with rocky shores and coral reefs. With the exception of seagrass beds, all of these habitats occur widely in Darwin Harbour (Northern Territory Government, 2011). Spotted Bottlenose Dolphin (*Tursiops aduncus*) – known to inhabit naturally turbid environments (Northern Territory Government, 2011). Indo-pacific Humpback Dolphin (*Sousa chinensis*) – tend to inhabit slightly deeper areas than Australian snubfins, including dredged channels. (Parra. 2006) The Indo-pacific humpback dolphin forages in a variety of habitats, ranging from mangrove communities to seagrass beds, sandy bottom communities and open coastal areas with rocky shores and coral reefs. With the exception of	-	-

Location	Receptor	Background	Key locations	Seasonality
		seagrass beds, all of these habitats occur widely in Darwin Harbour (Northern Territory Government 2011).		
	Dugong	Dugong (Dugong dugon) – The waters of Darwin Harbour are a naturally turbid environment, indicating that dugongs inhabiting Darwin harbour are at least tolerant of turbid water. Feeding in concentrated in areas such as the rocky reefs at Weed Reef, Channel Island and sea grass beds (Whiting 2001). However, it is not the most important dugong habitat in the region due to limited seagrass communities (Inpex Browse 2009), with the most extensive being located at Casuarina Beach, and are not known to occur further south than Fannie Bay (Northern Territory Government 2011).	Weed Reef Channel Island Casuarina Beach Fannie Bay	-
	Turtle	The green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), and flatback turtle (*Natator depressus*) are known to utilise Darwin Harbour regularly. The loggerhead turtle (*Caretta caretta*) and olive ridley turtle (*Lepidochelys olivacea*) are likely to be occasional visitors to the harbour (Northern Territory Governement 2011; Whiting 2001).	Flatback turtle are known to nest within Darwin Harbour, at Casuarina beach. There are no other known turtle nesting sites in Darwin Harbour as the mangroves and mudflats do not provide suitable nesting grounds (Northern Territory Government 2011).	-
	Crocodile	Saltwater crocodile (*Crocodylus porosus*) (Clancy and Fukuda 2024)	-	-
	Birds	Darwin Harbour regularly supports twenty-six species of migratory shorebird (Lilleyman 2020).	Intertidal mudflats during the low tide (Lilleyman *et al*. 2018).	Shorebirds begin arriving in Darwin in August with peaks in September, October and November and then start departing for their northward migration in February and March (Lilleyman 2016)
Djukbinj NP and Van Diemen Gulf Coast	Birds	Great knot (*Calidris tenuirostris*), greater sand plover (*Charadrius leschenaultia*), bar-tailed godwit (*Limosa lapponica*), lesser sand plover (*Charadrius mongolus*), red-necked stint (*Calidris ruficollis*), little curlew (*Numenius minutus*), sharp-tailed sandpiper (*Calidris acuminata*), various other shorebird Significant numbers of water birds found at Adelaide River floodplain. (AMOSC 2019)	Cape Hotham Adelaide River floodplain Mary River Chambers Bay Finke Bay Coast between South Alligator River and Minimini Creek (Chatto 2003)	-
	Dugong	Dugong (*Dugong dugon*) (vulnerable)	-	-
	Cetaceans	Australian snubfin dolphin (*Orcaella heinsohni*) Indo-Pacific humpback dolphin (*Sousa sahulenis*)	-	-

Location	Receptor	Background	Key locations	Seasonality
		Indo-Pacific bottlenose dolphin (Tursiops aduncus) (Groom *et al*. 2017)		
	Crocodile	Saltwater crocodile (*Crocodylus porosus*) (Fukuda and Cuff 2013)	-	-
	Turtle	The vast majority of the mainland coast of this bioregion has little sandy beach suitable for marine turtle nesting. Apart from the occasional Olive Ridley Turtle, nesting in this bioregion was recorded as dominated by Flatback Turtles (Chatto and Baker 2008).	Nesting islands: Greenhill Island Mogogout Island Wangoindjung Island Field Island Nesting on the mainland: Located between the West Alligator and Widman Rivers along the southern shoreline of Van Diemen Gulf. (Chatto and Baker 2008)	Flatback nesting may be all year round. Olive Ridley nesting January to June. (Chatto and Baker 2008)
Joseph Bonaparte Gulf Marine Park	Cetaceans	Australian snubfin dolphin (*Orcaella heinsohni*) Indo-Pacific humpback dolphin (*Sousa sahulenis*) Risso's dolphin (Grampus griseus) Pantropical spotted dolphin (*Stenella attenuate*)	-	-
	Dugongs	Dugongs are not abundant due to lack of seagrass	Anecdotal sightings near the shallow seagrass patches along the eastern coastal boundary (Przeslawski *et al.* 2011, Kyne *et al.* 2018)	-
	Turtles	Flatback turtle (*Natator depressus*) Olive ridley turtle (*Lepidochelys olivacea*) Hawksbill turtle (*Eretmochelys imbricate*) Loggerhead turtle (*Caretta caretta*) Green turtle (*Chelonia mydas*)	Loggerhead, flatback and hawksbill turtles are known to migrate and/or feed in the reef habitats and around the pinnacles on the mid-shelf of the gulf (Brewer *et al*. 2007, Donovan *et al*. 2008). The mid-shelf is also a BIA foraging area for Olive Ridley and green turtles, in areas foraging depths are less than 14 m (Whiting *et al*. 2007). Flatback turtle use the greater Joseph Bonaparte Gulf region including the adjacent marine park during nesting season (Limpus and Fien 2009; Galaiduk *et al* 2018)	-

Location	Receptor	Background	Key locations	Seasonality
	Birds	Seabirds such as tern and booby species, lesser frigate bird (*Fregata areil*), the silver gull (*Larus novaehollandiae*) and the common noddy (*Anous stolidus*) are expected to be observed in the marine park (Chatto 2001).	-	-
	Fishes and sharks	Limited information is available about the fish and sharks of the Joseph Bonaparte Gulf region (Galaiduk *et al* 2018). Northern River shark (Glyphis garricki) may occur inside the marine park (Kyne *et al* 2018). Green sawfish (*Pristis zijsron*), dwarf sawfish (*P. clavata*) and largetooth sawfish (*P. pristis*) all have distribution ranges which overlap the marine park and may occur inside the park (Kyne *et al* 2018).	The breeding grounds of green sawfish are likely overlapping the southern boundary of the marine park (Galaiduk *et al* 2018).	-
Joseph Bonaparte Gulf	Benthic	Benthic communities are exposed to strong tidal currents, high turbidity, and substantial sediment mobility, with disturbance decreasing offshore. Previous surveys in the Joseph Bonaparte Gulf have returned no seagrass or macroalgae beyond coastal habitats and only isolated hard corals (Przeslawski *et al* 2011).	Seagrass patches in the Eastern Joseph Bonaparte Gulf coast are reported in the following areas: King Shoals, Medusa Banks, Howland Shoals, Emu Reefs (Przeslawski *et al*. 2011; RPS 2009).	-
	Water	Waters are generally turbid due to the dominance of fine terrigenous sands and muds, a large tidal range (to 8m), and wet season sediment input from the numerous rivers in the area (Chatto and Baker 2008).	High turbidity exists in the inner Joseph Bonaparte Gulf, particularly during the wet season, with peak turbidity recorded 3 km from the coast, and much lower levels recorded ~ 30 km offshore (WEL 2004).	-
	Birds	This area has considerable shorebird habitat- there is a large amount of intertidal mudflat, backed by extensive mangroves an open saline wetland in Anson Bay (AMOSC 2019). Regionally important numbers of seabirds occur at Cape Ford and the Peron Islands (Chatto 2001), including up to 15,000 White Winged Terns (AMOSC 2019).	Anson Bay (mostly in the southern section and north of the Daly River Mouth) Perron Islands (Peron Island N- largest pelican colony in BT (Important Bird Area). Birds forage in exposed flats between Peron Islands during spring low tides. Cape Ford Finnis River Mouth Five Mile Beach Bare Sand Island Windirr Island	White Winged Terns- April to May (AMOSC 2019)

Location	Receptor	Background	Key locations	Seasonality
			(Chatto and Baker 2008, AMOSC 2019).	
	Turtles	Marine turtle nesting occurs at scattered locations throughout this region. Although most nesting is at low densities on scattered sandy beaches, there are some areas that have significantly dense nesting. The most significant nesting areas in this bioregion are North Peron, Bare Sand and Quail Islands and the mainland coast adjacent and just to the south of the latter two islands (Chatto and Baker 2008).	High abundance of Flatback nesting on Peron Island N (AMOSC 2019)- Mostly occurs on the west and south side of the island (Chatto and Baker 2008). Anson Bay South some unidentified turtle nesting (most likely flatback) (Chatto and Baker 2008). Channel Point to Point Jenny flatback nesting. Native Point to Five Mile Beach- flatback nesting (Chatto and Baker 2008) Bare Sand Island- flatback turtle nesting (Chatto and Baker 2008) Quail Island- Flatback turtle nesting (Chatto and Baker 2008) Indian Island North End- flatback turtle nesting (Chatto and Baker 2008)	Nesting occur from January to October (Chatto and Baker 2008)
Tiwi Islands	Turtles	Significant flatback turtle (*Natator depressus*), Olive ridley turtle (*Lepidochelys olivacea*) and green turtle (*Chelonia mydas*) nesting (AMOSC 2019), (Pendoley Environmental 2023)	East of Cape Gambier to Shoal Bay SW coast of Melville Island Buchanan Island West Bathurst Island Gordon Bay to Dudwell Creek Seagull Island NW tip Melville Island Johnson Point to Lethbridge Bay Lethridge Bay to Brenton Bay Point Jahleel Biradu Bay to Puloloo Bay	-
	Birds	Shorebirds: great knot (*Calidris tenuirostris*), red-necked stint (*C. ruficollis*) (near threatened), great sand plover (*Charadrius leschenaultii*) least concern), bar-tailed godwit (*Limosa lapponica*) (near threatened), lesser sand plover (*Charadrius mongolus*) (least concern), various other shorebirds Seagull Island has the largest crested tern (*Thalasseus bergii*) colony (>30,000) in the NT (AMOSC 2019)	Puwanapi Seagull Island Lethbridge Bay Quanipiri Bay	-

Location	Receptor	Background	Key locations	Seasonality
	Crocodile	Saltwater crocodile (*Crocodylus porosus*) (Fukuda and Cuff 2013)	-	-
Kimberley Marine Park	Cetaceans	The marine park is on the migration route of the humpback whale (*Megaptera novaeangilae*) and possibly the pygmy blue whale (*Balaenoptera musculus brevicauda*) (Puotinen *et al*. 2018)	-	Humpback migration occurring in dry season from April to October.
	Dugong		Dugong have been observed in south-eastern parts of the park where shallow water (<20 m) extends into the park (Bayliss and Hutton 2017; Puotinen *et al*. 2018).	-
	Turtle	Flatback turtle (*Natator depressus*) Olive ridley turtle (*Lepidochelys olivacea*) Hawksbill turtle (*Eretmochelys imbricate*) Loggerhead turtle (*Caretta caretta*) Green turtle (*Chelonia mydas*) Leatherback turtle (*Dermochelys coriacea*)	Green turtle nest along the North-West Shelf and at Scott Reef are known to disperse throughout the park while foraging and migrating (Commonwealth of Australia 2017). Nesting areas identified as critical to their survival include the Lacepede Islands located near the park (Puotinen *et al*. 2018). Loggerhead that nest within Western Australia have been tracked throughout the park (Commonwealth of Australia 2017). Olive Ridley that nest in Indonesia may track within the northernmost parts of the park (Commonwealth of Australia 2017). Leatherback that nest in Indonesia may track within the northernmost parts of the park (Commonwealth of Australia 2017). Hawksbill have not been observed to track within the park even though the park may fall within their home range (Commonwealth of Australia 2017). Flatback have nesting areas identified as critical to their survival include the Lacepede Islands located within but excluded from the park. The area that they use during the inter-nesting period	-

Location	Receptor	Background	Key locations	Seasonality
			is contained within the park (Puotinen *et al*. 2018).	
	Seabirds	-	The tidal flat systems surrounding Adele Island and the Lacepede Islands, which are located in close proximity to the marine park, are also important for some shorebird species, such as Pacific golden plover (*Pluvialis fulva*), Grey plover (*Pluvialis squatarola*), Lesser sand plover (*Charadrius mongolus*), Grey-tailed tattler (*Tringa brevipes*), Ruddy turnstone (*Arenaria interpres*) and Sanderling (*Calidris alba*) (Rogers *et al*. 2011). Adele Island is also an important nesting site for a number of seabirds including Brown booby (*Sula leucogaster*), Lesser frigatebird (*Fregata ariel*), Red-footed booby (*Sula sula*), Masked booby (*Sula dactylatra*), and Lesser crested tern (*Thalasseus bengalensis*) (DEWHA 2008).	-
	Whale shark	Whale sharks (*Rhincodon typus*) sometimes pass through the marine park (Puotinen *et al*. 2018).	-	-
	Benthic	The known benthic fauna of the Kimberley Marine Park is characteristic of the offshore, sandy and turbid habitats in the Indo-Pacific region. There are few hard-substrate features within the park that might typically be associated with diverse assemblages (Puotinen *et al*. 2018). The banks and terraces within the park may support diverse benthic assemblages (Puotinen *et al*. 2018). A survey of Lynher Bank identified 197 species of crustacean, 86 species of mollusc, 14 hard corals, 54 soft corals, 195 sponges, 19 asteroids, and eight echinoids (Heyward *et al*. 2018).	Lynher Bank	-
Oceanic Shoals Marine Park	Benthic	The banks in the Oceanic Shoals are biodiversity hotspots for sponges, with more species and different communities than the surrounding seafloor (species richness and endemism of sponges in the western sector may not be as high as those in the eastern sector) (Nichol *et al*. 2013).	-	-

Location	Receptor	Background	Key locations	Seasonality
	Fish	A wide variety of high-order pelagic fish species occur in these waters (Nichol *et al*. 2013).	-	-
	Turtle	Includes biologically important foraging areas for flatback turtle (*Natator depressus*), loggerhead turtle (*Caretta caretta*) and olive ridley turtle (*Lepidochelys olivacea*), and interesting areas for flatback.	Flatback turtle prefer foraging in waters 60 to 90 m deep in association with complex, benthic geomorphology (banks, shoals, terraces, deep holes and valleys) thought to support a high abundance of sessile invertebrates (Thums *et al*. 2017).	- ,
Vernon Islands	Birds	Low abundance for shorebirds and seabirds as largely covered in mangroves (AMOSC 2019)	-	-
	Dugong	Important dugong (*Dugong dugon*) habitat (Northern Territory Government 2011)	-	-
	Cetaceans	Australian snubfin dolphin (*Orcaella heinsohni*) Indo-Pacific humpback dolphin (*Sousa sahulenis*) Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (Groom *et al*. 2017)	-	-

References

Australian Marine Oil Spill Centre (AMOSC) (2019), Northern Territory Oiled Wildlife Response Plan, version 2.0, February 2019

Bayliss P and 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.

Brewer DT, Griffiths SP, Heales DS, Zhou S, Tonks ML, Dell Q, Taylor BR, Miller MJ, Kuhnert PM, Keys SJ (2007) Design, trial and implementation of an integrated, long-term bycatch monitoring program road tested in the Northern Prawn Fishery.

Chatto R (2001) The distribution and status of colonial breeding seabirds in the Northern Territory, Palmerston: Parks and Wildlife Commission of the Northern Territory

Chatto R (2003) The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory, Palmerston: Parks and Wildlife Commission of the Northern Territory

Chatto R, Baker B (2008) The distribution and status of marine turtle nesting in the Northern Territory, Palmerston: Parks and Wildlife Commission of the Northern Territory

Clancy TF and Fukuda, Y (2024). NT Saltwater Crocodile (*Crocodylus porosus*) Wildlife Trade Management Plan: 2022 Monitoring Report Northern Territory Department of Environment, Parks and Water Security.

Commonwealth of Australia 2017. Recovery Plan for Marine Turtles in Australia.

Department of Climate Change, Energy, the Environment and Water (DCCEEW)(2024) Conservation Atlas. Available at: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf (Accessed May 2024)

DEWHA (2008) Department of Environment, Water, Heritage and Arts. The North-West Marine Bioregional Plan. Bioregional Profile. A description of the ecosystems, conservation values and uses of the North-West marine region. Canberra

Donovan A, Brewer D, Velde T van der, Skewes T (2008) Scientific descriptions of four selected key ecological features (KEFs) in the north-west bioregion: final report., A report to the Department of the Environment, Water Heritage and the Arts, CSIRO Marine and Atmospheric Research, Hobart.

Fukuda, Y. and Cuff, N. (2013) Vegetation communities as nesting habitat for the saltwater crocodiles in the Norther territory of Australia. Herpetological Conservation and Biology 8(3): 641-651.

Galaiduk R, Huang Z, Miller K, Nanson R, Przeslawski R, Nichol S (2018). An eco-narrative of Joseph Bonaparte Gulf Marine Park: North-west marine region. Report to the National Environmental Science Program, Marine Biodiversity Hub. 21 pp.

Groom RA, Dunshea GJ, Griffiths AD, and Mackarous K (2017) The distribution and abundance of Dugong and other marine megafauna in Northern Territory, November 2015. Department of Environment and Natural Resources, Darwin.

Heyward A, Miller K, Fromont J, Keesing J, Parnum I (EDS.) (2018). Kimberley Seabed Biodiversity – Flatback turtle habitat assessment. WAMSI Project 1.1.1. Final Report to WAMSI.

INPEX Browse (2009) Icthys Gas Field Development Project Draft Environmental Impact Statement.

Kyne PM, Brooke B, Davies CL, Ferreira L, Finucci B, Lymburner L, Phillips C, Thums M, Tulloch V (2018) Final Report. Scoping a Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Darwin

Lilleyman A, Alley A, Jackson D, O'Brien G, Garnett ST (2018) Distribution and abundance of migratory shorebirds in Darwin Harbour, Northern Territory, Australia. Northern Territory Naturalist 28: 30-42

Lilleyman A (2020) Constraints to migratory shorebird populations at a tropical non-breeding site in northern Australia. PhD Thesis

Lilleyman A (2016). Report on potential impacts from disturbance to migratory shorebirds in Darwin: Defence Housing Australia- Lee Point Master-planned Urban Development. Report to EcOz Environmental Consultants, Darwin, September 2016.

Limpus CJ, Fien L (2009) A biological review of Australian marine turtles. Environmental Protection Agency

Northern Territory Government (2011) East Arm Wharf Expansion Project, Environmental Impact Statement Supplement

Parra GJ (2006) Resource partitioning in sympatric delphinids: space use and habitat preferences of Australian snubfin and Indo-Pacific humpback dolphins. Journal of Animal Ecology 75: 862-874.

Pendoley Environmental (2023). Desktop Report: Tiwi Island Turtle Activity. Prepared for Santos Ltd.

Puotinen M, Galaiduk R, Miller K, Nanson R, Huang Z, Nichol S (2018). An eco-narrative of Kimberley Marine Park: North-west marine region. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Geoscience Australia.

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

Rogers DI, Hassell CJ, Boyle A, Gosbell K, Minton C, Rogers KG, Clarke RH (2011) Shorebirds of the Kimberley Coast-Populations, key sites, trends and threats. J R Soc West Aust 94:377

Przeslawski R, Siwabessy J, Radke L, Potter A, Li J, Hughes M, Heap A, Barrie JV, Anderson T, Daniell J (2011) Seabed habitats and hazards of the Joseph Bonaparte Gulf and Timor Sea, northern Australia. Geoscience Australia

RPS (2009) Environment Plan: PGS 2D Seismic Survey: Bonaparte Gulf, Timor and Arafura Seas. West Perth, Petroleum Geoservices

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

Thums M, Jenner C, Waples K, Salgado Kent C, Meekan M. (2018) Humpback whale use of the Kimberley; understanding and monitoring spatial distribution. Report of Project 1.2.1 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 78pp.

WEL Woodside Energy Limited (2004). Existing Marine Environment. Blacktip Draft Environmental Impact Statement: Woodside

Whiting SD (2001) Preliminary Observations of Dugongs and Sea Turtles around Channel Island, Darwin Harbour. Report to Power and Water Authority Darwin, Biomarine International.

Appendix C OSM baseline data sources

Table C-1: Baseline data sources

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
Water Quality	RPS (2023) Pipeline Benthic Survey Report – Barossa DPD. Prepared for Santos	Santos	Along the Barossa Darwin Pipeline Duplication Darwin Harbour
	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	Radke L, Majid M, Mummery A, Lambrinidis D, Logan M, Wyatt J (2020) Sediment quality assessment of Outer Darwin Harbour (2020): Survey record and data report. Technical Report No. 38/2020, Department of Environment	Northern Territory Government	Shoal Bay
	Radke L, Majid M, Wyatt J, Lambrinidis D, Logan M, Fortune J, Nicholas T (2021) Benthic sediment sampling campaign of Middle Arm and West Arm, Darwin Harbour (2020): Survey record and data report. Technical Report No. 11/2021, Department of Environment and Natural Resources, Northern Territory Government, Darwin, Northern Territory.	Northern Territory Government	Middle Arm (Darwin Harbour) West Arm (Darwin Harbour)
	Benthic Sediment Monitoring for Darwin Harbour. Darwin Harbour Integrated Marine Monitoring and Research Program	Northern Territory Department of Environment, Parks and Water Security	Darwin Harbour
	Radke L, Majid M, Wyatt J, Lambrinidis D, Logan M, Fortune J, Nicholas T (2021) Benthic sediment sampling campaign of Middle Arm and West Arm, Darwin Harbour (2020): Survey record and data report. Technical Report No. 11/2021, Department of Environment and Natural Resources, Northern Territory Government, Darwin, Northern Territory.	Department of Environment and Natural Resources, Northern Territory Government	Darwin Harbour
	RPS (2023) Pipeline Benthic Survey Report – Barossa DPD. Prepared for Santos	Santos	Along the Barossa Darwin Pipeline Duplication Darwin Harbour

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Radke L, Majid M, Low Choy D (2024) Darwin Harbour Integrated Marine Monitoring and Research Program Benthic Sediment Monitoring Report 2023-24. DEPWS Technical Report 008/2024	Northern Territory Government	Darwin Harbour
	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	Salum R, Staben G, Roach C (2023). Darwin Harbour Integrated Marine Monitoring and Research Program. Mangrove Monitoring Report 2022-2023: Mangrove Health 2022. Technical Report No 5/2023, Department of Environment, Parks and Water Security, Northern Territory Government, Darwin, NT.	Rangelands Division-Northern Territory Department of Environment, Parks and Water Security	Darwin Harbour
	Brocklehurst P, Edmeades B, Munns P (2017) Mangroves of the Darwin Region: Native Point to Adelaide River, Northern Territory, 1996-2016. Technical Report: 3/2017D. Department of Environment and Natural Resources, Darwin, NT.	Northern Territory, Department of Environment, Parks and Water Security	Bynoe Harbour Charles Point Darwin Harbour Shoal Bay Gunn Point Adelaide River
	O2 Marine (2019) Darwin Industrial Processing Facility Benthic Habitat and Communities. Report R190216	O2 Marine for TNG Limited	Darwin Harbour East Channel Island (Darwin harbour) Middle Arm (Darwin harbour) Elizabeth River (Darwin harbour)
	Salum R and Roach C (2024). Darwin Harbour Integrated Marine Monitoring and Research Program. Mangrove Monitoring Report 2023-2024: Mangrove Health 2023. Technical Report No 22/2024, Department of Environment, Parks and Water Security, Northern Territory Government, Darwin, NT.	NT Department of Environment, Parks and Water Security	Darwin Harbour
	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	Kimberley

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
		by Western Science partners	
Benthic habitat	O2 Marine (2019) Darwin Industrial Processing Facility Benthic Habitat and Communities. Report R190216	O2 Marine for TNG Limited	Darwin Harbour East Channel Island (Darwin harbour) Middle Arm (Darwin harbour) Elizabeth River (Darwin harbour)
	Galaiduk R, Radford B, Harries S, Case M, Williams D, Low Choy D, Smit N (2019) Technical Report: Darwin – Bynoe Harbours predictive mapping of benthic communities. Australian Institute of Marine Science, Perth. pp 42.	AIMS	Darwin Harbour Bynoe Harbour
	AIMS (2023) Ranger led marine ecological surveys within the Joseph Bonaparte Gulf Marine Park. https://apps.aims.gov.au/metadata/view/e72fea7c-8959-4fcc-b504-54c9b1ba1d88, accessed 22-May-2024.	AIMS	Joseph Bonaparte Gulf Emu Break (Joseph Bonaparte Gulf Marine Park) Emu Reefs (Joseph Bonaparte Gulf Marine Park) Howland Shoals (Joseph Bonaparte Gulf Marine Park) Tchinbilli Reef
	RPS (2023) Pipeline Benthic Survey Report – Barossa DPD. Prepared for Santos	Santos	Along the Barossa Darwin Pipeline Duplication Darwin Harbour
	RPS(2024) DPD Trench Monitoring Pilot Survey Technical Report. Prepared for Santos	Santos	Darwin Harbour Woods Inlet Charles Point Fannie Bay East Point Casuarina Channel Island Wickham Point South Shell Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Weed Reef Mandorah Santos DPD Pipeline NT
	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
	DBCA Monitoring	DBCA Marine Science	North Kimberley Marine Park Cape Londonderry (North Kimberley Marine Park) Niiwalara (North Kimberley Marine Park) Angel Bay (North Kimberley Marine Park) Rocky Point (North Kimberley Marine Park) Seahorse Island (North Kimberley Marine Park) Cassini Island (North Kimberley Marine Park) Hat Point (North Kimberley Marine Park) Krait Bay (North Kimberley Marine Park) Long Reef Berthier Island (North Kimberley Marine Park) Maret Island Bernouilli Island (North Kimberley Marine Park)

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Hedley Island (North Kimberley Marine Park) Keraudren Island (North Kimberley Marine Park)
Marine fish and elasmobranchs	Kyne PM, Brooke B, Davies CL, Ferreira L, Finucci B, Lymburner L, Phillips C, Thums M, Tulloch V (2018). Final Report. Scoping a Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Charles Darwin University, Darwin.	Darwin University	Northern Territory Coastline
	AIMS (2023) Ranger led marine ecological surveys within the Joseph Bonaparte Gulf Marine Park. https://apps.aims.gov.au/metadata/view/e72fea7c-8959-4fcc-b504-54c9b1ba1d88, accessed 22-May-2024.	AIMS	Joseph Bonaparte Gulf Emu Break (Joseph Bonaparte Gulf Marine Park) Emu Reefs (Joseph Bonaparte Gulf Marine Park) Howland Shoals (Joseph Bonaparte Gulf Marine Park) Tchinbilli Reef
	Conservation and management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End (including green sawfish and freshwater sawfish)	The offset program commenced in 2021 and is implemented through a collaborative effort between INPEX, on behalf of the Ichthys Joint Venture partners, and the Northern Territory Department of Environment, Parks and Water Security	Northern Territory Coastline
	Australian Institute of Marine Science (AIMS). (2023). Understanding bio-cultural values of Moonjaniid jina baaliboor (Brue Reef) in the Kimberley Marine Park: Co-designing a project between Traditional Owners, the Australian Institute of Marine Science and Parks Australia. https://apps.aims.gov.au/metadata/view/2dcee86e-3bc3-43af-be7c-7d6d51065725, accessed 07-Oct-2024.	AIMS	Kimberley Marine Park Brue Reef
	West K, Harry A, Payet S, Harvey E, Dambimangari Rangers, Bardi-Jawi Rangers, Karajarri Rangers, Yawuru Country Managers, Travers M (2023): Comparative assessment of eDNA metabarcoding and longline deployments for elasmobranch surveying across a large tropical marine park network. v1. CSIRO. Data Collection. https://doi.org/10.25919/8wvd-e269	CSIRO DPIRD Curtin University	Kimberley Marine Park Roebuck Marine Park

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	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
	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	Trace and Environmental DNA (TrDNA) Laboratory, Curtin University	Kimberley
	DBCA Monitoring	DBCA Marine Science	Lalang-gaddam Marine Park Iron Islands (Lalang-gaddam Marine Park) Sister Islands (Lalang-gaddam Marine Park) King fisher Islands (Lalang-gaddam Marine Park) Montgomery Reef Okenia Reef (Lalang-gaddam Marine Park) Big Lucas Island (Lalang-gaddam Marine Park) Degerando Island (Lalang-gaddam Marine Park) Champagny Reef (Lalang-gaddam Marine Park)
Fisheries	Meteyard B (2024) Northern Prawn Fishery Data Summary 2023. NPF Industry Pty Ltd, Australia	Northern Prawn Fishery PTY Ltd	Northern Territory Kimberley Queensland
	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
	Errity C, Penny SS, Steffe A (2022) A Survey of Recreational Fishing in the Greater Darwin area 2016. Northern Territory Government, Australia. Fishery Report No 124.	Department of Industry Tourism and Trade,	Darwin Harbour Bynoe Harbour

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
		Northern Territory Government	Shoal Bay
	Knuckey I, Koopman M (2022). Survey of Tropical Snapper in Northern Territory Fisheries — 2021.	Department of Industry Tourism and Trade, Northern Territory Government	Northern Territory
	Errity C, Penny, SS, Steffe A (2022) A Survey of Recreational Fishing in the Greater Darwin area 2017. Northern Territory Government, Australia. Fishery Report No 125	Department of Industry Tourism and Trade, Northern Territory Government	Darwin Harbour Bynoe Harbour Shoal Bay
	West LD, Stark KE, Dysart K, Lyle JM (2022) Survey of recreational fishing in the Northern Territory: 2018 to 2019. Northern Territory Government, Australia	Department of Industry Tourism and Trade, Northern Territory Government	Northern Territory
	Northern Territory Government (2019) Status of Key Northern Territory Fish Stocks Report 2017. Northern Territory Government Department of Primary Industry and Resources. Fishery Report No. 121.	Department of Primary Industry and Resources, Northern Territory Government	Northern Territory
Reptiles	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
	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
	Kyne PM, Brooke B, Davies CL, Ferreira L, Finucci B, Lymburner L, Phillips C, Thums M, Tulloch V (2018). Final Report. Scoping a Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Charles Darwin University, Darwin.	Darwin University	Northern Territory Coastline
	Field Island (Gardangarl) - sea turtle monitoring	Gardangarl (Field Island) flatback turtle monitoring	Field Island
	New project to look at climate impacts on Northern Australia's turtle population	AIMS	Northern Territory Coastline

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
		Charles Darwin University Indigenous ranger groups	Tiwi Islands
	New protect 'how sea turtles are helping us unlock the secrets of Australia's remote seas'	AIMS	Tiwi Islands North West Crocodile Island
	Management Program for the Saltwater Crocodile (*Crocodylus porosus*) in the Northern Territory of Australia, 2016-2020	Department of Environment, Parks and Water Security, Northern Territory Government	Adelaide River Blyth River Cadell River Daly River Glyde River Liverpool River Mary River Tomkinson Rivers East Alligator River West Alligator River South Alligator River Wildman Rivers
	Conservation and management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End	The offset program commenced in 2021 and is implemented through a collaborative effort between INPEX, on behalf of the Ichthys Joint Venture partners, and the Northern Territory Department of Environment, Parks and Water	Northern Territory Coastline
	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

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	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	DBCA WAMSI	Kimberley
Marine megafauna (whale shark, dugong and cetaceans)	Brooks L, Palmer C, Griffiths AD, Pollock KH (2017) Monitoring variation in Small Coastal dolphin populations: An example from Darwin, Northern Territory, Australia, Frontiers in Marine Science, 4(APR), pp. 1–16.	Southern Cross University	Bynoe Harbour Darwin Harbour Shoal Bay
	Griffiths AD, Groom RA, Low Choy D, Mackarous K, Brooks L (2020) Darwin Region Coastal Dolphin Monitoring Program: Final Report – 2011 to 2019. Department of Environment, Parks and Water Security, Northern Territory Government.	Northern Territory Flora and fauna Division, Department of Environment, Parks and Water Security	Darwin Harbour Bynoe Harbour Shoal Bay
	Groom RA, Dunshea GJ, Griffiths AD, Mackarous K (2017) The distribution and abundance of dugong and other marine megafauna in the Northern Territory. Department of Environment and Natural Resources, Darwin.	Northern Territory Government	Northern Territory Coastline
	Palmer C, Brooks L, Fegan M, Griffiths T (2017) Conservation Status of Coastal Dolphins in the Northern Territory: Final Report. Marine Ecosystems Group, Flora and Fauna Division, Department of Environment and Natural Resources. Darwin.	Northern Territory Government	Northern Territory Coastline
	Kyne PM, Brooke B, Davies CL, Ferreira L, Finucci B, Lymburner L, Phillips C, Thums M, Tulloch V (2018) Final Report. Scoping a Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Charles Darwin University, Darwin.	Darwin University	Northern Territory Coastline
	Conservation and management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End	The offset program commenced in 2021 and is implemented through a collaborative effort between INPEX, on behalf of the Ichthys Joint Venture partners, and the Northern Territory Department of Environment, Parks and Water	Northern Territory Coastline
	von Takach B, Woolley L-A, Banks S (2020) Population Viability Analysis for Three Species of Coastal Dolphin in Darwin Harbour. Research Institute for the Environmental and Livelihoods, Charles Darwin University	Charles Darwin University	Darwin Harbour
	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,	AIMS	Shark Bay Ningaloo Coast World Heritage Area

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	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		Kimberley
	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	Kimberley Roebuck Bay Cygnet Bay Prince Regent River Cambridge Gulf
	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
Seabirds and shorebirds	Kyne PM, Brooke B, Davies CL, Ferreira L, Finucci B, Lymburner L, Phillips C, Thums M, Tulloch V (2018) Final Report. Scoping a Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species. Report to the National Environmental Science Programme, Marine Biodiversity Hub. Charles Darwin University, Darwin.	Darwin University	Northern Territory Coastline
	Lilleyman A, Maglio G, Bush R, Jessop R, Wright P, Minton CDT (2018) Darwin Shorebird Catching: Expedition Report 2018	Charles Darwin University	Darwin Harbour Finniss Beach East Arm Wharf (Darwin Harbour) Sandy Creek Lee Point-Buffalo Creek Tree Point
	Lilleyman A, Alley A, Jackson D, O'Brien G, Garnett ST (2018) Distribution and abundance of migratory shorebirds in Darwin Harbour, Northern Territory, Australia. Northern Territory Naturalist 28: 30-42	Charles Darwin University	Darwin Harbour East Arm Wharf (Darwin Harbour)
	SLR Consulting (2024) Preliminary Migratory Shorebird Survey. Undertaken for Aurizon Operations Ltd	Aurizon Operations Limited	Darwin Harbour
	Lilleyman A (2020) Constraints to migratory shorebird populations at a tropical non-breeding site in northern Australia. PhD Thesis	Charles Darwin University	Darwin Harbour East Arm Wharf (Darwin Harbour) Spot on Marine (Darwin Harbour)

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			Nightcliff Rocks (Darwin Harbour) Sandy Creek Lee Point-Buffalo Creek East Point (Darwin Harbour)
	Ecological and Heritage Partners (2023) Shorebird monitoring plan: Lee Point, Darwin, Northern Territory. Prepared for Defence Housing Australia	Ecology and Heritage Partners	Sandy Creek Lee Point-Buffalo Creek East Point (Darwin Harbour) Nightcliff Rocks (Darwin Harbour) Spot on Marine (Darwin Harbour)
	Conservation and management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End (including great knot, great sand plover, lesser sand plover)	The offset program commenced in 2021 and is implemented through a collaborative effort between INPEX, on behalf of the Ichthys Joint Venture partners, and the Northern Territory Department of Environment, Parks and Water	Northern Territory Coastline

Appendix D 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 D-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 D-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 E 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**

Confidential. Not to be reproduced in any form or media without written consent from the management of Oil Spill Response Limited.
Printed versions are uncontrolled and will not be updated.
Document Number: OSRL-OPER-FOR-01122 Revision: 1

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.

Confidential. Not to be reproduced in any form or media without written consent from the management of Oil Spill Response Limited.
Printed versions are uncontrolled and will not be updated.