Browse Regional Operational and Scientific Monitoring Bridging Implementation Plan

Document Number	HSE_PRE_016370
PML (SAP) Number	n/a
Revision Number	3.1
Document Status	Issued for Approval
Revision Date	5-Nov-25
Cyclical Review Cycle	5 Years (Procedures)
Safety Critical Content	[Not Safety Critical]
Technical Reviewer (TA2 or SME)	n/a
Process Area	HSSE

** all printed copies of this document are to be considered uncontrolled
** all electronic copies duplicated outside Shell Document Management systems are to be considered uncontrolled

Rev	Revision Update Description	Date Changed	BCD Development Roles Authors, Reviewers, Approvers	
2.1	Updated to broaden scope to the Browse Region for submission with the Crux Development Drilling EP	25-Jul-22	Environment Approvals Advisor Crux Environment Lead Environment Advisor Environment Manager West	Author Reviewer (SME) Reviewer (SME) Approver (PO)
3.0	Approved for Use	27-Jul-22	Environment Approvals Advisor Crux Environment Lead Environment Advisor Environment Manager West	Author Reviewer (SME) Reviewer (SME) Approver (PO)
3.1	Updated to include revised Crux/Prelude modelling and incorporate the revised OSM shared services.	5-Nov-25	Prelude Environment Advisor Crux Environment Lead Prelude SE Manager	Author Reviewer (SME) Approver (PO)

Table of Contents

List of Tables

List of Figures

1 Introduction

Operational and Scientific Monitoring (OSM) is a key component of the environmental management document framework for offshore petroleum activities. The framework includes an Environment Plan (EP), OSM and Oil Pollution Emergency Plan (OPEP).

Operational Monitoring (OM) is essential for maintaining situational awareness during a hydrocarbon spill. It enables the Incident Management Team West (IMT W) and field-based Emergency Response Team (ERT) to initiate a timely and effective response while continuously evaluating the performance of implemented strategies. OM typically begins immediately after the spill is detected and continues until established termination criteria are met.

In contrast, Scientific Monitoring (SM) addresses non-response objectives, focusing on assessing environmental impacts and tracking post-spill recovery. This phase often extends well beyond the conclusion of the spill response to provide a comprehensive understanding of ecological effects and long-term environment recovery.

1.1 Purpose

As part of the Offshore Petroleum Greenhouse Gas Storage (OPGGS) (Environment) Regulations 2023 (The Environment Regulations), Titleholders are required to ensure they have a suitable OSM plan for their offshore petroleum activities. Titleholders must demonstrate that they have adequate capability to conduct the required monitoring activities and make informed decisions regarding OSM implementation.

To meet the requirement of The Environment Regulations, titleholders have been working together on a collaborative OSM approach, which aims to align methodologies and develop a set of industry best practice guidelines. The Joint Industry OSM Framework is available on the Australian Energy Producers (AEP) Environment Publications Webpage. Use of the Joint Industry OSM Framework requires each Titleholder to develop a OSM Bridging Implementation Plan (BIP) which describes how the Framework interfaces with the Titleholder's activities, spill risks and internal management systems.

In 2021, NOPSEMA's released a Regulatory Advice Statement (RAS) regarding AEPs Joint Industry OSM Framework, to assist titleholders with the application of the framework. The RAS details how the AEP joint industry OSM framework fulfill content requirements for an EP. It also highlights constraints or limitations to be aware of when applying the framework.

The OSM-BIP (this document) in combination with the Browse Regional OPEP (BROPEP) and EP fulfils Shells requirements under The Environment Regulations and NOPSEMA RAS (Figure 1-1, Appendix A). The OSM-BIP and BROPEP apply for all Shell's activities in the Browse region, and form the documents required by titleholder shown in Figure 1-1.

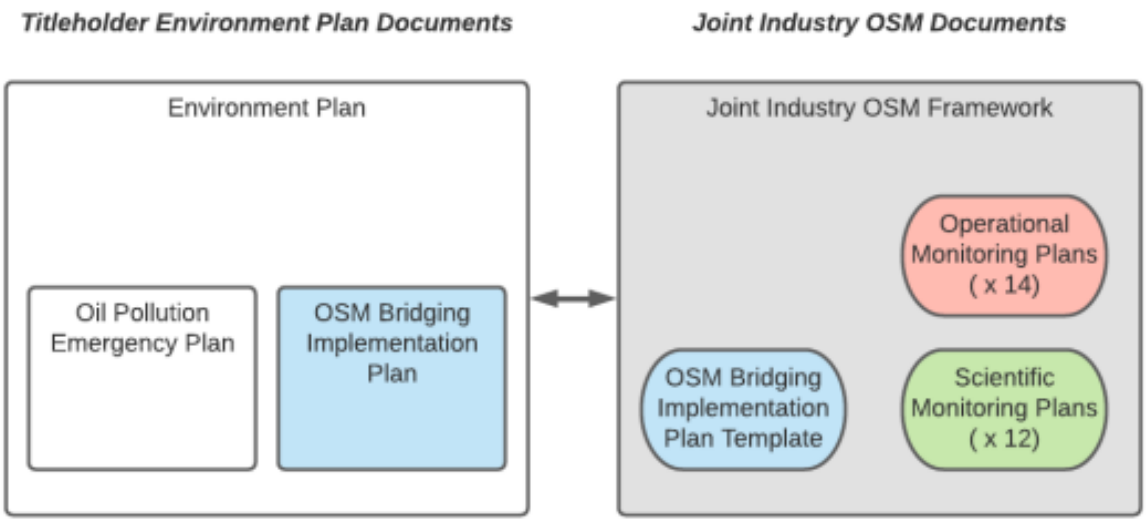

Figure 1-1 Relationship between titleholder documents and the joint industry framework.

1.2 Documentation structure

This Plan is presented in two parts.

- **Part A** outlines the relationship between the Shell Australia Pty Ltd.'s (Shell) environmental management document framework and the Joint Industry Operational and Scientific Monitoring (OSM) Framework (AEP, 2021).

- **Part B** provides operationally focussed guidance for Shell personnel, OSM Service Providers and sub-contracted Monitoring Service Providers to coordinate the implementation of monitoring plans.

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

Table 1-1 describes key documents that form Shell's environmental management document framework which should be read in conjunction with this BIP.

Mobilisation of OSM should follow the process listed in Part B: Section 13 Mobilisation and Activation Process.

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

Document	Description
Activity specific EP	The EP's describe the petroleum activities, location of activities, the environment and the risks to the environment as a result of the activity and the associated management controls. Of particular relevance to this plan, it identifies sensitive receptors at greatest risk from hydrocarbon spills and the Planning Area (also referred to as the Environment that May be Affected in the RAS).
Browse Regional Oil Pollution Emergency Plan (HSE_PRE_013075) (OPEP) and associated Basis of Design and Field Capability Assessment (HSE_GEN_016764)	The BROPEP provides the activation and response process for the credible spill scenarios, including: • incident management, • spill impact mitigation analysis (SIMA)/net environmental benefit (NEBA) process • detailed implementation guidance for individual response options. • Performance outcomes, standards and measurement criteria related to hydrocarbon spill preparedness and response.
Shell Incident Management Team (West) (IMT(W)) Emergency Response Plan (ERP) (HSE_GEN_011209)	The IMT(W) outlines the roles and responsibilities of the Level 2 and Level 3 IMT(W) during emergency response, excluding OSM roles which are addressed separately in this plan
Weekly Contact List Work Instruction	This work instruction contains all relevant contact and communications information to enable effective communication amongst the response personnel and also external stakeholders. It is updated and kept live at all times by Shell ER Advisor and includes relevant OSM contacts.

1.3 Application

When an Environment Plan (EP) is prepared for a new/revised activity, there are three main steps for assessing whether this OSM-BIP adequately covers the OSM requirements for each new/revised activity. These include:

1. Determine if the new/revised activity planning area fits within the BIP Combined OSM planning area, as outlined in Section 2.1
2. Determine the locations requiring a baseline review (as described in Section 4).
3. Determine whether the capability requirements and monitoring arrangements of the new/revised activity exceed or are met by the capability requirements outlined in Section 9 and Section 10.

Prior to submission for regulatory approval, each new/revised EP shall document whether the OSM-BIP adequately covers the OSM requirements as per the three steps described above. If additional operational and/or scientific monitoring capability is required for a new/revised activity above the OSM capability described in Section 9 and Section 10, this would trigger an update to the OSMP BIP. This update will follow Shell's MOC and risk assessment processes.

Part A – Preparedness

2 Planning Area and Monitoring Priorities

2.1 Planning Area and Browse Regional OSM Planning Area

Shell defines its Planning Area as the zone where ambient environmental and socioeconomic conditions may alter based on emergency events. The outer extent of the Planning Area is defined by low exposure thresholds (Section 7.1 of the activity EP).

A Browse Regional OSM Planning Area has been prepared to represent all of Shell's Browse activities and the resultant outer limit of OSM efforts for these activities (Figure 2-1). The Browse Regional OSM Planning Area corresponds to the low exposure values using stochastic modelling results applying the following thresholds[1]:

- 1 g/m^2 floating oil thickness, which is 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 entrained hydrocarbons represents the lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARMCANZ (2000) water quality guidelines; and
- 10 ppb dissolved aromatic hydrocarbons represents the low exposure zone, although it is not considered to be of significant biological impact.

The spills used to define the OSM planning area represent Shell's worst-case credible scenarios. These scenarios consider factors such as the size of each Scientific Monitoring Planning Area, hydrocarbon type, release volume, rate and duration, proximity to sensitive receptors, minimum time to contact, and their relevance to Shell's activity locations within the Browse Region of Western Australia.

For a description of the environment within each Scientific Monitoring Planning Area and respective Planning Area, refer to Section 7 of the activity-specific EPs. 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.

[1] These thresholds align with NOPSEMA's Oil Spill Modelling Environment Bulletin (2019). EPs under the Browse Regional OSM-BIP may use different thresholds, typically reflecting areas where ecological and socioeconomic receptors may be affected.

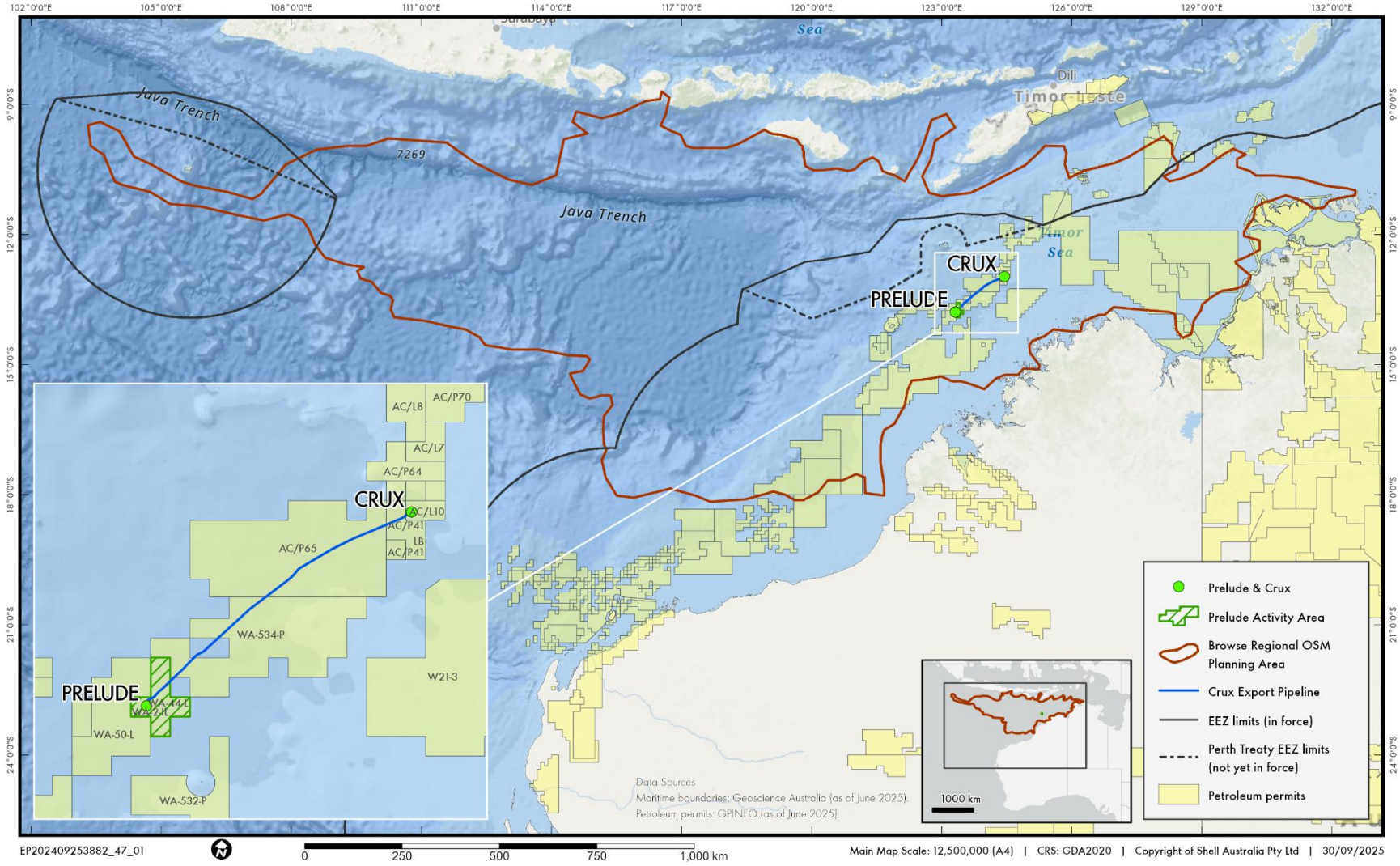

Figure 2-1: Shell OSM Planning Area

2.2 Monitoring Priority determination

Monitoring priorities for OSM are determined based the combination of several considerations, including:

- The risk of adverse consequences from the spill modelling (Section 2.2.1)
- Environment value of the habitat/receptor (e.g. State/Commonwealth protected areas), species (e.g. protected species), International Union of Conservation of Nature (IUCN) marine protected area categories, and important socio-economic/heritage values (Section 2.2.2, Appendix B)
- Availability of baseline information at the receptor (Section 4).

Monitoring priorities are subsequently identified as those receptors with high conservation value predicted to be contacted at the shortest timeframe (>5% probability) at the low exposure values. Higher priority is also given to receptors where baseline data is either not available or not sufficient.

It should be noted that the monitoring priorities provided in this document are listed for planning purposes only. Shell will work with its monitoring providers and key stakeholders in the initial stages of the spill regarding priority receptors and to assist in the finalisation of the monitoring design. This process is outlined in Section 14.

2.2.1 Spill modelling

Oil spill modelling is used to identify priorities for monitoring, as it predicts the probability and minimum time at which individual receptors may be contacted (RPS, 2025). Receptors predicted to be contacted sooner and with higher probability are prioritised for monitoring, as there is little opportunity for pre-contact data collection. By contrast, receptors predicted to have longer contact times may allow for the collection of reactive baseline data prior to impact.

Shell has assessed oil spill modelling results for the Prelude and Crux activities to identify these priority receptors. Table 2-1 presents the receptors predicted to be contacted at the low exposure values within 14 days at a probability >5%. Appendix B lists these receptors and identifies their relevant OMPs and SMPs.

Table 2-1: Worst-case spill scenarios used to determine the Browse Regional OSM Planning Area

Environment Plan	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 14 days
Prelude Operations Environment Plan	Prelude Condensate	A long term (80-day) uncontrolled, release of Prelude condensate from a subsea wellhead through the 7" production tubing.	80 days	31,800	**0-7 days:** Browse Island **7-14 days:** Cartier Island AMP Kimberley AMP* Seringapatam Reef* Cartier Island Heywood Shoal* Seringapatam Reef*
	Marine Diesel Oil (MDO)	Surface release due to vessel collision during product offloading	1 hour	750	**0-7 days:** Browse Island **7-14 days:** Nil
	Heavy Fuel Oil (HFO)	Surface release due to vessel collision during product offloading	1 hour	1,000	**0-7 days:** Browse Island Scott Reef North* Scott Reef South (includes Sandy Islet) Seringapatam Reef* Echuca Shoal* Heywood Shoal*

Environment Plan	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 14 days
					7-14 days: Argo-Rowley Terrace AMP* Ashmore Reef AMP Ashmore Reef
	Prelude Condensate	Condensate tank rupture - surface release due to vessel collision during product offloading	2 hours	42,000	**0-7 days:** Browse Island Heywood Shoal* **7-14 days:** Ashmore Reef AMP Cartier Island AMP Cartier Island Kimberley AMP* Scott Reef North* Scott Reef South (includes Sandy Islet) Seringapatam Reef* Goeree Shoal* Johnson Bank* Vulcan Shoal* Woodbine Bank*
Crux Environment Plans • Completions, Hot Commissioning, Start-up and Operations	Crux Condensate	Complete subsea well blowout of a well during development well drilling.	80 days	222,528	**0-7 days:** Kimberley AMP* Oceanic Shoals AMP* Barracouta Shoal*

Environment Plan	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 14 days
• Installation and cold Commissioning • Development well Drilling					Eugene McDermott Shoal* Goeree Shoal* Heywood Shoal* Vulcan Shoal* **7-14 days:** Ashmore Reef AMP Cartier Island AMP Cartier Island Browse Island Ashmore Reef Echuca Shoal* Gale Bank* Johnson Bank* Sahul Bank* Woodbine Bank*
	Low sulphur Intermediate Fuel Oil (IFO)	A vessel collision between a project vessel or third–party vessel with the topsides leading to release of IFO if a fuel tank is ruptured.	1 hours	665	**0-7 days:** Cartier Island AMP Kimberley AMP* Oceanic Shoals AMP* Cartier Island Eugene McDermott Shoal* Goeree Shoal* Vulcan Shoal* **7-14 days:**

Environment Plan	Hydrocarbon Type	Scenario	Release Duration	Volume (m^3)	Receptors predicted by stochastic modelling to be contacted ≥5 % probability within 14 days
					Ashmore Reef AMP Woodbine Bank*
	Crux Condensate	Release of Crux Condensate from the deck level of a drilling platform, resulting in a vertical spray into the air and fall onto the sea adjacent to the drilling platform.	80 days	87,077	**0-7 days:** Oceanic Shoals AMP* Barracouta Shoal* Eugene McDermott Shoal* Goeree Shoal* Heywood Shoal* Vulcan Shoal* **7-14 days:** Cartier Island AMP Kimberley AMP* Browse Island Johnson Bank* Echuca Shoal* Woodbine Bank*

**Indicates a submerged feature.*

2.2.2 Environment Value of the Receptor

Monitoring prioritisation during a spill should consider the sensitive receptors with the highest risk of adverse consequences. For planning purposes, monitoring priorities have been drawn from the key receptor locations and sensitivities identified in the activity-specific EPs (Section 7) and through spill modelling (Section 2.2.1)

Supplementary information on receptor presence, distribution, seasonality, and where relevant, reproductive state is provided in **Appendix C: Background information for key sensitivities**.

In addition to these locations, there are receptors that are transient (i.e. cetaceans, seabirds, whale sharks) and others that are broadscale, such as managed fisheries with large spatial extents, KEF and Biologically Important Areas (BIAs).

A number of broadscale ecological features are located within the Browse Regional OSM Planning Area and have been considered in monitoring prioritisation and OSM capability planning for the Browse Region. Table 7-4 of the Crux EPs and Table 7-3 of the Prelude EP describe all KEFs within the Planning Area.

A number of KEFs are within 100 km of Shell's Activity Areas, so are at a higher risk of contact with hydrocarbons, including:

- Continental Slope Demersal Fish Communities
- Ancient Coastline at 125 m depth contour
- Ashmore Reef and Cartier Island and surrounding Commonwealth waters
- Carbonate Bank and terrace system of the Sahul Shelf

These KEFs include subsea receptors (benthic and pelagic habitats; demersal fish communities; marine fauna aggregations) that may be at risk from subsea releases, such as the loss of containment scenario associated with Crux activities or the Prelude subsea release scenario

Therefore, OSM planning and resourcing for Shell's activities includes relevant monitoring requirements, such as water quality, sediment quality, benthic habitats and fish for these features (Refer Appendix B and Section 8.1).

The Browse Regional OSM Planning Area also overlaps a number of BIAs and protected species potentially occurring in the area, as described in Section 7 of the activity EP. A number of the BIAs and protected species are located within the monitoring priorities identified, such as marine turtles within the Ashmore AMP, so would automatically be included in the relevant SMPs for that monitoring priority location. Where BIAs and protected species are situated away from the monitoring priorities listed, they will be captured in the Offshore Environs monitoring unit described in Table 8-2.

2.2.3 Availability of baseline data

The availability of baseline data further influences the determination of monitoring priorities. Section 3 outlines Shell's existing baseline data sources, Section 4 outlines Shell's baseline review and evaluation process, and Table 4-3 summarises the baseline data assessment for the sensitive receptors contacted by the spill modelling.

3 Relevant Existing Baseline Information Sources

Shell has access to a number of different baseline data sources that are relevant to the high value receptors in the Browse Region. These include:

3.1 Data.gov.au

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

3.1 Australian Ocean Data Network

The Australian Oceans 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 an Australian Government Research Infrastructure project, and the Western Australia Marine Science Institute (WAMSI).

3.2 Western Australian Oil Spill Response Atlas

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

3.3 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 Planning Area. The ALA receives support from the Australian Government through the National Collaborative Research Infrastructure Strategy and is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

3.4 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;
- Commonwealth 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.

Other sources of information including Shell commissioned studies, 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

Baseline monitoring provides information on the condition of ecological receptors prior to, or spatially independent (e.g. if used as an unaffected control site) 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 and quantify environmental impact from the spill (compared to natural variation and/or impacts unrelated to the spill) is necessary. Knowing the extent, quality and suitability of existing baseline data is important in helping to prioritise the scientific monitoring response, as priority should be given to those locations and sensitive receptors where there is no or insufficient baseline.

Understanding the presence or absence, suitability and quality of baseline data for locations and associated receptors predicted to be contacted within 14 days is an important preparatory measure for prioritising monitoring. During a spill event, prioritisation of capability may be given to those receptors less baseline data, where it is possible to collect baseline data post-spill pre-impact. Further, where post-spill pre-impact monitoring is not feasible due to short contact times, understanding which receptors have less 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).

Shell is part of a Joint Industry Collaborative Group who are working together to determine the extent, quality and suitability of existing baseline data for the marine environments in the North West Shelf, Browse and Timor Sea Regions of Australia. The Marine Environment Baseline Database includes available data for all receptors relevant to the Joint Industry OSM Framework (apart from Fisheries and Heritage and Social Impacts)[2] and has assessed the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs.

4.1 Baseline Data Review Process

An overview of the process used to assess baseline data is provided in the steps below:

1. **Identification of receptors requiring a baseline review**: Receptors predicted to be contacted at the low thresholds within 14 days, at a probability greater than 5%, are identified and aligned with OMPs and SMPs.
2. **Collection of baseline data**: Environmental baseline monitoring data relevant to the locations and receptors is located (as per sources outlined in Section 3) and included (if it is not already included) in the Marine Environment Baseline Database. A summary of some of the data included in the baseline database is provided in Appendix D.
3. **Assessment of baseline data**: The relevance of each data source is assessed:

[2] Fisheries data in Western Australia are maintained by the Department of Primary Industries and Regional Development and include commercial catch and effort records, recreational fishing surveys, and annual State of the Fisheries reports. While highly valuable for fisheries management, these datasets are typically broad in scale and, in some cases, confidential or aggregated to protect individual operators, making them unsuitable for integration into a shared industry database. Heritage and social impact values are similarly subject to distinct custodianship and governance arrangements, involve sensitive or confidential information, and require specialised and culturally appropriate approaches. For these reasons, these aspects will remain outside the scope of the Marine Environment Baseline Database.

a) 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.

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

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

SMP	Key parameter	Key methodology
sharks, dugong and cetaceans	abundance / counts, key behaviour	
SM6: Benthic habitat assessment	At least one key parameter: presence, diversity, distribution	Any of the following, as appropriate to the parameters: • Transects • Towed camera • Drop camera • Remotely Operated Vehicle (ROV) camera • Diver-based camera surveys • Remote sensing (coral & seagrass broad scale survey) • Sediment grab for infauna
SM7: Marine fish and elasmobranch assemblages assessment	At least one key parameter: species identification, abundance, habitat type	Any of the following, as appropriate to the parameters: • Baited remote underwater video stations (BRUVS) • Stereo Baited Remote Underwater Video Stations (SBRUVS) • ROV • Towed video survey

Table 4-2: Assessment criteria for baseline data review

Year of most recent data capture	Duration of monitoring program	Frequency of data capture	Similarity of methods to Joint Industry SMP	Similarity of parameters to Joint Industry SMP
High = less than 5 years old	High = > 4 years	High = 4+ sampling trips per year	High	High
Medium = between 5-10 years old	Medium = 2-4 years	Medium = 2-3 sampling trips per year	Medium	Medium
Low = greater than 10 years old	Low = <2 years	Low = one-off sampling trip	Low	Low

4. **Assessment of baseline data**: A qualitative annual evaluation of the adequacy (in terms of the likely ability to detect changes between pre-impact and post-impact conditions) of the collective baseline data for each 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

b) Review new data available from studies and monitoring activities within the last 5 years. Depending on the receptor and associated Joint Industry SMP, the following is considered:

i) Does the data collectively cover the required spatial extent of the receptor within a location (taking into consideration any background historical information on the distribution of the receptor)?

ii) Does the data collectively cover all the species/biological communities required for the relevant Joint Industry SMP and that may be present at the receptor/location?

5. **Assessment outcome**: Each location and associated receptor is then categorised as follows, and summarised:

a) Comprehensive baseline data or ongoing monitoring collected within the last 5 years. Data align with Joint Industry SMP parameters and methods, cover required species/communities and span the necessary spatial extent; or

b) Historical data (>5 years old) that remain of value, or some current but not extensive baseline data; or

c) No baseline data available, or existing data are inadequate in quality, scope, or relevance.

4.2 Baseline data for Sensitive receptors

Using the Marine Environment Baseline Database, Shell has reviewed the baseline data for all of the receptors listed in Table 4-3 to determine which receptors and key features have low levels/no baseline data available to support prioritisation in a spill event.

The assessment outcomes shown in Table 4-3, have identified several locations where data is historical (>5 years old) or no baseline data is available. Response locations will consider prioritisation based on receptors with no baseline data or historical data (>5 years old).

Table 4-3: Baseline data assessment versus SMPs for receptors predicted at being contacted >5% probability and <14 days

Grouping	Location	SMP									
		Water quality impact	Sediment quality impact	Intertidal and coastal habitat	Seabirds and shorebirds	Marine mega-fauna - reptiles	Marine mega-fauna - whale sharks, dugong and cetaceans	Benthic habitat	Marine fish assemblages	Fisheries impact	Heritage and social impact
Australian Marine Parks / Marine Parks	Ashmore Reef AMP*	Priority	Priority	N/A		Priority				Survey Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort. Locations to be determined in consultation with stakeholders.	
	Argo-Rowley Terrace AMP*	Priority	Priority	N/A	Priority	Priority		Priority			
	Cartier Island AMP	Priority	Priority	N/A	Priority	Priority		Priority			
	Kimberley AMP*	Priority	Priority	N/A	Priority	Priority		Priority			
	Oceanic Shoals AMP*	Priority	Priority	N/A	Priority	Priority		Priority			
Other Emergent Coastlines	Ashmore Reef	Priority	Priority	Priority		Priority	Priority		Priority		
	Browse Island	Priority	Priority	Priority		Priority	Priority				
	Cartier Island	Priority	Priority	Priority		Priority	Priority		Priority		
	Scott Reef South (includes Sandy Islet)	Priority	Priority	Priority		Priority	Priority				
Other Submerged Banks, Shoals and Reefs	Seringapatam Reef*	Priority	Priority	N/A	Priority	Priority	Priority				
	Scott Reef North*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Echucha Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Heywood Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Goeree Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Johnson bank*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Vulcan Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Woodbine Bank*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Barracouta Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Eugene McDermott Shoal*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Gale Bank*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		
	Sahul Bank*	Priority	Priority	N/A	Priority	Priority	Priority	Priority	Priority		

Key	
	Survey - current monitoring data/knowledge is sufficient (i.e. it could be used to detect level of change in the event of a significant impact); lower priority for post-spill, pre-impact data collection.
Priority Survey	Historical data (>5 years old), data aligns with joint industry SMP parameters.
Priority Survey	No baseline data available, data of low quality, doesn't align with joint industry SMP parameters.
N/A	This receptor and the relevant SM is not applicable to the priority monitoring location

** Submerged receptor*

5 OSM Organisational Structure

Shell uses the Incident Command System (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 Shell Australia Incident Management Team West (IMT (W)) will be responsible for coordinating OSM activities, which will be led by the Operations Section within the IMT, with planning support.

The Shell IMT (W) structure is shown in Figure 5-1. Incidents/spills that encroach into State waters will be managed through a coordinated command between IMT (W) and the DoT with DoT taking on the role of Control Agency for the State water response. Shell is still expected to continue monitoring activities with oversight from DoT. Figure 5-1. illustrates the structure of the OSM Management Team during the response phase. The IMT (W) Leader/Incident Commander (IC) 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.

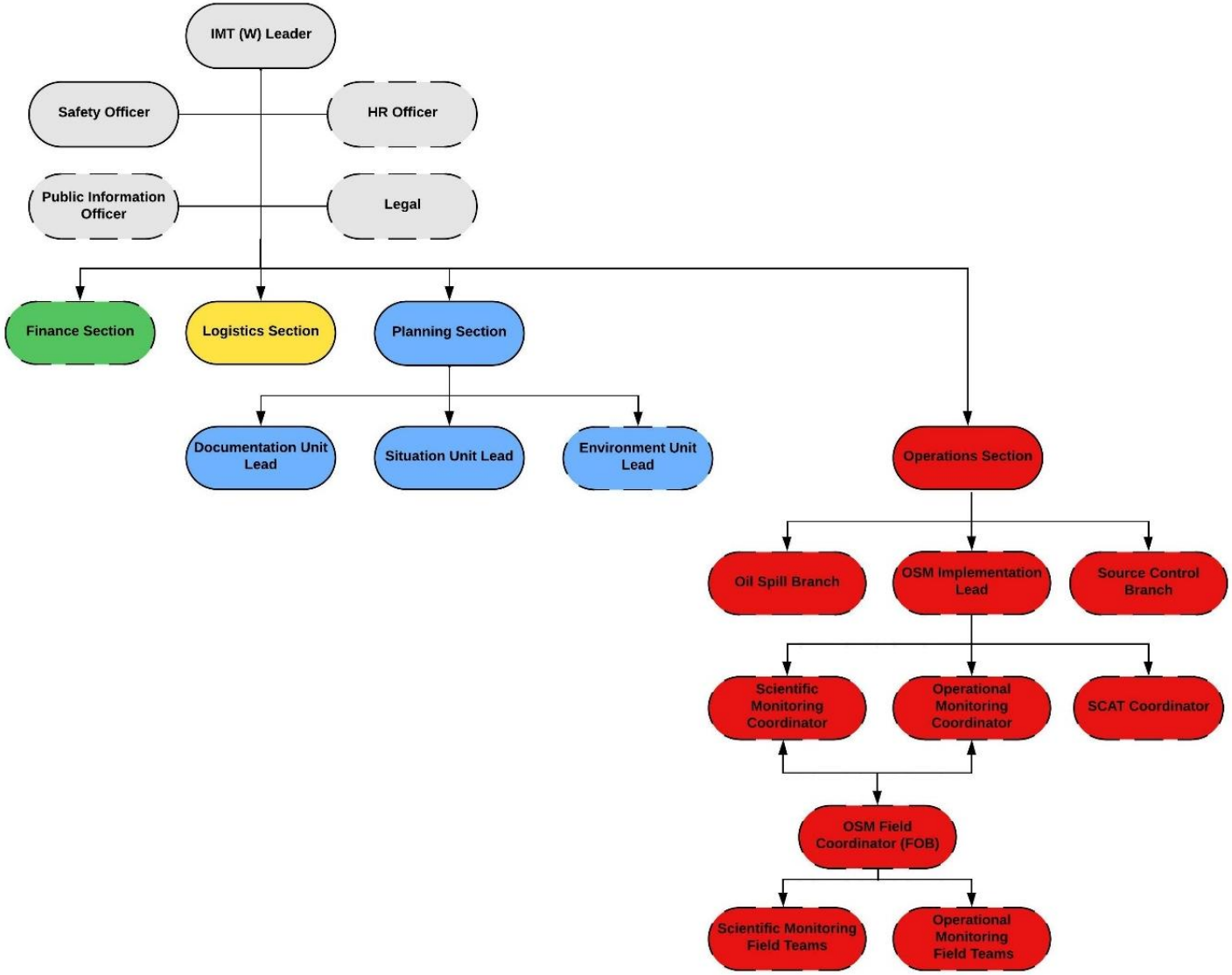

Figure 5-1: Shell IMT (W) Structure – solid line roles are on call while dotted lines are activated as needed via the IMT Leader.

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 Shell and OSRL.

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

Table 6-1: Roles and Responsibilities – Shell OSM

Role	Held by
Environment Unit Leader	Shell
OSM Implementation Lead	Shell - OSRL/MSPs can be requested to fulfill this role, however the Titleholder has the responsibility to ensure this role is filled.
Operational Monitoring Coordinator and/or Scientific Monitoring Coordinator	OSRL (Monitoring Services Provider, MSP)
OSM Field Operations Manager	OSRL (MSP)
OSM Field Teams	OSRL (MSP)

7 Mobilisation and Timing of OMP and SMP implementation

Table 7-1 provides an indicative implementation schedule for OMP and SMPs in the Planning Area and adjacent waters. 'Implementation' of an OMP/SMP is defined as being ready, at the point of staging or departure, to mobilise for monitoring. If the monitoring plan is desktop-based, implementation is defined as commencing the work (e.g. computer model inputs).

Through Shell's membership in the OSRL OSM Supplementary Agreement, OSM services are available for preparedness, activation, and monitoring (Section 9). This agreement ensures operational monitoring personnel can deploy within 72 hours of notification, and scientific monitoring personnel within 5-7 days, which is reflective of the implementation schedule provided in Table 7-1.

The Shell Browse Region Oil Pollution Emergency Plan - Basis of Design and Field Capability Assessment (HSE_GEN_016764) (Section 6.6) details the field capability statements for all response strategies, including minimum implementation times. This includes components of OSM capability, including initial aerial surveillance within 5 hours of IMT activation and SCAT within 48 hours, which will assist the IMT in initial decision making for relevant response operations.

Due to short contact times, there may be instances where post-spill pre-impact monitoring is not feasible. For these receptors and 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 Shell OSM activities

Proximity to spill source	Monitoring type	0-48 hours from OSM activation	Within 72 hours of OSM activation	~5-7 days from OSM activation	1-2 weeks from OSM activation	Ongoing
Spill site and surrounding waters	OM	• Activation of OMP Team Leads. • Finalise OMPs. • Aerial surveillance – which will also document fauna observations. Commence activation and implementation.	• OM1: Hydrocarbon Characterisation, where resources are available (e.g. Supply Vessel with onboard sampling equipment). • OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM4: Surface Chemical Dispersant Effectiveness (commencing with Tier 1 SMART Protocol) • OM5: Rapid Marine Fauna Surveillance • OM7: Air Quality Modelling • Continue to finalise OMPs.	Continued (as per on-going arrangements)	Continued (as per on-going arrangements)	As results from implemented OMPs are available, data is 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.

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
			• Continue to activate and mobilise OM personnel.			
	SM	• Commence activation and implementation process. • Activation of SMP Team Leads.	• Continue to activate and mobilise personnel. • Work on finalising SMPs	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM6: Benthic Habitat Assessment • SM7: Marine fish and elasmobranch assemblages assessment	Continued	Continue SMP monitoring until termination criteria are met
Sensitive receptors predicted to be contacted within 7 days	OM	• Activation of OMP Team Leads. • Aerial surveillance – which will also document fauna observations. • OM6: Shoreline Clean-up Assessment. • Finalise OMPs. • Commence activation and	• OM1: Hydrocarbon Characterisation • OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM5: Rapid Marine Fauna Surveillance	Continued (as per on-going arrangements)	Continued (as per on-going arrangements)	As results from implemented OMPs are available, data is 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

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
		mobilisation of OM personnel.	• Continue to finalise OMPs. • Continue to activate and mobilise OM personnel.			termination criteria are met
	SM	Activation of SMP Team Leads and finalisation of SMPs	• Continue to activate and mobilise personnel. • Work on finalising SMPs.	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM3: Intertidal and Coastal Habitat Assessment • SM4: Seabirds and Shorebirds • SM5: Marine Mega-fauna Assessment-Reptiles • SM5: Marine Mega-fauna Assessment-Cetaceans, Whale Sharks, Dugong • SM6: Benthic Habitat Assessment • SM7: Marine Fish and	Continued	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
				Elasmobranch Assemblages assessment • SM8: Fisheries impact assessment • SM9: Heritage Features Assessment • SM10: Social Impact		
Sensitive receptors predicted to be contacted week 1-2	OM	-	-	• Additional Activation of OMP Team Leads. • Commence activation and mobilisation of additional OM personnel.	• Continue to finalise OMPs. • Continue to activate and mobilise OM personnel. • OM1: Hydrocarbon Characterisation • OM2: Hydrocarbons in Water Assessment • OM3: Hydrocarbons in Sediment Assessment • OM5: Rapid Marine Fauna Surveillance	As results from implemented OMPs are available, data is 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

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
					• OM6: Shoreline Clean-up Assessment	
	SM	-	-	• Additional Activation of SMP Team Leads. • Commence activation and mobilisation of additional SM personnel.	• SM1: Water Quality Impact Assessment • SM2: Sediment Quality Impact Assessment • SM3: Intertidal and Coastal Habitat Assessment • SM4: Seabirds and Shorebirds • SM5: Marine Mega-fauna Assessment-Reptiles • SM5: Marine Mega-fauna Assessment-Cetaceans, Whale Sharks, Dugong • SM6: Benthic Habitat Assessment • SM7: Marine Fish and Elasmobranch Assemblages assessment	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
					• SM8: Fisheries impact assessment • SM9: Heritage Features Assessment • SM10: Social Impact	

8 Resource Requirements

To guide OSM resourcing requirements, the spill scenarios most likely to require the greatest initial and on-going capability were selected from those informing the Browse Regional OSM Planning Area. Selection was based on stochastic modelling results, focussing on the scenarios with the greatest predicted number of receptors contacted at the low thresholds for floating, shoreline or dissolved hydrocarbon contact (Section 2.1) within 7 days; followed by the greatest number of receptors contacted with 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, predicted time to contact, proximity to key receptors, and hydrocarbon properties. The chosen scenarios and reasons for their selection are presented in Table 8-1.

Table 8-1: Scenarios selected for OSM capability analysis

Scenario	Rationale for selection
Prelude: surface release of 1,000 m^3 HFO due to vessel collision during product offloading	• Represents a heavy, persistent hydrocarbon (Group 4) • Located close to a number of sensitive emergent receptors, such as Browse Island and Scott Reef • Highest number of receptors predicted to be contacted by floating and shoreline hydrocarbons within 14 days
Crux: Subsea release of 222, 582 m^3 condensate with gas over 80 days due to LOWC	• Highest number of receptors predicted to be contacted by dissolved hydrocarbons within 14 days • Represents a light, non-persistent hydrocarbon (Group 1) • Located close to a number of sensitive submerged receptors

8.1 Monitoring Units

Using stochastic modelling results, Shell has grouped its monitoring priorities into monitoring 'units' Table 8-2. These units incorporate all of the possible receptors that may be contacted by the scenarios shown in Table 2-1.

These unit groupings are based on consultation with experienced monitoring personnel and planners, who often group these receptors together for time-bound monitoring projects. The grouping of units is based on factors such as access and distance to ports, Simultaneous Operations (SIMOPs) of multiple vessels and teams working in a close area, travel time between individual locations/receptors and time taken to collect samples for each SMP.

The monitoring units presented in Table 8-2 also include KEFs, BIAs and transient species. Additional information on the seasonality of the receptors can be found in

Appendix C and in Section 7 of the activity EP. Each monitoring unit will require 1-2 teams during the initial response (1-2 weeks). The number of teams allocated to each unit will depend on the extent of the spill, the outcome of the monitoring prioritisation finalised at the time of the spill (Section 14), the Operational Net Environmental Benefit Analysis and SIMOPs.

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

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

Monitoring Unit	Receptors within Monitoring Unit
Ashmore / Cartier	Ashmore Reef
	Ashmore AMP
	Cartier Island
	Cartier Island AMP
	Ashmore Reef and Cartier Island and surrounding Commonwealth Waters KEF*
	Continental Slope Demersal Fish Communities KEF*
	Woodbine Bank*
	Johnson Bank*
	Barracouta Shoal*
	Seabird BIAs*
	Marine turtle BIAs*
	Pygmy blue whale BIA*
	Whale shark BIA*
Browse	Browse Island
	Goeree Shoal*
	Vulcan Shoals*
	Heywood Shoal*
	Echuca Shoal*
	Eugene McDermott Shoal*
	Ancient Coastline at 125m Depth Contour KEF*
	Whale shark BIA*
	Marine turtle BIAs*
Scott	Scott Reef North
	Scott Reef South (including Sandy Islet)
	Seringapatam Reef

Monitoring Unit	Receptors within Monitoring Unit
	Seringapatam Reef and Commonwealth Waters in the Scott Reef Complex KEF*
	Ancient Coastline at 125m Depth Contour KEF*
	Continental Slope Demersal Fish Communities KEF*
	Seabird BIAs*
	Marine turtle BIAs*
	Pygmy blue whale BIA*
Kimberley	Cape Bougainville and nearby islands (i.e. Cassini Island, Sand Island, Traughton Island)
	Holothuria Banks*
	Long Reef*
	Branch Banks*
	Otway Bank*
	Rothery Reef*
	Kimberley AMP*
	Seabird BIAs*
	Dolphin BIAs*
	Whale shark BIA*
	Humpback whale BIA*
	Marine turtle BIAs
Offshore Environs	Oceanic Shoals AMP*
	Gale Bank*
	Sahul Bank*
	Carbonate bank and terrace system of the Sahul Shelf KEF*
	Pinnacles of the Bonaparte Basin KEF*
	Whale shark BIA*
	Marine turtle BIAs*
Control	Control sites

*Submerged receptor that has no features above the sea surface.

8.2 Deterministic modelling

To better understand worst-case capability OSM requirements, deterministic modelling was undertaken for the scenarios listed in Table 8-1. The deterministic run with the most receptors contacted by either floating, shoreline or dissolved hydrocarbons at the low thresholds and within 14 days was selected for further analysis. Deterministic modelling enables oil spill planners to assess the results of a single run from the stochastic oil spill modelling results, helping to assess the possible worst-case capability requirements. The results of this deterministic assessment are presented in Table 8-3 and

Table 8-4.

The resources required to assist the IMT in the coordination and management of OSM are outlined in Table 8-5. The resources required to commence OM and SM components during weeks 1-2 are presented in Table 8-6 and Table 8-7 respectively, which are based on the monitoring priorities for those scenarios, the implementation schedule outlined in Table 7-1, and the worst-case deterministic trajectories outlined in Table 8-3 and

Table 8-4. If required, additional resources will be mobilised from weeks 2-3 onwards via the OSRL contract, which includes provision of scale-up resources.

Table 8-3: Deterministic modelling results Prelude: surface release of 1,000 m³ HFO due to vessel collision during product offloading

Receptor	Arrival time (days) for deterministic run No. 85			
	Floating oil ≥1 g/m²	Shoreline Accumulation ≥10 g/m²	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥10 ppb
Kimberley AMP	7.0	NA	NC	NC
Cassini Island	10.0	NC	NC	NC
Sand Island	10.5	10.5	NC	NC
Branch Banks*	12.3	NA	NC	NC
Long Reef*	10.5	NA	NC	NC
Rothery Reef*	10.7	NA	NC	NC
Traughton Island	11.3	12.2	NC	NC
East Holothuria Reef	11.8	NC	NC	NC
Holothuria Banks*	11.8	NA	NC	NC
Otway Bank*	11.8	NA	NC	NC

Table 8-4: Deterministic modelling results Crux: Subsea release of 222,582 m³ condensate with gas over 80 days due to LOWC

Receptor		Arrival time (days) for deterministic run No. 45			
	Floating oil ≥1 g/m²	Shoreline Accumulation ≥10 g/m²	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥10 ppb	Maximum continuous residence time (hours) for dissolved hydrocarbons exposure at ≥10 ppb
Goeree Shoal*	9.4	NA	6.15	6.16	4.8
Vulcan Shoal*	50.5	NA	8.2	8.3	1.6
Cartier Island AMP*	NC	NA	10.3	13.5	0.4

Receptor		Arrival time (days) for deterministic run No. 45			
	Floating oil ≥1 g/m²	Shoreline Accumulation ≥10 g/m²	Total Entrained Oil ≥10 ppb	Dissolved Hydrocarbons ≥10 ppb	Maximum continuous residence time (hours) for dissolved hydrocarbons exposure at ≥10 ppb
Cartier Island	NC	13.2	11.4	13.8	0.3

Key
Receptor contacted with 7 days
Receptor contacted with 14 days

* Submerged receptor that has no features above the sea surface.

Table 8-5: Resources required for key OSM coordination roles

Role	Throughout monitoring process	Arrangement
OSM Implementation Lead (Shell)	1 x OSM Implementation Lead	Oil Spill Response Limited (OSRL) OSM Supplementary Service Agreement
Operational Monitoring Coordinator and Scientific Monitoring Coordinator (OSRL MSP)	1 x Operational Monitoring Coordinator 1 x Scientific Monitoring Coordinator	
OSM Field Operations Manager (OSRL MSP)	1 x OSM Field Operations Manager	

Table 8-6: Resources required for initial implementation of operational monitoring plans

OMP	Week 1 (total)#	Week 2 (total) #	Arrangement
OM1: Hydrocarbon characterisation*^	**Prelude – HFO release** 1 team (spill site and surrounds) 1 team - Kimberley Unit **Total 2 teams**	**Prelude – HFO release** 1 team (spill site and surrounds) 2 teams - Kimberley Unit **Total 3 teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
	Crux – condensate release 1 team (spill site and surrounds) 1 team – Browse Unit **Total 2 teams**	**Crux – condensate release** 1 team (spill site and surrounds) 1 team – Browse Unit 1 team - Ashmore Unit **Total 3 teams**	
OM2: Hydrocarbon in water assessment*	Refer to OM1: Hydrocarbon characterisation* (all sites)		
OM3: Hydrocarbon in sediment assessment*	Refer to OM1: Hydrocarbon characterisation* (all sites)		
OM4a: Surface dispersant effectiveness monitoring	**Any scenario** 1 team for visual observations, which may be performed by		OSRL OSM Supplementary Service Agreement AMOSC Member Agreement

OMP	Week 1 (total)#	Week 2 (total) #	Arrangement
	trained aerial observers used during monitor and evaluate if trained in observation and verification of chemical dispersant effectiveness For water quality observations, refer to OM2: Hydrocarbon in water assessment		Aviation providers Marine contractors
OM4b: Subsea dispersant injection effectiveness monitoring	No subsea dispersant injection until week 2 due to transportation requirements	1 team	OSRL Subsea Well Intervention Service (SWIS) Capping Stack Membership
OM5: Rapid marine fauna surveillance^	**Any scenario** 1 team to conduct initial aerial surveys for all sites (2 observers per aircraft)	**Any scenario** 1 team	OSRL OSM Supplementary Service Agreement Aviation providers
OM6: Shoreline clean-up assessment	As per BROPEP		
Air quality modelling (responder health and safety)	1 team (all sites)	1 team (all sites)	Shell in-house personnel
Maximum total number of teams required	5 teams	6 teams	-

** Initial co-mobilisation between OM1: Hydrocarbon characterisation, OM2: Hydrocarbon in water assessment, OM3: Hydrocarbon in sediment assessment and OM4a: Surface dispersant effectiveness monitoring.*
 # Specific units are mentioned for planning and guidance purposes based on a worst case planning approach. In the event of an actual spill, other locations and/or receptors may be contacted. This would be identified and managed as part of implementation as per the guidance in Section 14.
^ These resources may not be required if relevant scientific monitoring components initiation criteria have been triggered.

Table 8-7: Resources required for initial implementation of scientific monitoring plans

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
SM1: Water quality impact assessment^	**Prelude – HFO release** 1 team (spill site and surrounds) 1 team - Kimberley Unit 1 team - control site(s) **Total 3 teams**	**Prelude – HFO release** 1 team (spill site and surrounds) 2 teams - Kimberley Unit 1 team - control site(s) **Total 4 teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
	Crux – condensate release 1 team (spill site and surrounds) 1 team – Browse Unit 1 team control site(s) **Total 3 teams**	**Crux – condensate release** 1 team (spill site and surrounds) 1 team – Browse Unit 1 team - Ashmore Unit 1 team control site(s) **Total 4 teams**	
SM2: Sediment quality impact assessment	Refer to SM1: Water quality impact assessment* (all sites)		OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
SM3: Intertidal and coastal habitat assessment	**Prelude – HFO release** 1 team - Kimberley Unit 1 team - control site(s) **Total 2 teams**	**Prelude – HFO release** 2 teams - Kimberley Unit 1 team - control site(s) **Total 3 teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
	Not required – no contact with emergent receptors predicted until week 2	**Crux – condensate release** 1 team - Ashmore Unit	

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
		1 team - control site(s) **Total 2 teams**	
SM4: Seabirds and shorebirds^	**Prelude – HFO release** **Aerial** 1 team to conduct initial aerial surveys for Kimberley Unit (2 observers per aircraft) **Total 1 aerial team** **Vessel** 1 team to conduct vessel-based surveys for Kimberley Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 2 vessel-based teams** **Ground** 1 team to conduct ground-based surveys for Kimberley Unit 1 team control site(s) (1 experienced ornithologists per team) **Total 2 ground-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	**Prelude – HFO release** **Aerial** 1 team to conduct aerial surveys for Kimberley Unit (2 observers per aircraft) **Total 1 aerial team** **Vessel** 2 teams to conduct vessel-based surveys for Kimberley Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** **Ground** 1 team to conduct ground-based surveys for Kimberley Unit 1 team control site(s) (1 experienced ornithologists per team) **Total 2 ground-based teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
		Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	
	Crux – condensate release **Aerial** 1 team to conduct initial aerial surveys for Browse Unit (2 observers per aircraft) **Total 1 aerial team** **Vessel** 1 team to conduct vessel-based surveys for Browse Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 2 vessel-based teams** Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	**Crux – condensate release** **Aerial** 1 team to conduct initial aerial surveys for Browse and Ashmore Units (2 observers per aircraft) **Total 1 aerial team** **Vessel** 1 team to conduct vessel-based surveys for Browse Unit 1 team to conduct vessel-based surveys for Ashmore Unit 1 team control site(s) (surveys would include all fauna [birds, reptiles, cetaceans, dugong and whale shark]) **Total 3 vessel-based teams** **Ground** 1 team to conduct ground-based surveys for Ashmore Unit 1 team control site(s) (1 experienced ornithologists per team) **Total 2 ground-based teams**	

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
		Note: can initially be performed by the same team as OM5: Rapid marine fauna surveillance	
SM5: Marine mega-fauna assessment (whale shark, dugong and cetaceans) ^	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds		OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
SM5: Marine mega-fauna assessment (reptiles) ^	Aerial surveys refer to SMP: Seabirds and shorebirds Vessel surveys refer to SMP: Seabird and shorebirds Ground based survey refer to SMP: Seabird and shorebirds (including 1 member experienced with ground turtle surveys)		OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
SM6: Benthic habitat assessment	**Prelude – HFO release** 1 team (spill site and surrounds) 1 team - Kimberley Unit 1 team - control site(s) **Total 3 teams**	**Prelude – HFO release** 1 team (spill site and surrounds) 2 teams - Kimberley Unit 1 team - control site(s) **Total 4 teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
	Crux – condensate release 1 team (spill site and surrounds) 1 team – Browse Unit	**Crux – condensate release** 1 team (spill site and surrounds) 1 team – Browse Unit	

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
	1 team control site(s) **Total 3 teams**	1 team - Ashmore Unit 1 team control site(s) **Total 4 teams**	
SM7: Marine fish and elasmobranch assemblages assessment	**Prelude – HFO release** 1 team (spill site and surrounds) 1 team - Kimberley Unit 1 team - control site(s) **Total 3 teams**	**Prelude – HFO release** 1 team (spill site and surrounds) 2 teams - Kimberley Unit 1 team - control site(s) **Total 4 teams**	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
	Crux – condensate release 1 team (spill site and surrounds) 1 team – Browse Unit 1 team control site(s) **Total 3 teams**	**Crux – condensate release** 1 team (spill site and surrounds) 1 team – Browse Unit 1 team - Ashmore Unit 1 team control site(s) **Total 4 teams**	
SM8: Fisheries impact assessment	**Any scenario** Total 2 teams to cover all relevant Commonwealth and State fisheries.	**Any scenario** Total 2 teams to cover all relevant Commonwealth and State fisheries.	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement
SM9: Heritage features assessment	**Any scenario** 1 team	**Any scenario** 1 team	OSRL OSM Supplementary Service Agreement Marine contractors Laboratory arrangement

SMP	Week 1 (total) #	Week 2 (total)#+	Arrangement
SM10: Social impact assessment	**Any scenario** 1 team	**Any scenario** 1 team	OSRL OSM Supplementary Service Agreement
Maximum total number of teams	**20 teams**	**33 teams**	-

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

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

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

+ Depending on the circumstances of the spill, additional resources will be scaled in to cater for monitoring needs beyond week 2.

9 Capability arrangements

Shell is a Member to the OSRL OSM Supplementary Service Agreement, which provides OSM Annual Services and Response Services to members who have subscribed to this supplementary service. This OSM Supplementary Service Agreement includes access to OSRL's sub-contracted Monitoring Service Providers (MSP) in Australia and internationally (who will report through OSRL) to deliver monitoring capability.

Details of OSM services are provided in Table 9-1. In addition, Shell is a Member of OSRL's Subsea Well Intervention Service (SWIS), enabling access to trained personnel and specialised monitoring equipment for subsea dispersant injection monitoring. Shell will maintain responsibility for implementing OMP: Air quality modelling (responder health and safety).

OSRL, 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: OSRL preparedness and activation / monitoring services

Preparedness[3]
24/7 Duty Manager accessed through 24 hr hotline
Provision of a suitably trained operational and scientific monitoring personnel
Monthly reports on personnel and equipment availability
Access to OSRL's sub-contracted Monitoring Service Providers
Access to OSRL's network of laboratories and equipment providers
Activation / Monitoring[4]
Provision of OM and SM Coordinators to the Shell IMT within 12 hours of notification
Provision of an initial Monitoring team within 72 hours of notification, ready to deploy from a nominated port(s) or staging location (e.g. Forward Operating Base [FOB])
Assisting Shell in finalisation of monitoring plans
Provision of scientific monitoring personnel within 5-7 days of notification
Access to OSRL personnel and equipment

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

9.2 Personnel competencies

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

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

In addition and where practicable, Shell 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 OSRL in the finalisation of monitoring designs.

9.3 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, OSRL will provide all specialised field monitoring equipment to implement individual OMPs and SMPs. Shell will remain responsible for support and field logistics, including monitoring platforms (e.g. vessels, vehicles and aircraft), flights and accommodation for personnel and transportation/couriers for samples to be sent back to laboratories.

Availability of key field equipment will be listed in the Capability Register.

Table 9-2: OSM Equipment

Equipment type	Source
Shell equipment	
Desktop equipment (e.g. Oil Spill Response Atlas, GIS)	Coordinated through IMT (W) Situation Team
Logistical equipment (e.g. in-field accommodation, vessels, aircraft)	Refer to BROPEP HSE_GEN_016765
OSM Service Provider equipment	
In-field specialised monitoring equipment (e.g. fluorometers, sample bottles, ROVs)	Coordinated through OSRL's OSM response and implementation services
Subsea dispersant injection monitoring equipment	OSRL SWIS Capping Services Membership

9.4 Exercises

OSRL, via the OSM Supplementary Service Agreement, is contracted to maintain an OSM Services Annual Assurance Program. Assurance activities forming the OSM Services Assurance Program 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, OSRL will prepare exercise reports and track any action items to completion.

Table 9-3: OSM Assurance program

Assurance activity	Responsibility	Description	Frequency
Assurance Program Workshop	OSRL, Industry Member Technical Advisory Group (IMTAG) and Monitoring Service Providers	The outputs from the annual OSM Services and Assurance Program Workshop will form the basis of the OSM Annual Services and Assurance Program for the coming Contract Year.	Annually
Notification exercise	Shell with OSRL	Test procedures to notify and activate the OSM Services with OSRL. Test activation of sub-contracted Monitoring Service Providers is conducted once annually via the IMTAG.	Annually
Tabletop or Incident Management Exercise exercise	IMTAG and OSRL to agree a lead Titleholder for each Calendar Year	Involves IMT activation to establish command, control, and coordination of a Level 2 or 3 incident. The exercise will simulate all actions to validate the enactment of plans, procedures, protocols, roles and tasks during a simulated incident.	Annually
Desktop review	Monitoring Service Providers & OSRL	A desktop review of capability for a selected 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 Shell's worst-case capability requirements (as outlined in Table 8-6 and Table 8-7) 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: Shell OSM Capability

Component	Maximum No. Personnel Required (Weeks 1-2)[5]	Personnel available via OSM Supplementary Services Agreement	Personnel available via Oil Spill Response Organisations	Shell	Total Personnel Available
OSM Personnel embedded in Shell IMT	1 OM Coordinator 1 SM Coordinator 1 Field Operations Manager	1 OM Coordinator 1 SM Coordinator 1 Field Operations Manager	N/A	1 OSM Implementation Lead (can be MSP if available)	1 OSM Implementation Lead 1 OM Monitoring Coordinator 1 SM Coordinator 1 Field Operations Manager
OMPs					
OM1: Hydrocarbon characterisation*	3 teams	6 teams	-	-	6 teams
OM2: Hydrocarbon in water assessment*	Refer to OM1: Hydrocarbon characterisation				

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

Component	Maximum No. Personnel Required (Weeks 1-2)[5]	Personnel available via OSM Supplementary Services Agreement	Personnel available via Oil Spill Response Organisations	Shell	Total Personnel Available
OM3: Hydrocarbon in sediment assessment*	Refer to OM1: Hydrocarbon characterisation				
OM4a: Surface dispersant effectiveness monitoring	1 team	1 visual observation team Refer to OM2: Hydrocarbon in water assessment	4 AMOSC Staff 2 AMOSC Core Group trained personnel	-	1 visual observation team 4 AMOSC Staff 2 AMOSC Core Group trained personnel
OM4b: Subsea dispersant injection effectiveness monitoring	1 team	1 team	SWIS Membership: 18 specialist personnel available through OSRL sub-contracts	-	1 team SWIS specialist personnel
OM5: Rapid marine fauna surveillance^	1 team	2 teams	-	-	2 teams
OM6: Shoreline clean-up assessment	As outlined in BROPEP				
OM7: Air quality modelling (responder health and safety)	1 team	-	-	1 Air Quality Specialist Specialists from Project and Technology Team (Shell Global)	1 Air Quality Specialist Specialists from Project and Technology Team (Shell Global)
SMPs					

Component	Maximum No. Personnel Required (Weeks 1-2)[5]	Personnel available via OSM Supplementary Services Agreement	Personnel available via Oil Spill Response Organisations	Shell	Total Personnel Available
SM1: Water quality impact assessment^	4 teams	6 teams	-	-	6 teams
SM2: Sediment quality impact assessment	Refer to SM1: Water quality impact assessment* (all sites)				
SM3: Intertidal and coastal habitat assessment	3 teams	6 teams	-	-	6 teams
SM4: Seabirds and shorebirds^	1 aerial team 3 vessel teams 2 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])	2 aerial teams 5 vessel teams 5 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])	-	-	2 aerial teams 5 vessel teams 5 ground based teams (plus 1 team member per team experienced with ground turtle surveys – see Marine mega-fauna assessment [reptiles])
SM5: Marine mega-fauna assessment (whale shark, dugong and cetaceans) ^	Refer to SM4: seabirds and shorebirds				
SM5: Marine mega-fauna assessment (reptiles) ^	Aerial and vessel - Refer to SM4: seabirds and shorebirds				

Component	Maximum No. Personnel Required (Weeks 1-2)[5]	Personnel available via OSM Supplementary Services Agreement	Personnel available via Oil Spill Response Organisations	Shell	Total Personnel Available
	Ground surveys - Refer to SM4: seabirds and shorebirds (plus 1 team member per team experienced with ground turtle surveys)				
SM6: Benthic habitat assessment	4 teams	6 teams	-	-	6 teams
SM7: Marine fish and elasmobranch assemblages assessment	4 teams	6 teams	-	-	6 teams
SM8: Fisheries impact assessment	2 teams	2 teams	-	-	2 teams
SM9: Heritage features assessment	1 team	1 team	-	-	1 team
SM10: Social impact assessment	1 team	1 team	-	3-4 Social impact assessment specialists	1 team 3-4 Social impact assessment specialists

11 Review of Plan

As part of the Environment Plan review cycle, this document will be periodically reviewed and revised, if required, in accordance with the Shell's Management of Change Manual. This could include changes required in response to one or more of the following:

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

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

Part B – Implementation

12 Control Agencies and Jurisdictional Authorities

Section 2 of the Shell BROPEP provides detailed information on Jurisdictional Authority and Control Agency responsibilities and should be referred to when planning operational and scientific monitoring activities, particularly in WA State Waters and along WA shorelines. Where the WA DoT is the Control Agency, OMP: Shoreline Clean-up Assessment will be implemented under their direction, with resources provided by Shell.

In addition, Section 2 of all Shell BROPEP provides regulatory and stakeholder notification and reporting requirements. Whilst all notification and reporting will be performed by Shell 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.

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

13 Mobilisation and Activation Process

Shell's IMT Environment Unit Lead is responsible for activating OSM components, subject to approval from the Incident Commander. Table 13-1 outlines Shell's OSM activation process to be completed within the specified timeframe.

Table 13-1: OSM Mobilisation and Activation Process

Responsibility	Task	Timeframe[6]	Complete
Shell 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 or Deputy Incident Commander to activate OSRL	Within 4 hours of spill notification	❑
	Contact OSRL and verbally notify their Duty Manager of the incident, requesting provision of OSM Personnel to the IMT. Complete Call	Within 4 hours of spill notification	❑

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

Responsibility	Task	Timeframe[6]	Complete
	Off Order Form (Appendix E) and submit to OSRL to confirm activation of OSM Services		
	Provide monitor and evaluate data (e.g. aerial surveillance, fate and weathering modelling, tracking buoy data, current IAPs) to OSRL	Within 1 hour of data being received by IMT	❑
	Liaise with Shell Logistics Section Chief to identify potential staging and departure location/s for monitoring activities. Provide this information to OSRL	Within 4-6 hours of spill notification	❑
	Record tasks in Individual Log	At time of completion of task	❑
Safety Officer (Shell)	Develop a Site Safety and Control Plan	Prior to mobilisation of personnel to the field	❑
Logistics Section Chief (Shell)	Commence arrangements for vessels, accommodation and transport to mobilise monitoring teams	Within 24 hours of spill notification	❑
OSRL	Duty Manager to activate relevant Sub-Contracted Monitoring Service Providers	Within 30 minutes of Call Off Order Form being received by OSRL	❑
	OSM personnel (OM/SM Coordinators) requested by Shell (via Call Off Order Form) to be sent to Shell's IMT	Within 12 hours of notification being made to OSRL	❑
	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	❑

14 Monitoring Priorities

As described in Sections 2 and 3, the available spill trajectory modelling, in conjunction with a desktop review of current baseline data, has been analysed to understand the likely initial monitoring priorities for Shell activities in the Browse region. Table 4-3 provides a review and categorisation of baseline data, to assist in identifying where post-spill, pre-impact monitoring should be focused.

The information provided in Sections 2 and Table 4-3 is to be used as 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 14-1 provides a checklist to assist in the confirmation of monitoring priorities for individual spills.

Table 14-1: Checklist for determining monitoring priorities

Responsibility	Task	Timeframe	Complete
Shell Environment Unit Lead (or delegate)	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	❑
Shell Environment Unit Lead (or delegate) with input from OSRL	Confirm monitoring receptors/locations for activated OMPs and SMPs based on: • Current monitor and evaluate data (i.e. situational awareness data, including predicted time to receptor impact, aerial/vessel surveillance observations, tracking buoy data, satellite data); • Monitoring priorities identified in Section 3 and Table 4-3; • Nature of hydrocarbon spill (i.e. subsea blow out, surface release, hydrocarbon characteristics, volume, expected duration of release); • Seasonality and presence of receptors impacted or at risk of being impacted; • Current information on transient and broadscale receptors /(surface and subsea); • Current operational considerations (e.g. weather, logistics and SIMOPs); 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 receptors 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 receptors/ locations, noting that	Within 12 hours of monitor and evaluate data	❑

Responsibility	Task	Timeframe	Complete
	suitable control or reference sites may be outside of the Planning Area	being received from IMT	
	Continually re-evaluate monitoring priorities in consultation with Environment Unit Lead and relevant key stakeholders throughout spill response (and with Shell Environment Advisor).	Ongoing	❑

15 Protected Matters Requirements

Table 15-1 provides a checklist to ensure monitoring personnel consider protected matters requirements in the finalisation of OMPs and SMPs.

Section 7 of the activity EPs outlines the management plans, recovery plans and conservation advice statements relevant for the EPBC Act MNES (protected matters) within the Planning Area. This information is likely to be important to the final design of the OMPs and SMPs. Section 7 of the activity EPs and Appendix C: Background information for key sensitivities include relevant priority monitoring locations where these receptors are known to occur in order to expedite consideration of relevant information into finalised monitoring designs.

Table 15-1: Checklist for inclusion of protected matters into monitoring designs

Responsibility	Task	Complete
Shell Environment Unit Lead (or delegate) with input from OSRL	Review Monitoring, Evaluation and Surveillance data and available OM 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 Section 7 of the activity EP 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 fauna 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	❑

16 Finalising Monitoring Design

The methods presented in the Joint Industry OMPs and SMPs are designed to allow OSRL and their sub-contracted Monitoring Service Providers 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.

Shell's checklist for finalising monitoring designs post-spill is provided in Table 16-1. The OSM Implementation Lead, in liaison with the Shell Environment Unit Lead, will be responsible for approving the finalised monitoring design used in the OMPs and SMPs upon first deployment and ongoing monitoring.

Table 16-1: Checklist for finalising monitoring design

Responsibility	Task	Timeframe	Complete
OSM Implementation Lead in liaison with Shell Environment Unit Lead and OSRL	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	❑
	Review Table 10-4 of the Joint Industry OSM Framework to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs	Before finalising monitoring designs	❑
	Liaise with the Shell Environment Unit Lead to review the Environmental Performance Standards listed in the BROPEP and to ensure compliance with relevant EPS'	Before finalising monitoring designs	❑
	Finalise standard operating procedures	Within 48 hours of initial monitoring priorities being confirmed by IMT	❑
	Scientific monitoring: • Establish benchmarks and guidelines to be used • Confirm indicator species • Confirm parameters and metrics	Within 96 hours of initial monitoring priorities being confirmed by IMT	❑

17 Mobilisation of Monitoring Teams

When the monitoring design has been finalised for each OMP and SMP, OSRL and MSPs shall work in conjunction with the Shell IMT Planning and Logistics Section to develop and execute a monitoring mobilisation plan, which should be incorporated into the Incident Action Planning process.

OSRL will be required to coordinate the availability of personnel and equipment for all monitoring programs (with the exception of OM7: Air Quality Modelling). Shell will be responsible for flights, accommodation and victualing for field personnel. Shell 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 17-1.

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

Table 17-1: Checklist for mobilisation of monitoring teams

Responsibility	Task	Complete
OSRL with input from Environment Unit Lead (Shell)	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 Shell 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/EMT and process requirements, including data transfer approach and frequency/timing	❑
	Confirm data formats and metadata requirements with personnel receiving data	❑
	Logistics	
	Confirm Shell Logistics Section have arranged flights, accommodation, and car hire arrangements are in place	❑
	Develop field survey schedules, detailing staff rotation	❑
	Equipment	
	Confirm Shell 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)	❑

Responsibility	Task	Complete
	Confirm Shell Logistics Section have arranged vessels with correct fit-out specifications (e.g. winches, Geographic Positioning System (GPS), satellite, deck crane, hiab, sufficient deck space, water supplies (fresh and/or salt), accommodation)	❑
	Confirm consumables (including personal protective equipment [PPE]) have been purchased and will be delivered to required location	❑
	Liaise with NATA-accredited laboratories to confirm availability, limits of detection, sampling holding times, transportation, obtain sample analysis quotes and arrange provision of appropriate sample containers, Chain of Custody (CoC) forms and suitable storage options for all samples. Make arrangements for couriers (if necessary)	❑
	Confirm specialist equipment requirements and availability (including redundancy)	❑
	Check GPS units and digital cameras are working and that sufficient spare batteries and memory cards are available	❑
	Confirm sufficient equipment to allow integration of survey software and navigational systems (e.g. GPS, additional equipment and adaptors), and additional GPS units prepared	❑
	Confirm GPS survey positions (where available) have been Quality Assurance and Quality Control (QA/QC) checked and pre-loaded into navigation software/positioning system	❑
	Check field laptops, ensuring they have batteries (including spares), power cable, and are functional	❑
	Check if a first aid kit or specialist PPE is required	❑
	Confirm arrangements for freight to mobilisation port is in place	❑

18 Permits and Access Requirements

Permit and access requirements apply to Marine Parks, Marine Protected Areas, restricted heritage areas, operational/activity areas of industrial sites, defence locations, certain fauna and managed fisheries. Table 18-1 lists relevant protected areas within the Browse Region and the jurisdictional authority to be contacted to obtain the necessary permit or access permission.

OSRL will work with Shell 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 18-1: Permits required in the Browse Regional OSM Planning Area

Receptor	Jurisdictional Authority	Relevant information on permits
Permits for monitoring fauna	DCCEEW DBCA	Any interactions involving nationally listed threatened fauna may require approval from DCCEEW - https://www.dcceew.gov.au/environment/biodiversity/threatened/permits WA- appropriate permits can be found at: https://www.dbca.wa.gov.au/licences-and-permits/fauna NT – information can be found at - https://nt.gov.au/environment/animals/wildlife-permits
State/Territory Marine Protected Areas; Fish Habitat Protection Areas	DBCA (WA) State/Territory government department with jurisdiction for fisheries	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 No specific permitting requirements exist for monitoring in NT fish protection areas, but zones are described here - https://nt.gov.au/marine/recreational-fishing/when-and-where-to-fish/reef-fish-protection-areas
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.dcceew.gov.au/environment/epbc/our-role/what-is-protected
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 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 - https://www.dcceew.gov.au/science-research/australias-biological-resources/access-biological-resources-commonwealth

Receptor	Jurisdictional Authority	Relevant information on permits
State/Territory Managed Fisheries	State/Territory government department with jurisdiction for fisheries	No specific permitting requirements exist for WA Fisheries, but additional information is available at – https://www.fish.wa.gov.au/Fishing-and-Aquaculture/Pages/default.aspx No specific permitting requirements exist for NT Fisheries, but additional information is available at - https://daf.nt.gov.au/fisheries
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) (WA) Territory government department with jurisdiction for indigenous heritage	Entry access permits to Aboriginal Lands in WA - https://www.wa.gov.au/government/document-collections/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 and https://www.dplh.wa.gov.au/information-and-services/aboriginal-heritage Indigenous heritage information in NT - https://nt.gov.au/leisure/arts-culture-heritage/visit-a-cultural-or-heritage-site/indigenous-heritage-information
Defence/restricted military area	Department of Defence	Unexploded Ordanances (mapping information)– https://www.defence.gov.au/UXO/default.asp Maritime military firing practice and exercise areas - https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.hydro.gov.au/n2m/2010/annual/n2m/9.pdf&ved=2ahUKEwi08LDJ_c-PAxWiamwGHUmjCiQQFnoECB0QAQ&usg=AOvVaw0A_L5br6pqJx_IZgW7N15M
Industry (e.g. operational zone of	Operating company	Safety zones (up to 500 m from outer edge of well or equipment) – https://www.nopsema.gov.au/safety/safety-zones/

Receptor	Jurisdictional Authority	Relevant information on permits
offshore oil or gas platform)		
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

19 Use of Data in Response Decision-making

19.1 Operational Monitoring to Inform Response Activities

OSRL 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 19-1 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 OSM Implementation Lead via field reporting forms, debriefs and reports. Laboratory analysis reports should also be directed to the OSM Implementation Lead.

The OSM Implementation Lead is responsible for the interpretation and analysis of data. OM 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. SM 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, SM 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 IMT Planning Section, who will then distribute the data from each monitoring component to the relevant IMT Unit and/or Section. Table 19-2 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. During a response, all SM data will also be provided to the IMT Planning Section.

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 SIMA (also referred to as a Net Environmental Benefit Analysis [NEBA]), which would then 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 OM data to aid in decision making and determine if the response options can be commenced, continued, escalated, terminated, or if controls need to be put in place to manage impacts of the response activities. These decisions will be communicated to the broader IMT during regular situation debriefs.

Table 19-1: Checklist for utilising OM data to inform IMT in decision making

Responsibility	Task	Timeframe	Complete
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	❑
	OM data provided to the IMT Situation Unit Leader	Daily and ongoing	❑
Field Team	Reports from OM6: Shoreline Clean-up Assessment will be provided to the IMT daily, detailing the assessed areas to maximise effective utilisation of resources	Daily reporting	❑
Shell Situation Unit Leader	Incorporate OM data into Common Operating Picture	Daily and ongoing	❑

Responsibility	Task	Timeframe	Complete
Shell Environment Unit Leader	Incorporate OM data into operational SIMA/NEBA and IAP for the next operating period	Each operational period	❑

Table 19-2: Data generated from each OMP and how this may be used by IMT in decision making

Operational Monitoring Plan	Data generated[7]	IMT Section requiring data	How data may be used by IMT
OM1: Hydrocarbon characterisation	Hydrocarbon physical characteristics (e.g. viscosity, asphaltene content, fingerprinting, weathering ratios of hydrocarbon chains)	Planning Section to aid in response option selection / modification	Changes to the hydrocarbon properties will affect the window of opportunity for particular responses and the associated logistical requirements of these responses, such as use of chemical dispersants, recovery and pumping equipment suitability, hydrocarbon storage and hydrocarbon disposal requirements.
OM2: Hydrocarbon in water assessment	Distribution of oil in water column and change in hydrocarbon concentrations (e.g. total recoverable hydrocarbons, BTEXN, PAH), physio-chemical parameters and dispersant detection	Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill within the water column and verify spill modelling and surveillance data; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites. Data can also influence ongoing use of dispersant through ongoing operational NEBA.
OM3: Hydrocarbon in sediment assessment	Distribution of oil in sediment and change in hydrocarbon concentrations (e.g. Total recoverable hydrocarbons, BTEXN, PAH)	Situation Unit Lead to validate surveillance and modelling data; Planning Section for use in IAP	Confirm spatial extent of spill; extent of spill can in turn influence location of other OMP and SMP monitoring components and sites.
OM4a: Surface dispersant effectiveness monitoring	Visual observations of dispersant efficacy; fluorometric readings in water column (see also water quality assessment);	Environment Unit for use in operational NEBA; Planning Section to aid in IAP development; Operations Section to confirm dispersant effectiveness for decision-	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).

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

Operational Monitoring Plan	Data generated[7]	IMT Section requiring data	How data may be used by IMT
		making purposes in current operations period.	
OM4b: Subsea dispersant injection effectiveness monitoring	Visual observations of dispersant efficacy; fluorometric readings in water column (see also water quality assessment)	Source Control Branch to aid decision-making for other source control operations; Environment Unit for use in operational NEBA; Planning Section to aid in IAP development.	Determine efficacy of subsea dispersant in treating oil to help understand if injection should continue or be modified; understand the nature and extent of the subsea plume; and provide an initial assessment of potential ecological effects. This information can be used in NEBA to help decide if dispersants are being effective at minimising oil reaching sensitive receptors (NEBA to evaluate any trade-offs between receptors) and also if subsea dispersants are effectively reducing volatile organic compound (VOC) levels so that operations are within lower explosive limits (LEL).
OM5: Rapid marine fauna surveillance	Rapid assessment of presence and distribution of marine fauna; evaluate impact of spill and response activities on fauna	Planning Section for use in IAP; Oiled Wildlife Unit/Division to help in developing Wildlife Response Sub-plan	Understanding of species, populations and geographical locations at greatest risk from spill impacts. IMT can use this information to help qualify locations with highest level of protection priority (e.g. dugong nursery area is at risk of high contact therefore dispersant use closest to spill source may be a preferred option); understanding the impacts of spill response activities can help IMT to modify or terminate activities if they are assessed as creating more harm than the oil alone (e.g. large shoreline clean-up teams and staging areas may disturb shorebird nesting resulting in adults abandoning chicks).
OM6: Shoreline clean-up assessment	Assessment of shoreline character; assessment of shoreline oiling; recommendations for	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);

Operational Monitoring Plan	Data generated[7]	IMT Section requiring data	How data may be used by IMT
	response activities; post-treatment surveys		• Oil deposition and/or removal rate for a shoreline sector will help determine effectiveness of relevant tactics (e.g. shoreline protection and/or clean-up operations); • Assessment teams provide ground truthing of sites that are not possible via satellite imagery, therefore the IMT can rely on the recommendations of Assessment Teams (e.g. flagging access issues, suitable tactics, likely resourcing needs).
OM7: Air quality modelling (responder health and safety)	Modelled outputs of VOCs	Operations Section to help determine safe zones in close vicinity of spill; Planning Section for use in IAP	Determine safe distances from spill source for response personnel; determine the presence and persistence of volatile organic compounds to know if response areas are safe for personnel.

19.2 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 BROPEP to ensure potential impacts from response activities are considered and incorporated into relevant OMP/SMP designs.

19.3 Operational Monitoring of Effectiveness of Control Measures and to Ensure EPS are met

When finalising monitoring designs, the OSM Implementation Lead and Environment Unit Lead (or delegate) shall review the Environmental Performance Standards listed in the BROPEP and integrate checks into the monitoring design that will help determine if relevant Environmental Performance Standards are being met.

20 Data Management

Minimum standards for data management are provided in Section 10.11 of the Joint Industry OSM Framework, and will be adopted by Shell and OSRL.

21 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 Shell and OSRL.

22 Communication Protocols

Communication protocols between Shell, OSRL and MSPs 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. This clear and consistent messaging is critical in what would be a highly dynamic and evolving situation.

22.1 OSRL and MSPs

The following communication protocols must be observed:

- Communication between Shell and OSRL during the preparedness phase (pre-spill) will be between the nominated Industry Member Technical Advisory Group representative and the OSRL.
- Communication between Shell and OSRL during activation (prior to deployment) will be between the Environment Unit Lead (or delegate) and the OSRL representative.
- During implementation (post deployment), primary communication occurs via two pathways:
  1. Environment Unit Lead and the OSRL Duty Manager for contractual, management, scientific and general direction matters; and
  2. Shell On-Scene Commander and the OSRL's Operations Manager/s / Field Team Leaders for on-site matters.
- All key OSM operational decisions should be logged in an ICS 214a Individual 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 Shell 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 Shell and OSRL during a response should be recorded and kept on file.
- All communication received by OSRL 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 OSRL outside of these protocols should be confirmed via the Shell Environment Unit Lead or On-Scene Commander prior to implementation.

During the post-response phase all communications shall be between the Shell Environment Advisor and the OSM Implementation Lead (if OSM lead is OSRL/MSP).

22.2 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.

Shell's IMT Public Information Officer and/or Liaison Officer (initially be will same individual) will be the focal point for external engagement during the response operation.

Stakeholder communications post-response will be managed by Shell's External (Government) Corporate Relations Team.

23 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 OM monitoring teams will be advised to stand down. Following this stage, Shell is responsible for coordinating a lessons-learnt meeting between OSRL, sub-contracted Monitoring Service Providers and other relevant stakeholders. It is the responsibility of Shell 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 23-1 provides a checklist to assist in terminating the OMPs and SMPs and the monitoring effort.

Table 23-1: Checklist for terminating monitoring components

Responsibility	Task	Complete
Environment Unit Leader / Environment Advisor with input from OSRL	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/after action review meeting	❑

24 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.

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

Department of Parks and Wildlife (DPaW) (2014) Eighty Mile Beach Marine Park Management Plan 2014–2024, Management Plan No. 80, DPaW, Perth, WA

DPaW (2016) North Kimberley Marine Park Joint management plan 2016. Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management areas, No. 89. DPaW, Perth, WA

DPaW (2013) Lalang-garram / Camden Sound Marine Park management plan No. 73 2013–2023, DPaW, Perth, WA

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.

RPS (2025) Shell Prelude 5-Year Revision Oil Spill Modelling Report. Rev 1. Report prepared for Shell Australia Pty Ltd, Perth, Western Australia

25 Abbreviations and Acronyms

Abbreviation/Acronym	Definition
AEP	Australian Energy Producers (formerly Australian Petroleum Production and Exploration Association [APPEA]; from 13 September 2023)
AIMS	Australian Institute for Marine Science
ALA	Atlas of Living Australia
AMOSC	Australian Marine Oil Spill Centre
AODN	Australian Ocean Data Network
API	American Petroleum Institute
BACI	Before-After Control-Impact
BIA	Biologically Important Areas
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
DTMI	Department of Transport and Major Infrastructure
EP	Environment Plan
ERT	Emergency Response Team
FoB	Forward Operating Base
GIS	Geographic Information System
GPS	Geographic Positioning System
HSE	Health, Safety, and Environment
IAP	Incident Action Plan
ICS	Incident Command System
IMT	Incident Management Team
IMTAG	Industry Member Technical Advisory Group
IMT Leader	Incident Management Team Leader. Equivalent to an Incident Controller or Incident Commander.
IUCN	International Union of Conservation of Nature
KEF	Key Ecological Feature

Abbreviation/Acronym	Definition
MSP	Monitoring Services Provider
NATA	National Association of Testing Authorities
OMP	Operational Monitoring Plan
OPEP	Oil Pollution Emergency Plan
OPGGS (E)	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 Regulations
OSM	Operational and Scientific Monitoring
OSM-BIP	Operational and Scientific Monitoring-Bridging Implementation Plan
OSRA	Oil Spill Response Atlas
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
OWR	Oiled Wildlife Response
PAH	Polycyclic aromatic hydrocarbons
PPE	Personal Protective Equipment
QA/QC	Quality Assurance and Quality Control
RAS	Regulatory Advice Statement
SIMA	Spill Impact Mitigation Assessment
SIMOPs	Simultaneous Operations
SMP	Scientific Monitoring Plan
SSDI	Subsea Dispersant Injection
SWIS	Subsea Well Intervention Services
TPH	Total Recoverable Hydrocarbons
TRH	Total Petroleum Hydrocarbons
UAV	Unmanned Aerial Vehicle

Appendix A: Demonstration of Meeting OSM Framework Regulatory Requirements

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
Conducted an appropriate risk assessment of worst-case oil pollution scenario(s) supported by spill modelling.	Shell has assessed its worst-case oil pollution scenarios, including spill volumes, hydrocarbon types, and potential release locations, within its OSM Baseline and Monitoring Assessment Matrix. This matrix includes an assessment of each activity and all of its worst-case spill scenarios. As part of this process and in that document, Shell reviews stochastic spill modelling outputs for each activity to evaluate spill risks relevant to OSM planning. A full assessment of worst-case oil pollution scenarios for each activity is also incorporated in the activity Environment Plan (EP) and Browse Regional OPEP.
Evaluated and adopted all reasonably practicable measures to reduce oil pollution risks by preventing incidents and preparing for a timely and effective response to pollution events.	The control measures for reducing oil pollution risks are included in the activity EP in the unplanned activities risk assessment section. Information pertaining to response preparedness is provided in the Browse Regional OPEP.
Identified monitoring arrangements and resource requirements based on the worst-case oil pollution scenario(s).	Section 8 Resource Requirements outlines the process for determining the greatest OSM resource requirements based on the worst-case scenarios for Shell's Browse Region activities, including the use of deterministic modelling. Monitoring arrangements, including contracted and internal capability are presented in Sections 9 Capability arrangements and 10 Capability Assessment .
Presented monitoring arrangements and capability that are scalable and adaptable and will provide timely information.	Section 9 Capability arrangements outlines Shell's monitoring arrangements via OSRL's OSM Supplementary Service Agreement, including scalable resourcing, if it is required.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
Identified suitably qualified personnel who will be in decision making roles and implementing the monitoring and who are prepared for their responsibilities in advance of the incident occurring.	Section 1 outlines personnel who will fill key OSM decision making roles. Roles filled by the OSRL are managed via the OSRL OSM Supplementary Services Agreement which specifies responsibilities for OSM response.
Established operational monitoring requirements based on the response needs and capacity reasoning applied to demonstrate ALARP for the response control measures detailed in the OPEP	Shell has assessed its OSM control measures and required capability in preparing this OSM-BIP. In addition, Shell has undertaken a Browse Regional OSM ALARP assessment in the Spill Response Strategy Risk Section (Section 9) of the activity EP to determine if any improvements could be made to the existing suite of control measures.
Demonstrated all feasible preparatory actions to improve reliability, effectiveness and timeliness of response arrangements and capability (including operational monitoring), have been implemented where costs are not grossly disproportionate to the environmental benefit gained	The Spill Response Strategy Risk Section (Section 9) of the activity EP demonstrates a detailed control measure options analysis was undertaken and all feasible control measures for OSM have been implemented.
Set environmental performance standards that reflect the level of performance required of the response control measures (including monitoring) to achieve the defined environmental performance outcomes.	The BROPEP (Section 4.7.4) details all OSM control measures and performance standards, many of which relate directly to the RAS Requirements. Section 19.3 Operational Monitoring of Effectiveness of Control Measures and to Ensure EPS are met outlines tasks for the OSM Implementation Lead and Environment Unit Leader to ensure environmental performance standards are met via operational monitoring activities.
The EP clearly commits to initiate all OMPs as listed in Table 5-1 as per initiation criteria listed in Table 9-1.	Table 13-1: OSM Mobilisation and Activation Process outlines the guidance to be followed during mobilisation. In addition, the Browse Regional OPEP, Section 4.7.4, commits to activating OMPs in line with the initiation criteria set out in the Framework.
The EP clearly commits to initiate all SMPs as listed in Table 6-1 as per initiation criteria listed in Table 9-2.	Table 13-1: OSM Mobilisation and Activation Process outlines the guidance to be followed during mobilisation. In addition, the

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
	Browse Regional OPEP, Section 4.7.4, commits to activating SMPs in line with the initiation criteria set out in the Framework.
The EP clearly commits to the Termination Criteria listed in Table 9-1 for operational monitoring and Table 9-2 for scientific monitoring.	Table 23-1: Checklist for terminating monitoring components outlines the guidance to be followed during termination of OSM. In addition, the Browse Regional OPEP, Section 4.7.4, commits to terminating SMPs in line with the termination criteria set out in the Framework.
The EP clearly commits to the quality assurance and quality control items listed in Section 10.11 of the framework.	Section 21 Quality Assurance and Quality Control commits that Shell and the OSRL will use Section 10.11 of the Joint Industry OSM Framework for QA/QC minimum standards.
The EP includes a clear commitment to use the same description of the roles and responsibilities for key emergency response personnel presented in the framework in Table 10-6.	Section 1 commits that Shell and the OSRL will use the key roles and responsibilities provided in Section 10.13.2 of the Framework.
The EP clearly commits to emergency response personnel having the competencies outlined in Table 11-1. However, Titleholders need to ensure that regardless of the university qualifications that personnel may have, ultimately the monitoring undertaken must be of suitable experimental design, and with personnel who are trained and competent in experimental design and in situ monitoring implementation, irrespective of their qualifications, this may not be achieved.	Personnel competencies in Section 9.1 commits that Shell and the OSRL will use the competencies outlined in Table 11-1 of the Framework.
The EP clearly commits to the minimum standards identified in Appendix A, with the addition of replacing language in the form of "should" and "where possible" with "will". EP's that commit to the standards identified in this appendix without replacing the text described above with more definitive language will likely to be subject to a more comprehensive assessment of the arrangements in accordance with the risk factors particular to the EP and receive requests for clarification from NOPSEMA during the assessment process.	The BROPEP (Section 4.7.4) commits that Shell will comply with the minimum standards listed in Appendix A of the Joint Industry OSM Framework. In addition, all of the minimum standards have been reviewed and integrated into this OSM-BIP and/or Browse Regional OPEP.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
The EP clearly commits to meet the competencies identified for teams in Appendix D Table D1.	Personnel competencies in Section 9.1 commits that Shell and the OSRL will use the competencies for SMP Field Teams as outlined in Appendix D of the Framework.
The EP clearly commits to an annual review and reviews where all the suggested triggers apply as advised in the template.	Section 11 Review of Plan and Section 4.7.4 of the BROPEP commit to conducting an annual review of the OSM-BIP, providing the criteria for the review.
The EP uses the process described in Sections 2 and 13 of the template to identify the environment that may be affected and the protection and monitoring priorities, including the application of oil concentration thresholds consistent with the exposure values for oil spill modelling presented in NOPSEMA's oil spill modelling bulletin, and fully justifies the outcome.	Section 2 Planning Area and Monitoring Priorities demonstrates that Shell has applied the NOPSEMA oil spill modelling bulletin thresholds for determining the Scientific Monitoring Planning Area (Step 1 of the BIP Template). As noted in Step 2 of the BIP Template, Shell has applied a regional approach to its BIP, consistent with its Browse Regional OPEP. The Crux and Prelude activities are geographically close, which also means the sensitive receptors for each activity are very similar. Section 2 Planning Area and Monitoring Priorities also outlines Shell's process for identifying monitoring priorities for the Browse Region, as required by Section 2 of the BIP Template (step 3). This process incorporates the key elements listed in the BIP Template, including analysis of spill modelling results with receptors of high conservation value (especially receptors predicted to be contacted at higher probabilities and a rapid timeframe) and availability of baseline data. As noted in Section 2 of the BIP template, the monitoring priorities listed are for planning purposes only and Shell and its OSRL will follow the process outlined in Section 14 Monitoring Priorities when confirming monitoring priorities in the event of a spill.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
The EP adheres to the process described in Sections 3 and 4 of the template to undertake baseline data analysis and fully justifies the outcome.	Sections 3 Relevant Existing Baseline Information Sources and 4 Baseline Data Review follow the guidance provided in the BIP Template, with the addition of more information to support continuous improvement in this area. Noting this, Shell is part of a Joint Industry Collaborative Group who are working together to determine the extent, quality and suitability of existing baseline data for the marine environments in the North West Shelf, Browse and Timor Sea Regions of Australia. The Marine Environment Baseline Database includes available data for all receptors relevant to the Joint Industry OSM Framework and has assessed the spatial and temporal relevance of this data and comparison of methods and parameters to those outlined in the Joint Industry SMPs, as recommended in Section 7 and Appendix A of the Framework and Section 4 of the BIP Template.
The EP makes clear, unambiguous commitment that scientific monitoring reports "will be" peer reviewed by an expert panel (Section 4, p10).	Section 4.7.4 of the BROPEP commits that draft OSM data reports will be peer reviewed by an expert panel for data integrity. This is also stated in Section 21 Quality Assurance and Quality Control.
The EP includes clear, unambiguous activation, mobilisation, and implementation timeframes, which are relevant to the predicted time to contact of the pollution with sensitive receptors, baseline data available, sensitivities affected, practicability of implementation and/or other factors. Indicative mobilisation timeframes for OSM activities presented as worked examples in the template, for example, activation timeframes in Table 7-1 and Section 12 and implementation timeframes in Sections 13 and 15, should be revised to reflect each activity's oil pollution scenario(s) and specific response requirements.	Section 13 Mobilisation and Activation Process provides the mobilisation and activation process and timeframes for the OSRL OSM Supplementary Services Agreement. Section 7 Mobilisation and Timing of OMP and SMP implementation provides timeframes for mobilisation and activation that are relevant to Shell's Browse Regional activities, including predicted time to contact to sensitive receptors (from spill modelling), availability of baseline data and practicability of implementation (i.e. remote environments, timeframes for mobilising specialised equipment and personnel).
Monitoring implementation timeframes consider any time requirements to finalise SMPs prior to implementation being required or take actions to reduce timeframes during the pre-spill (preparedness) phase.	The timeframes for finalising SMPs have been accounted for in the timeframes provided in Part B of the OSM-BIP, in particular, Section 16 Finalising Monitoring Design.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
The EP includes OMPs that are sufficiently developed and/or finalised to ensure that they are ready to implement in the identified timeframes for operational monitoring to provide information to support initial and ongoing response decision-making.	The Joint Industry Framework includes well developed OMPs that have been socialised with the OSRL and will be finalised in the event of a spill. The timeframe for finalising the OMPs is factored into the implementation timeframes provided in Section 7 Mobilisation and Timing of OMP and SMP implementation.
The EP identifies that operational monitoring detailed in the OMPs will be initiated, monitoring teams deployed, and information provided to the incident management team (IMT) in timeframes that match those identified and applied to the oil pollution emergency response planning in the development of the OPEP.	As described in Section 7 Mobilisation and Timing of OMP and SMP implementation, the BROPEP describes additional monitoring activities that will support the implementation of response strategies. This includes SCAT teams to support shoreline protection and clean-up; aerial surveillance to support oiled wildlife activities and marine fauna monitoring.
The EP identifies monitoring resources in the BIP that match the monitoring and response needs in terms of numbers of personnel, teams, equipment, sites etc. Tables 8-2, 8-3 and 10-1 in the template provide a suitable method of presenting the number of personnel and teams required to resource a monitoring program, however, the content of these tables will be assessed by NOPSEMA in the context of the oil pollution scenario(s), response needs analysis and capacity reasoning presented in the EP.	Section 8 Resource Requirements outlines the Browse Regional spill scenarios expected to place the highest demand on Shells' initial and on-going monitoring capability. These scenarios form the basis of the OSM capability assessment. As per Section 8 of the BIP Template, Shell has determined its resourcing requirements by considering spill modelling outputs, implementation timeframes and monitoring priorities. To further strengthen this assessment, and consistent with continuous improvement and current approaches to defining oil spill response capability (e.g. response strategies), Shell has applied deterministic modelling to refine its capability requirements. Additionally, the use of 'Monitoring Units' has been incorporated, as described in Section 8.1 Monitoring Units, and also to demonstrate how BIAs, KEFs and broadscale features are integrated into the capability assessment.
The EP adheres to the exercise and testing process described in Section 9.3. Additionally, the BIP should identify the specific objectives of the testing of monitoring arrangements, ensure the frequency of the schedule of testing is consistent with the regulatory requirements and	Section 9.4 Exercises is consistent with the BIP Template, outlining the types of exercises that shall be conducted by the OSRL, as per the OSRL OSM Supplementary Services Agreement; and also by Shell.

RAS Requirement	Relevant Section of Documentation that Addresses the Requirement
provide information on any aspects of the testing of monitoring that differ to the OPEP testing arrangements described elsewhere in the EP.	
The EP confirms that the aims and objectives of the OMPs and SMPs are appropriate for a Titleholder's monitoring requirements and address the potential impacts and risks and response activities.	Section 4.7.1 of the BROPEP confirms which OMPs and SMPs are relevant to the activity and that the aims and objectives of these monitoring plans are appropriate to the needs of the spill, its risks and response activities.
The EP uses the method provided in the template for Titleholders to ensure special requirements for Matters Protected Under Part 3 of the EPBC Act are met through the proposed monitoring (Section 14). However, the method indicates that this would be done prior to finalisation of OMPs and SMPs, which may not be completed in a Titleholder's EP. Titleholders should ensure that relevant requirements are at least identified in the EP. This process would also be repeated during finalisation of OMPs and SMPs in the event of an oil pollution emergency to ensure any changes to requirements since submission of the EP or the latest review are included.	Shell summarises special requirements for Matters Protected Under Part 3 of the EPBC Act in Section 7 of the activity EPs. The process for ensuring all relevant Protected Matters are integrated into the final monitoring design is outlined in Section 15 Protected Matters Requirements.
The EP sets environmental performance outcomes, standards and measurement criteria that relate to the environmental impacts and risks and required level of performance of the proposed monitoring arrangements (preparedness and implementation) defined in the BIP.	Section 4.7.4 of the BROPEP outlines a number of environmental performance outcomes, standards and measurement criteria committing Shell to OSM preparedness and implementation performance relevant to this OSM-BIP.

Appendix B: Sensitive receptors and their relevant OMPs and SMPs

Table B-1: Receptors contacted within 14 days at a probability >5% versus relevant OMPs and SMPs

Receptor	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	SMP: Water quality impact assessment	SMP: Sediment quality impact assessment	SMP: Intertidal and coastal habitat assessment	SMP: Seabirds and shorebirds	SMP: Marine megafauna assessment- reptiles	SMP: Marine megafauna assessment- whale sharks, dugong and cetacean	SMP: Benthic habitat assessment	SMP: Marine fish and elasmobranch assemblages assessment	SMP: Fisheries impact assessment	SMP: Heritage and social impact assessment
AMPs															
Ashmore AMP	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	✓
Argo-Rowley Terrace AMP	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Cartier Island AMP	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	✓
Kimberley AMP	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	✓
Oceanic Shoals AMP	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Islands															
Ashmore Reef	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Browse Island	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cartier Island	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reefs, Shoals and Banks															
Scott Reef (and Sandy	✓	✓	✓	⊙	✓	✓	✓	⊙	⊙	⊙	⊙	✓	✓	✓	⊙

Receptor	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	SMP: Water quality impact assessment	SMP: Sediment quality impact assessment	SMP: Intertidal and coastal habitat assessment	SMP: Seabirds and shorebirds	SMP: Marine megafauna assessment- reptiles	SMP: Marine megafauna assessment- whale sharks, dugong and cetacean	SMP: Benthic habitat assessment	SMP: Marine fish and elasmobranch assemblages assessment	SMP: Fisheries impact assessment	SMP: Heritage and social impact assessment
Islet) and Seringapatam Reef															
Goeree Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Heywood Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Echuca Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Eugene McDermott Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Barracouta Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Johnson Bank	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Vulcan Shoal	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Woodbine Bank	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Gale Bank	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
Sahul Bank	✓	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	✓	-
KEFs within 100 km of Activity Areas															
Ancient Coastline at	-	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	-	-	-

Receptor	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	SMP: Water quality impact assessment	SMP: Sediment quality impact assessment	SMP: Intertidal and coastal habitat assessment	SMP: Seabirds and shorebirds	SMP: Marine megafauna assessment- reptiles	SMP: Marine megafauna assessment- whale sharks, dugong and cetacean	SMP: Benthic habitat assessment	SMP: Marine fish and elasmobranch assemblages assessment	SMP: Fisheries impact assessment	SMP: Heritage and social impact assessment
125 m depth contour															
Continental Slope Demersal Fish Communities	-	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	-	-
Ashmore Reef and Cartier Island and surrounding Commonwealth waters	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Carbonate Bank and terrace system of the Sahul Shelf	-	✓	✓	-	✓	✓	✓	-	⊙	⊙	⊙	✓	✓	-	-
BIAs															
Whale shark BIA	-	✓	-	-	✓	✓	-	-	-	-	✓	-	-	-	✓
Pygmy blue whale BIA	-	✓	-	-	✓	✓	-	-	-	-	✓	-	-	-	-
Dolphin BIA	-	✓	-	-	✓	✓	-	-	-	-	✓	-	-	-	-
Humpback whale BIA	-	✓	-	-	✓	✓	-	-	-	-	✓	-	-	-	-

Receptor	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	SMP: Water quality impact assessment	SMP: Sediment quality impact assessment	SMP: Intertidal and coastal habitat assessment	SMP: Seabirds and shorebirds	SMP: Marine megafauna assessment- reptiles	SMP: Marine megafauna assessment- whale sharks, dugong and cetacean	SMP: Benthic habitat assessment	SMP: Marine fish and elasmobranch assemblages assessment	SMP: Fisheries impact assessment	SMP: Heritage and social impact assessment
Flatback turtle BIAs	-	✓	-	✓	✓	✓	✓	-	-	✓	-	✓	-	-	-
Green turtle BIAs	-	✓	-	✓	✓	✓	✓	-	-	✓	-	✓	-	-	-
Hawksbill turtle BIAs	-	✓	-	✓	✓	✓	✓	-	-	✓	-	✓	-	-	-
Loggerhead turtle BIAs	-	✓	-	✓	✓	✓	✓	-	-	✓	-	✓	-	-	-
Brown booby BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Greater frigatebird BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Lesser crested tern BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Lesser frigatebird BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Little tern BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Red footed booby BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Roseate tern BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-

Receptor	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	SMP: Water quality impact assessment	SMP: Sediment quality impact assessment	SMP: Intertidal and coastal habitat assessment	SMP: Seabirds and shorebirds	SMP: Marine megafauna assessment- reptiles	SMP: Marine megafauna assessment- whale sharks, dugong and cetacean	SMP: Benthic habitat assessment	SMP: Marine fish and elasmobranch assemblages assessment	SMP: Fisheries impact assessment	SMP: Heritage and social impact assessment
Wedge-tailed shearwater BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
White-tailed tropicbird BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Bridled tern BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-
Crested tern BIA	-	✓	-	✓	✓	✓	✓	-	✓	-	-	-	-	-	-

Key	
✓	It is highly likely that the initiation criteria would be met for the relevant OMP/SMP
⦿	It is possible that the initiation criteria may or may not be met for the relevant OMP/SMP
-	Not applicable

Appendix C: Background information for key sensitivities

Table C-1: Background information for key sensitivities and receptors predicted to be contacted within 14 days, at a probability >5%

Receptor	Sensitivity	Background	Key locations	Seasonality
Argo-Rowley Terrace AMP	Benthic habitat	The marine park contains ecosystems typical of two provincial settings: the Northwest Transition, with shelf break, continental slope, and much of the Argo Abyssal Plain, where Mermaid, Clerke, and Imperieuse Reefs form a biodiversity hotspot; and the Timor Province, dominated by warm, nutrient-poor waters in which submarine canyons are key drivers of productivity and marine life aggregations (Parks Australia n.d. [a]).	-	-
	Birds	Biologically important resting and breeding habitat for seabirds.	-	-
	Marine mammals	Migratory pathway for pygmy blue whales (*Balaenoptera musculus brevicauda*). The marine park contains submarine canyons that link the deep Argo Abyssal Plain with the shallower Rowley Terrace and Scott Plateau. These canyons transport sediments downslope and modify currents, creating periodic upwelling that increases surface-water productivity and provides important habitat for the pygmy blue whale.	-	April to December
Ashmore Reef and AMP	Turtle	Genetically distinct populations of green turtles (*Chelonia mydas*) occur at Ashmore Reef and Cartier Island, with both sites supporting important nesting and inter-nesting habitat (Commonwealth of Australia 2017). Incidental hawksbill nesting has been recorded (Whiting and Guinea 2005). Loggerhead turtles are usually temperate nesters, although a verified nesting record exists for Ashmore Reef (Whiting and Guinea 2005).	-	-
	Sea snake	Ashmore Reef was historically a global hotspot for sea snakes, including leaf-scaled (*Aipysurus foliosquama*) and short-nosed (*A. apraefrontalis*). Dedicated surveys documented severe declines, with no sightings of these two species at Ashmore or nearby Hibernia after 2001, and Reef Life Survey expeditions in 2012 and 2017–2018 likewise reported no sea	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		snakes at Ashmore sites (Lukoschek et al. 2013; Edgar et al. 2020). In April 2021, during mesophotic reef exploration that used a ROV for deep-reef research, a short-nosed sea snake was incidentally observed at 67 m depth at Ashmore Reef, one of four sea snake species recorded on that expedition. This suggests deeper habitats may act as refuges for species now rare or absent in the shallows, although many historically recorded species remain undetected (AIMS 2021).		
	Marine mammals	Aerial and opportunistic surveys in the 1990s documented dugongs (*Dugong dugon*), including cow and calf pairs, at Ashmore Reef, indicating a small resident population associated with local seagrass meadows (Whiting 1999). Dedicated dugong surveys at Ashmore have been limited and knowledge gaps remain; in 2019, seagrass assessments recorded heavy grazing consistent with foraging by dugongs and green turtles (*Chelonia mydas*) (Keesing et al. 2021).	-	-
	Birds	Ashmore Reef Marine Park is one of Australia's most important tropical seabird and shorebird sites, supporting ~100,000 breeding seabirds in a typical year with at least 16 breeding seabird species and four heron/egret species, with peak breeding from April; major colonies include sooty tern (*Onychoprion fuscatus*), common noddy (*Anous stolidus*), brown booby (*Sula leucogaster*), plus masked booby (*Sula dactylatra*), red-footed booby (*Sula sula*), lesser frigatebird (*Fregata ariel*), great frigatebird (*F. minor*), red-tailed tropicbird (*Phaethon rubricauda*), white-tailed tropicbird (*P. lepturus*) and wedge-tailed shearwater (*Ardenna pacifica*); breeding herons include eastern reef egret (*Egretta sacra*), with occasional little egret (*E. garzetta*), great egret (*Ardea alba*) and nankeen night-heron (*Nycticorax caledonicus*); the reef is also a key non-breeding and stopover site on the East Asian–Australasian Flyway, where ≥7 shorebird species regularly exceed the 1% population threshold (e.g., sanderling [*Calidris alba*], grey plover [*Pluvialis squatarola*, grey-tailed tattler [*Tringa brevipes*], ruddy turnstone [*Arenaria interpres*], greater sand plover [*Charadrius leschenaultii*]), and its near-colony waters qualify as a Marine IBA for lesser frigatebird and	-	Peak breeding from April

Receptor	Sensitivity	Background	Key locations	Seasonality
		brown booby (Parks Australia n.d[b].; Clarke and Carter, 2011; BirdLife International, n.d.).		
Barracouta Shoal	Benthic	Barracouta Shoal is a submerged carbonate bank rising to ~20–40 m, with ubiquitous Halimeda (calcareous green algae; [*Halimeda* spp.]) across the plateau, interspersed with patchy but sometimes dense live coral, rubble fields with rhodoliths, low-relief consolidated reef, and sand patches, plus a large soft-coral field (provisional *Nephthea* sp.) on the western margin (Heyward et al. 2010). A dedicated dataset provides point-score coral estimates from 2010, 2011, 2013 and 2016 still imagery on Barracouta (Heyward et al. 2017).	-	-
	Fish	Stereo-BRUVS surveys recorded rich fish assemblages on these shoals. At Barracouta East, 122 species occurred on ≥5% of samples across years (2011–2016). Assemblages featured emperors (e.g., yellowtail emperor [*Lethrinus atkinsoni*], spot-cheek emperor [*Lethrinus rubrioperculatus*]), red bass [*Lutjanus bohar*], white-margined coronation trout [*Variola albimarginata*], redtooth triggerfish [*Odonus niger*], yellow-spotted tilefish [*Hoplolatilus cuniculus*], and surgeonfishes such as lined bristletooth [*Ctenochaetus striatus*] (Heyward et al. 2017). Higher hard-coral cover generally aligned with higher richness/abundance in model results (Heyward et al. 2017).	-	-
Browse Island	Birds	Historically renowned for guano and immense seabird numbers, Browse Island's breeding colonies collapsed following late 19th and early 20th century guano extraction and the introduction of invasive mammals (cats and the Asian house mouse). Strategically located between Ashmore Reef and Adele Island off the Kimberley's northwest coast, Browse Island forms a connective link among the region's major seabird breeding hubs, which also include the Lacepede Islands (Moro et al. 2019). During a DBCA expedition in August 2018, observers recorded brown boobies (*Sula leucogaster*) roosting in large numbers (up to about 200 birds at dusk), bridled terns (*Onychoprion anaethetus*) exhibiting	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		breeding behaviour with a chick confirmed (the first modern record), and regular presence of		
	Turtle	The green turtle population (*Chelonia mydas*) nesting on Sandy Islet (Scott Reef) and Browse Island is a genetically distinct unit (Commonwealth of Australia 2017).	-	-
	Marine mammals	Resident bottlenose dolphin groups (*Tursiops* spp.) occur at Browse Island, the Rowley Shoals, and other offshore island and reef complexes in the North-west Marine Region (Department of Sustainability, Environment, Water, Population and Communities 2012).	-	-
Cartier Island and AMP	Birds	Several species, including the Pacific reef heron (*Egretta sacra*), brown booby (*Sula leucogaster*), ruddy turnstone (*Arenaria interpres*) and crested tern (*Thalasseus bergii*), are regular visitors to Cartier Island and Cartier Reef (Clarke et al. 2017). The crested tern is known to breed on the island in small numbers (Clarke et al. 2017). During high tides, the Island provides the only available land within this reef for roosting birds. At lower tides, reef-flats provide additional resting and foraging substrates for species such as egrets and shorebirds (Clarke et al. 2017). The waters of the Cartier AMP are considered important foraging grounds for the internationally significant numbers of seabird species that breed on Ashmore Reef (Clarke et al. 2017). A total of 34 species of birds have been recorded from the Cartier Island AMP (Clarke et al. 2017).	-	-
	Turtle	Genetically distinct populations of green turtles (*Chelonia mydas*) occur at Ashmore Reef and Cartier Island, with both sites supporting important nesting and inter-nesting habitat (Commonwealth of Australia 2017). The most recent publicly documented nesting reports for Cartier Island are from the Montara Environmental Monitoring Program's turtle and sea-snake surveys in 2012–2013, which confirmed green turtle (*Chelonia mydas*) nesting on the island (Guinea 2013).	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
	Sea snake	Historically, high abundance and diversity of sea snakes (Guinea 2013).	-	-
	Marine mammal	The Ashmore Reef National Nature Reserve supports a small population of dugong (*Dugong dugon*) and their range possibly extends to Cartier Island (Whiting 1999). Cartier Island lies in the vicinity of the pygmy blue whale (*Balaenoptera musculus brevicauda*) distribution and migration BIA.	-	-
Echuca Shoal	Benthic	Across 2014–2016, macroalgae dominated benthic cover on Echuca (mean algal cover ~42–45% depending on year), with rhodoliths, *Halimeda* (calcified green algae; [*Halimeda* spp.]), soft corals (octocorals), hard corals, and sand forming the other principal categories (AIMS 2017a). Deeper (30–60 m) mesophotic zones had relatively more *Halimeda*, free-living corals (e.g., *Fungia* spp.), massive corals, and non-Acropora branching corals, and were compositionally distinct from the shallow plateau (AIMS 2017a). Multibeam mapping and imagery from AIMS have been used to resolve Echuca's 3-D shape and habitat mosaics that support these assemblages (AIMS 2018).	-	-
	Fish	Echuca supports a diverse reef-associated fish fauna. Pooled stereo-BRUVS across Echuca and nearby Heywood over four visits (2011, 2014–2016) recorded 45,142 individuals from 439 species in 165 genera and 55 families: fishes, sharks, rays and sea snakes inclusive, values comparable to other NW Shelf shoals and Great Barrier Reef features (AIMS 2017a). Named examples prominent in analyses include red bass (*Lutjanus bohar)*, Ambon emperor (*Lethrinus amboinensis*), longnose emperor (*L. olivaceus*), spot-cheeked emperor (*L. rubrioperculatus*), yellowtail emperor *(L. atkinsoni*), and white-margined coronation trout (*Variola albimarginata*) (AIMS 2017a).	-	-
	Sea snake	Targeted work found sea snakes on mid-shelf Kimberley shoals, including Echuca: ringed sea snake (*Emydocephalus annulatus*) was recorded at Echuca (two individuals) during surveys; other species were found on adjacent shoals in the same cluster (*Aipysurus laevis*, *Aipysurus duboisii*),	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		highlighting suitability of these shoal habitats for sea snakes (Moore and Richards 2015).		
Eugene McDermott Shoal	Benthic	Targeted octocoral surveys at Station 147 on the shoal (20 m) describe it as a wave- and current-swept isolated shoal with mostly bare rock, coarse coralline sand and rubble, and small to medium rocky outcrops, a hard-rock foundation with generally low coral cover (Bryce et al. 2014).	-	-
	Fish	Stereo-BRUVS were deployed on Eugene McDermott as part of the Montara offshore banks and shoals program, documenting diverse reef-associated fish assemblages typical of NW Shelf shoals (AIMS/Research Data Australia n.d.).	-	-
Goeree Shoal	Benthic	Surveyed depths on the shoal plateau are broadly 20–45 m, steepening to shoal sides by about 60 m. Habitats are a mosaic of calcareous reef pavement, sand and rubble with patchy biota. Across the three Montara shoals re-surveyed in 2011 and 2013, Goeree's benthos was dominated by algal cover and abiotic substrates, with living cover from hard corals, soft corals, sponges, ascidians and occasional seagrass also present. (AIMS 2013).	-	-
	Fish	BRUVS surveys at Goeree documented a diverse demersal fish assemblage typical of outer-shelf shoals. Key and abundant taxa included emperors such as *Lethrinus rubrioperculatus*, *L. atkinsoni*, *L. amboinensis and L. olivaceus*, red bass (*Lutjanus bohar*), and white-margined coronation trout (*Variola albimarginata*). Across 2011, 2013 and 2016, species richness remained high, with 100+ species recorded in at least 5 percent of samples at individual shoals. Fish richness and abundance were positively related to hard coral cover (AIMS 2017a).	-	-
	Sea snake	Sea snakes were detected on BRUVS at Goeree. Counts across the three Montara shoals dropped from 50 individuals in 2011 to 6 in 2013, with Goeree recording 8 sea snakes in 2011 and 1 in 2013 (AIMS 2013; AIMS 2017a).	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
Heywood Shoal	Benthic	Heywood Shoal has a broad plateau in about 15–30 m water depth with margins sloping to about 40–60 m. Substrates are a mix of sand, rubble and generally low-relief consolidated reef that support benthic primary producers to roughly 50–60 m. Across 2014–2016, broad categories quantified from towed-video stills include hard corals, soft corals, *Halimeda*, rhodoliths and sand. Seagrass was not present at these shoals in ARP7 surveys (AIMS 2017b).	-	-
	Fish	Stereo-BRUVS recorded high fish richness and abundance, with assemblage structure strongly related to depth and hard-coral cover. Species highlighted in length-frequency analyses include red bass (*Lutjanus bohar*), Ambon emperor (*Lethrinus amboinensis*), longnose emperor (*Lethrinus olivaceus*), spot-cheek emperor (*Lethrinus rubrioperculatus*), yellowtail emperor (*Lethrinus atkinsoni*) and white-margined coronation trout (*Variola albimarginata*) (AIMS 2017a).	-	-
	Sea snakes	Olive sea snake (*Aipysurus laevis*) and turtle-headed sea snake (*Emydocephalus annulatus*) were observed at mid-shelf shoals including Heywood during dedicated searches (Moore and Richards 2015).	-	-
Johnson Bank	Benthic	Johnson Bank is one of several subtidal reefs, banks and shoals near Ashmore and Cartier. These shallow features support benthic primary producers including zooxanthellate corals and algae, with common habitats of bare sand and coral rubble that in turn support reef fishes and sea snakes (RPS 2013). Historical resource surveys classify Johnson Bank as a substantial shoal area of about 137 km² within the MOU74 Box, with hard-bottom patches in places (CSIRO Marine Research 1999).	-	-
Kimberley AMP	Fish	Across soft-sediment plains and rocky reefs, the park supports slope demersal fish assemblages among the most diverse in Australia (Australian Marine Parks, n.d.; Seamap Australia, n.d.).	-	-
	Birds	Adele Island is surrounded by the marine park and supports large breeding and foraging assemblages of seabirds and shorebirds; species that breed on the island also forage within the park, including the	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		critically endangered eastern curlew (*Numenius madagascariensis*) and curlew sandpiper (*Calidris ferruginea*) (Australian Marine Parks, n.d.).		
	Marine mammals	The park is described as a hotspot for marine mammals, including dugong (*Dugong dugon*), dolphins and whales (Australian Marine Parks, n.d.). Humpback whales (*Megaptera novaeangliae*) breed and calve in these waters, with the park overlapping their migration and breeding habitat (Australian Marine Parks, n.d). Three dolphins use the park to feed and transit to coastal nursery grounds: Australian snubfin dolphin (*Orcaella heinsohni*), Indo-Pacific humpback dolphin (*Sousa chinensis*), and spotted bottlenose dolphin (*Tursiops aduncus*) (Australian Marine Parks, n.d.). Regional aerial surveys integrating Indigenous knowledge estimate approximately 12,600 dugongs in Kimberley coastal waters, establishing a baseline for management of *D. dugon* (Bayliss and Hutton 2017).	-	-
Northern Kimberley (including Cape Bougainville and nearby islands)	Benthic	Between 2009 and 2014, surveys at 177 stations (<30 m) across the Kimberley recorded 296 species of benthic algae and seagrasses, with inshore sites showing the highest diversity; collections include many green, brown and red algal taxa (e.g., *Halimeda*, *Caulerpa*, *Sargassum*) and four seagrass species (Magnoliophyta) spread across inshore locations (Huisman et al. 2021). Key outcome: a region-scale, specimen-based baseline for benthic primary producers that underpins later habitat work (Huisman et al. 2021). Synthesising six years of shallow surveys at 0 to 15 m depth on Kimberley reefs and islands, the Western Australian Museum reported that hard corals were the dominant live benthos with mean cover of 23.81 percent ± 1.28 percent, and documented clear inshore to offshore and intertidal to subtidal gradients in community structure across sites including Adele Island, Montgomery Reef, Long Reef and Cassini Island (Richards et al. 2018).	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
	Intertidal	In 2017, AIMS and WAMSI ran intertidal and shallow-subtidal drop-camera surveys from Eclipse Archipelago through Cape Bougainville and Cape Voltaire to island chains in the North Lalang-garram Marine Park, documenting that macroalgae often dominate inner to mid reef flats while coral diversity and cover rise towards outer reef flats and crests. The work included multiple coastal islands and ria-coast shorelines, with explicit intertidal observations and mapping intended to support marine-park management (Heywood et al. 2018).	-	-
	Fish	AIMS, UWA and partner agencies, working with Bardi Jawi Rangers, completed eight field trips from March 2015 to March 2016 across mangroves, seagrass, intertidal pools and fringing reef habitats around Cygnet Bay and the Sunday Island group at the mouth of King Sound, using unbaited stereo-RUVs to quantify recruitment; 125 species were recorded, recruitment peaked in the wet season, and mangroves and seagrass were identified as critical nurseries for culturally important taxa including juvenile *Lutjanus argentimaculatus* and the herbivore *Siganus lineatus* (Depczynski et al. 2017). The Western Australian Museum synthesised 2009 to 2014 shallow-water surveys using underwater visual census and extractive methods to build the first species-by-site table for more than 134 locations across the Kimberley, including island groups such as Adele, Long Reef, Cassini, Bigge and the Bonaparte Archipelago, and reported a reference dataset of 1,529 fish species with new distributional records that included rays like Pastinachus ater and *Aetomylaeus vespertilio*; the work highlights strong inshore to offshore differences relevant to island and coastal habitats north of Derby (Moore et al. 2020).	-	-
	Turtle	DBCA and WAMSI, with Traditional Owner ranger groups, established a region-wide baseline for nesting turtles across the Kimberley using aerial surveys and on-ground verification in 2013–2016, modelling sand temperatures and sex ratios at focal rookeries including Cape Domett,	Cape Domett, Cassini Island, West Governor Island	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		Cassini Island, West Governor Island, Eighty Mile Beach and the Lacepede Islands; this documented winter nesting by flatback (*Natator depressus*) at Cape Domett, summer nesting by green turtles (*Chelonia mydas*) on several islands, and no nesting by loggerhead (*Caretta caretta*) or leatherback (*Dermochelys coriacea*) in the Kimberley (Whiting et al. 2018). A follow-on study integrated Traditional Ecological Knowledge with aerial photogrammetry of nesting tracks in summer and winter to rank hotspots, confirming Cape Domett as the highest-density winter flatback rookery and identifying moderate to lower density nesting across North Kimberley islands including Maret, Cassini, Parry and Sir Graham Moore, with summer-peaking green turtle nesting and rarer, irregular nesting by hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*) verified by ranger observations (Tucker et al. 2021).		
	Crocodile	A peer-reviewed synthesis of Kimberley coastal habitats and survey records reported that saltwater crocodile (*Crocodylus porosus*) occur throughout the major river systems and coastal waterways of the Kimberley, with the largest populations in Cambridge Gulf and the Prince Regent and Roe systems, much lower densities in King Sound, and generally limited nesting along the rocky, archipelagic coast where narrow ravines and island-lined embayments constrain floodplain development; the study illustrated habitat contrasts for Yampi Sound opposite Cockatoo Island and for mangrove-filled deltas and creeks across islands and gulfs (Semeniuk et al. 2011).	Cambridge Gulf and the Prince Regent and Roe systems	-
	Sea snake	In 2016, a team from AIMS, JCU and the WA Department of Fisheries analysed 2,290 BRUVS deployments made between 1999 and 2016 across the North-west Marine Region to map sea-snake occurrence, with explicit coverage of the Kimberley coast and its mid-shelf and oceanic shoals; modelling of presence/absence showed that the Kimberley's coastal and mid-shelf areas are likely to support important habitats for sea snakes, highlighting the region for priority surveys and noting habitat associations for taxa including *Aipysurus apraefrontalis*,	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		Aipysurus foliosquama, *Aipysurus fuscus* and *Hydrophis* spp. (Udyawer et al. 2016).		
	Birds	DEC (now DBCA) and the Western Australian Museum undertook opportunistic but standardised island bird surveys across 24 large Kimberley islands from 2007–2010, spanning the Bougainville, Bonaparte and Buccaneer archipelagos; the compilation provides island-by-island species inventories and confirms widespread use of offshore islands by breeding seabirds and roosting shorebirds, informing management of colony islands and biosecurity priorities (Pearson, Cowan and Caton 2013).	-	-
	Marine mammals	In September to October 2015, CSIRO and DBCA with Indigenous ranger partners flew fixed-wing transects from the shoreline to the 20 m isobath across the North Kimberley's island-fringed waters and estimated dugong (*Dugong dugon*) abundance at 9,734 ± 483 with a density of 0.29 km^{-2}, with highest densities aligned with mapped seagrass and calves recorded widely; when the adjacent Dampier Peninsula block flown in 2009 is included as part of the North Kimberley roll-up, the regional total is 10,513 ± 497. In 2016, a pilot satellite-tagging study showed dugongs (*Dugong dugon*) can move rapidly among island-lined embayments, supporting management that integrates Traditional Ecological Knowledge with movement and habitat data. Incidental aerial sightings also logged Australian snubfin dolphin (*Orcaella heinsohni*) and marine turtles including green turtle (*Chelonia mydas*) (Bayliss and Hutton 2017; Bayliss, Hutton and Anstee 2017). AIMS, the Centre for Whale Research, DBCA and Curtin collated aerial, vessel and satellite-tag datasets from 2008–2013 and modelled humpback whale (*Megaptera novaeangliae*) use of nearshore Kimberley waters; the study confirmed Lalang-garram/Camden Sound as the primary breeding and calving area, found lower whale densities	Humpback whale: Lalang-garram/Camden Sound the primary breeding and calving area	Humpback whale peak presence in Lalang-garram/Camden Sound: late July through August

Receptor	Sensitivity	Background	Key locations	Seasonality
		north of Camden Sound, and showed cow–calf groups occur closer to shore (Thums et al. 2018). Boat-based surveys, photo-ID, genetics and passive acoustics were conducted at Cone Bay (2014–2015), Cambridge Gulf (August 2016), and the Rothsay Water–Prince Regent River–St George Basin area (September 2016), with additional passive acoustic monitoring at Cygnet Bay (2014, 2015). Australian snubfin dolphin (*Orcaella heinsohni*) and Australian humpback dolphin (*Sousa sahulensis*) were recorded at all sites, and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) was found in parts of the Prince Regent River. Encounter-rate maps included islands such as Lacrosse Island and Uwins Island. Genetics showed low gene flow between some bays (Cygnet Bay versus Roebuck Bay), while adjacent sites such as Cygnet Bay and Cone Bay were not differentiated. The study provides site-specific encounter rates and a recommended repeat-survey route for future monitoring (Brown et al. 2017).		
Oceanic Shoals AMP	Benthic	Submerged carbonate banks, terraces and pinnacles support exceptionally rich sponge gardens, with ~350 species recorded and up to ~900 species predicted from surveys and modelling (Przeslawski et al. 2015; Parks Australia 2025; AIMS 2015). Mesophotic hard-coral communities grow to ~60–70 m depth on the shoals; AIMS reported several IUCN-listed hard-coral species (Near Threatened to Endangered) in the western park area (AIMS 2015; AIMS 2017c).	Sponge assemblages are most diverse on raised geomorphic features (banks, ridges, terraces) and differ from surrounding plains/valleys, important for park zoning and monitoring (Przeslawski et al. 2015).	

Receptor	Sensitivity	Background	Key locations	Seasonality
	Fish	Remote surveys of north-west oceanic shoals (including sites in the Oceanic Shoals region) found 341 fish species from 47 families and concluded these shoals host the highest mesophotic reef fish diversity recorded globally (AIMS 2017c). Enhanced productivity from local upwellings likely helps sustain these assemblages (AIMS 2017c). Species of conservation interest recorded in the wider region include humphead wrasse (*Cheilinus undulatus*) (AIMS, 2017). The same surveys documented 10 shark species on the oceanic shoals, including greater hammerhead (*Sphyrna mokarran*) among species of conservation concern in the region (AIMS 2017c).	-	-
	Turtle	The park provides important resting and feeding areas for breeding marine turtles, notably flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*), and loggerhead (*Caretta caretta*) (Parks Australia 2025; AIMS 2015).	-	-
	Sea snake	Sea snakes (Hydrophiinae) are a characteristic part of the shoals fauna; the oceanic-shoals fish surveys recorded two sea-snake species (AIMS 2017c).	-	-
	Birds	The park includes the Pinnacles of the Bonaparte Basin, where nutrient-rich upwellings attract aggregations of fish and seabirds, a key ecological feature recognised by managers (Parks Australia 2025).	-	-
	Marine mammals	Confirmed cetacean records from western Oceanic Shoals include orca (*Orcinus orca*) among pelagic visitors (AIMS 2015).	-	-
Sahul Bank	Benthic	Sahul Bank is part of a complex system of carbonate banks, terraces and channels on the Sahul Shelf. These banks rise steeply from ~200–300 m to tens of metres below sea level and provide hard substrate for rich epibenthic communities, including sponge gardens and octocorals, with soft-sediment flanks supporting different assemblages. This carbonate bank and terrace system is a Key Ecological Feature noted for	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
		enhanced biodiversity and productivity relative to surrounding seabeds. (AIMS n.d.; DCCEEW KEF n.d.)		
Seringapatam Reef	Benthic	A rapid coral assessment recorded 159 scleractinian species at Seringapatam from 57 genera, with distinct assemblages across reef front, lagoon and reef-flat habitats (McKinney 2009). A quantitative sponge survey across Mermaid, Scott and Seringapatam recorded 132 sponge species from four habitats (fore-reef slope, channels, lagoon and intertidal flats) (Fromont and Vanderklift 2009). Marine flora surveys of the shelf-edge atolls recorded several seagrasses. *Halophila decipiens* was confirmed by video at Scott and Seringapatam and occurs in deeper water; overall, offshore atolls support patchy, generally sparse seagrass relative to inshore Kimberley banks (Huisman et al. 2009).	-	-
	Fish	Historical and contemporary surveys across Rowley Shoals–Scott–Seringapatam list a rich fish fauna. The foundational WA Museum survey listed hundreds of species for Rowley Shoals and Scott–Seringapatam (Allen and Russell 1986). Later work added new records from the area, including reef sharks and large rays. Examples noted for the complex include silvertip shark (*Carcharhinus albimarginatus*), whitetip reef shark (*Triaenodon obesus*), potato cod (*Epinephelus tukula*), and manta ray (*Manta birostris*, now *Mobula birostris*) (Hutchins et al. 1995; Morrison 2009).	-	-
	Sea snake	Targeted surveys in 2012–2013 found Seringapatam had the highest sea snake density among surveyed Sahul Shelf reefs, with an average of 4.44 individuals per hectare. Species recorded at Seringapatam included olive sea snake (*Aipysurus laevis*), dusky sea snake complex (*Aipysurus fuscus sensu lato*), turtle-headed sea snake *(Emydocephalus annulatus*) and Dubois' sea snake (*Aipysurus duboisii*) (Guinea 2013).	-	-
	Turtle	Foraging green turtles (*Chelonia mydas*) and hawksbills (*Eretmochelys imbricata*) are common regionally on Sahul Shelf reefs (Guinea 2013).	-	-

Receptor	Sensitivity	Background	Key locations	Seasonality
	Cetacean	Scott and Seringapatam Reefs are mapped as a Key Ecological Feature that attracts aggregations of cetaceans including humpback whale (*Megaptera novaeangliae*), Bryde's whale (*Balaenoptera edeni*), pygmy blue whale (*Balaenoptera musculus brevicauda*), Antarctic and dwarf minke whales (*Balaenoptera bonaerensis*, *Balaenoptera acutorostrata*), dwarf sperm whale (*Kogia sima*) and spinner dolphin (*Stenella longirostris*) (Department of the Environment 2011).	-	-
Scott Reef	Turtle	Two species nest on Sandy Islet, green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*) with inter-nesting and foraging also occurring in adjacent waters (Guinea 2006). The green turtles are a discrete genetic unit known to only nest on Sandy Islet and Browse Island (Commonwealth of Australia 2017).	Sandy Islet	Summer nesting season; late Nov–Feb
	Sea snake	National Environmental Science Program (NESP) Marine Biodiversity Hub technical report by Udyawer et al. (2016) synthesised data on sea snake occurrence, abundance, and distribution across the North West Marine Region (including Scott Reef) using baited remote underwater video stations (BRUVS) and fisheries-independent trawl records from 1999-2016. Declines in sea snake populations have occurred at Ashmore, Hibernia, and Scott Reef. The extent and underlying causes of sea snake declines are unknown.	-	-
	Marine mammals	AIMS aerial, satellite and acoustic monitoring shows humpback whales (*Megaptera novaeangliae*) migrating along the shelf; some groups (including cows with calves) enter Scott Reef's lagoon/adjacent waters. Pygmy blue whales (*Balaenoptera musculus brevicauda*) pass mainly west of the reefs, with acoustic detections and occasional visual sightings. AIMS also reports >3,000 dolphins sighted in 2008 and at least 10 species overall, dominated by spinner dolphins (*Stenella longirostris*), with regular bottlenose dolphins (*Tursiops* spp.) and short-beaked common dolphins (*Delphinus delphis*), plus pilot whales (*Globicephala* spp.) and false killer whales (*Pseudorca crassidens*) (Gilmour et al. 2013).	-	Humpback whales migrating along the shelf Jun–Oct Pygmy blue whales southbound Oct–Jan, northbound Apr–Aug

Receptor	Sensitivity	Background	Key locations	Seasonality
Vulcan Shoal	Benthic	The shoal rises steeply from roughly 100–200 m to a plateau around 40–50 m depth. Substrates include calcareous reef, rubble and sand. Dense meadows recorded in 2010 included strap seagrass (*Thalassodendron ciliatum*) and other low-density seagrasses. Quantitative analyses show seagrass at Vulcan declined from 2010 to 2011 and was essentially absent by 2013; synthesis estimates indicate ~29 percent cover in 2010, ~18 percent in 2011, ~4 percent in 2013 and ~3 percent in 2016 (AIMS 2010; AIMS 2013; eAtlas 2018). By 2011 and 2013 the benthic community shifted toward higher macroalgal and sand/silt cover, with sponges and soft corals generally declining from 2011 to 2013 (AIMS 2010; AIMS 2013).		
	Fish	Stereo-BRUVS across Barracouta East, Goeree and Vulcan recorded 6,692 fishes and sharks from 262 species in 2013; emperors and other demersal taxa were prominent. Key species analysed across years included spot-cheek emperor (*Lethrinus rubrioperculatus*), yellowtail emperor (*Lethrinus atkinsoni*), Ambon emperor (*Lethrinus amboinensis*), longnose emperor (*Lethrinus olivaceus*), red bass (*Lutjanus bohar*) and white-margined coronation trout (*Variola albimarginata*). Length distributions and richness/abundance were reported by shoal and year, including Vulcan (AIMS 2013; AIMS 2017a).	-	-
	Sea snake	Sea snakes were recorded at Vulcan. Counts declined from 22 sightings in 2011 to 4 in 2013 at Vulcan (0.92 to 0.17 snakes per deployment); species recorded in the dataset include olive sea snake (*Aipysurus laevis*) (AIMS 2013).	-	-
Woodbine Bank		Woodbine Bank is a mid-shelf shoal within the MOU74 Box. CSIRO habitat mapping shows Woodbine's seabed is dominated by soft sediments (notably Halimeda sand), with patches of rubble, rock, boulders and discrete areas of reef/coral; on the northern shoals these reef patches tend to occur on southern margins (CSIRO Marine Research 1999).	-	-

Baseline References:

Australian Institute of Marine Science (AIMS) (n.d.) Big Bank Shoals of the Timor Sea. Australian Institute of Marine Science. Available at: https://www.aims.gov.au/research-topics/monitoring-and-discovery/mapping/big-bank-shoals-timor-sea

Australian Institute of Marine Science (AIMS) (2010) Montara surveys Initial field report and data assessment of Barracouta and Vulcan Shoals. Australian Institute of Marine Science for PTTEP Australasia. Available at: https://www.dcceew.gov.au/sites/default/files/env/pages/bcefac9b-ebc5-4013-9c88-a356280c202c/files/banks-shoals-report.pdf

Australian Institute of Marine Science (AIMS) (2013) Montara: Barracouta East, Goeree and Vulcan Shoals Survey 2013. Australian Institute of Marine Science for PTTEP Australasia. Available at: https://www.dcceew.gov.au/sites/default/files/env/pages/bcefac9b-ebc5-4013-9c88-a356280c202c/files/2013-offshore-banks-assessment-survey.pdf

Australian Institute of Marine Science (AIMS) (2015) "Voyage of discovery" yields hotspot of diversity and new species. AIMS News & Stories. Available at: https://www.aims.gov.au/information-centre/news-and-stories/voyage-discovery-yields-hotspot-diversity-and-new-species

Australian Institute of Marine Science (AIMS) (2017a) The Barracouta, Goeree and Vulcan Shoals Survey 2016. Australian Institute of Marine Science for PTTEP Australasia. Available at: https://maps.northwestatlas.org/files/montara/AIMS_PTTEP_Montara4ShoalsReport_RevA.pdf

Australian Institute of Marine Science (AIMS) (2017b) ARP7: Subtidal Benthos – towards benthic baselines in the Browse Basin. Final Report – Submerged Shoals 2017. Australian Institute of Marine Science for Shell/INPEX. Available at: https://www.shell.com.au/sustainability/environment/_jcr_content/root/main/section/call_to_action_1691531940/links/item2.stream/1696490812044/5b952cfd055c913701a6a797c9de5befdf20ea8c/arp7-subtidal-benthos-towards-benthic-baselines-in-the-browse-basin.pdf

Australian Institute of Marine Science (AIMS) (2017c) Exceptional fish diversity found on Australia's north-west oceanic shoals. AIMS News & Stories. Available at: https://www.aims.gov.au/information-centre/news-and-stories/exceptional-fish-diversity-found-australias-north-west-oceanic-shoals

Australian Institute of Marine Science (AIMS) (2018) Multibeam technology helping Australian scientists understand seafloor. Australian Institute of Marine Science. Available at: https://www.aims.gov.au/information-centre/news-and-stories/multibeam-technology-helping-australian-scientists-understand-seafloor

Australian Institute of Marine Science (AIMS) (2021) "Thought to be lost forever": locally extinct sea snake re-discovered during deep-sea expedition. Australian Institute of Marine Science, 21 April 2021. Accessed 12 August 2025: Available at: https://www.aims.gov.au/information-centre/news-and-stories/thought-be-lost-forever-locally-extinct-sea-snake-re-discovered-during-deep-sea-expedition

Australian Marine Parks. n.d. Kimberley Marine Park. Parks Australia. Available at: https://australianmarineparks.gov.au/parks/north-west-marine-parks-network/kimberley-marine-park/

Bayliss P, Hutton M, Anstee J (2017) WAMSI 2 Kimberley Node: Project 1.2.5 Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (Dugong dugon) management in the Kimberley. CSIRO Data Collection. Available at: https://doi.org/10.4225/08/5a17c7eedffaa

BirdLife International (n.d.) Ashmore Reef – Marine IBA factsheet. Available at: https://datazone.birdlife.org/site/factsheet/ashmore-reef

Brown AM, Smith J, Salgado Kent C, Marley S, Allen SJ, Thiele D, Bejder L, Erbe C, Chabanne D (2017) Relative abundance, population genetic structure and passive acoustic monitoring of Australian snubfin and humpback dolphins in regions within the Kimberley. WAMSI Kimberley Marine Research Program Final Report 1.2.4. Western Australian Marine Science Institution, Perth. Available at: https://wamsi.org.au/wp-content/uploads/2019/03/Final-Report-Relative-abundance-population-genetic-structure-and-acoustic-monitoring-of-Australian-snubfin-and-humpback-dolphins-in-regions-within-the-Kimberley_WAMSI-KMRP-Report-1_2_4_Brown-et-al-2017_FINAL.pdf

Clarke R H and Carter M (2011) The status of breeding seabirds and herons at Ashmore Reef, off the Kimberley coast, Australia. Journal of the Royal Society of Western Australia. Available at: https://ia803209.us.archive.org/20/items/biostor-256339/biostor-256339.pdf

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

Commonwealth of Australia (2017) Recovery Plan for Marine Turtles in Australia 2017–2027. Australian Government, Canberra. Available at: https://www.dcceew.gov.au/environment/marine/marine-species/marine-turtles/recovery-plan-marine-turtles-australia-2017

Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine Research (1999) Survey and Stock Size Estimates of the Shallow Reef 0–15 m and Shoal Area 15–50 m Marine Resources and Habitat Mapping within the Timor Sea MOU74 Box Volume 1 Stock Estimates and Stock Status. Available at: https://www.agriculture.gov.au/sites/default/files/documents/ashmore-marine-resources-1.pdf

Department of Climate Change, Energy, the Environment and Water (DCCEEW) KEF (n.d.) Key Ecological Feature: Carbonate banks and terrace system of the Sahul Shelf. Department of Climate Change, Energy, the Environment and Water. Available at: https://environment.gov.au/sprat-public/action/kef/view/3

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2012) Species group report card: Cetaceans. Supporting the marine bioregional plan for the North-west Marine Region. Australian Government, Canberra.

Depczynski M, Cure K, Holmes T, Moore G, Piggott C, Travers M, Wilson S, Oades D, McCarthy P, George K Snr, George K Jnr, Edgar Z, Howard A (2017) Key Ecological

Processes in Kimberley Benthic Communities: Fish Recruitment. WAMSI Kimberley Marine Research Program Final Report 1.1.2a. Western Australian Marine Science Institution, Perth. Available at: https://library.dbca.wa.gov.au/FullTextFiles/072404.pdf

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

eAtlas (2018) Updated synthesis What do we know about the North West Banks and Shoals. Australian Institute of Marine Science. Available at: https://eatlas.org.au/nwa/pttep/synthesis2

Edgar GJ, Mellin C, Turak E, Stuart-Smith RD, Cooper AT, Ceccarelli DM (2020) Reef Life Survey assessment of coral reef biodiversity in the North-west Marine Parks Network. Reef Life Survey Foundation Incorporated.

Fromont J and Vanderklift M A (2009) Porifera (sponges) of Mermaid, Scott and Seringapatam Reefs, north Western Australia. Records of the Western Australian Museum, Supplement 77: 89–103. Western Australian Museum. Available at: https://museum.wa.gov.au/sites/default/files/SuppWAMuseum_2009_77_89to103_FROMONTetal_0.pdf

Guinea M (2006) Sea turtles, sea snakes and dugongs of Scott Reef, Seringapatam Reef and Browse Island with notes on West Lacepede Island., Report submitted to the Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.

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

Heyward A, Moore C, Radford B and Colquhoun J (2010) Monitoring Program for the Montara Well Release, Timor Sea: Final Report on the Nature of Barracouta and Vulcan Shoals. Australian Institute of Marine Science for PTTEP Australasia. Available at: https://www.dcceew.gov.au/sites/default/files/env/pages/bcefac9b-ebc5-4013-9c88-a356280c202c/files/banks-shoals-report.pdf

Heyward A, Case M, Cappo M, Colquhoun J, Curry L, Fisher R, Radford B, Stowar M, Wakeford M and Wyatt M (2017) The Barracouta, Goeree and Vulcan Shoals Survey 2016 for PTTEP Australasia (Ashmore Cartier) Pty Ltd. Australian Institute of Marine Science. Available at: https://maps.northwestatlas.org/files/montara/AIMS_PTTEP_Montara4ShoalsReport_RevA.pdf

Heyward A, Stowar M, Wakeford M, Colquhoun J, Spagnol S, Radford B, Abdul Wahab MA, Richards Z (2018) Shallow coral habitat distributions across the offshore Kimberley region subproject 1.1.1.8 report prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 50pp. Available at: https://wamsi.org.au/wp-content/uploads/bsk-pdf-manager/2020/09/1_1_1_8-Shallow-coral-habitats-distribution-_Heyward-et-al_-2018-.pdf

Huisman J M, Leliaert F, Verbruggen H and Townsend R A (2009) Marine benthic plants of Western Australia's shelf-edge atolls. Records of the Western Australian

Museum, Supplement 77: 50–88. Western Australian Museum. Available at: https://museum.wa.gov.au/research/records-supplements/records/marine-benthic-plants-western-australia-s-shelf-edge-atolls

Huisman JM, Dixon RRM, Townsend RA, Belton GS (2021) Diversity and distribution of marine benthic algae and seagrasses in the tropical Kimberley, Western Australia. Records of the Western Australian Museum 85, 185–200. Available at: https://museum.wa.gov.au/sites/default/files/SuppWAMuseum_2021_85_185to200_HUISMANetal.pdf

Hutchins J B, Williams D M, Newman S J, Cappo M and Speare P (1995) New records of fishes for the Rowley Shoals and Scott/Seringapatam Reefs, off north-western Australia. Records of the Western Australian Museum 17: 119–123. Available at: https://museum.wa.gov.au/sites/default/files/NEW%20RECORDS%20OF%20FISHES%20FOR%20THE%20ROWLEY%20SHOALS%20AND%20SCOTTSERINGAPATAM%20REEFS%2C%20OFF%20NORTH-WESTERN%20AUSTRALIA.pdf

Keesing J, Thomson D, Haywood M, Babcock R, Doropoulos C, Bessey C; Tonks M, Westlake E, Miller M, Ceccarelli D, Hardiman L (2020) Child Ashmore Reef Marine Park Environmental Assessment 2019 - Marine. v1. CSIRO. Data Collection. https://doi.org/10.25919/0kfd-az26

Lukoschek V, Beger M, Ceccarelli D, Richards Z, Pratchett MS (2013) Enigmatic declines of Australia's sea snakes from a biodiversity hotspot. Biological Conservation 166:191–202.

McKinney D (2009) A survey of the scleractinian corals at Mermaid, Scott and Seringapatam Reefs, Western Australia. Records of the Western Australian Museum, Supplement 77: 105–143. Western Australian Museum. Available at: https://museum.wa.gov.au/sites/default/files/5.%20McKinney.pdf

Moore GI and Richards ZT (2015) New records of sea snakes at mid-shelf shoals of Australia's North West Shelf. Marine Biodiversity 45:595–596. Available at: https://link.springer.com/content/pdf/10.1007/s12526-014-0267-7.pdf

Moore G I, Morrison S M, Johnson J W (2020) The distribution of shallow marine fishes of the Kimberley, Western Australia, based on a long-term dataset and multiple methods. Records of the Western Australian Museum Supplement 85: 105–115. Available at: https://museum.wa.gov.au/sites/default/files/SuppWAMuseum_2020_85_105to115_MOOREetal.pdf

Moro D, Palmer R, Greatwich B, Dickinson R, Anderson H (2019) Browse Island: A journey to Western Australia's most remote nature reserve. Landscope 34(4):22–27. Department of Biodiversity, Conservation and Attractions, Perth. Accessed 15 August 2025. Available at: https://library.dbca.wa.gov.au/static/Journals/080052/080052-34.014.pdf

Morrison P F (2009) Subtidal habitats of Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reefs, Western Australia. Records of the Western Australian Museum, Supplement 77: 29–49. Western Australian Museum. Available at: https://museum.wa.gov.au/sites/default/files/2.%20Morrison.pdf

Parks Australia. (n.d. [a]). Values of the North-west Marine Parks Network. Australian Marine Parks. Accessed August 23, 2025. Available from:

https://australianmarineparks.gov.au/management/values/values-north-west-marine-parks-network/

Parks Australia (n.d. [b]) Ashmore Reef Marine Park. Australian Marine Parks. Available at: https://australianmarineparks.gov.au/parks/north-west-marine-parks-network/ashmore-reef-marine-park/

Pearson D J, Cowan M A, Caton W (2013) The avifauna of larger islands along the Kimberley coast, Western Australia. Records of the Western Australian Museum Supplement 81: 125–144. Available at: https://museum.wa.gov.au/research/records-supplements/records/avifauna-larger-islands-along-kimberley-coast-western-australia

Richards ZT, Bryce M, Bryce C (2018) The composition and structure of shallow benthic reef communities in the Kimberley, north-west Australia. Records of the Western Australian Museum Supplement 85, 75–103. Available at: https://museum.wa.gov.au/research/records-supplements/records/composition-and-structure-shallow-benthic-reef-communities-kimb

RPS (2013) Environment Plan Summary North Browse Semi-Regional Seabed Sampling Program. National Offshore Petroleum Safety and Environmental Management Authority. Available at: https://docs.nopsema.gov.au/A333630

Przeslawski R, Alvarez B, Kool J, Bridge T, Caley MJ and Nichol S (2015) Implications of sponge biodiversity patterns for the management of a marine reserve in northern Australia. PLOS ONE 10(11): e0141813. https://doi.org/10.1371/journal.pone.0141813

Seamap Australia. n.d. North-west > Kimberley. Available at: https://seamapaustralia.org/region-reports/north-west-kimberley/

Semeniuk V, Manolis C, Mawson PR, Webb GJW (2011) The saltwater crocodile, Crocodylus porosus Schneider, 1801, in the Kimberley coastal region. Journal of the Royal Society of Western Australia 94: 407–416. Available at: https://archive.org/download/biostor-256342/biostor-256342.pdf

Tucker AD, Pendoley KL, Murray K, Loewenthal G, Barber C, Denda J, Lincoln G, Mathews D, Oades D, Whiting SD, Balanggarra Rangers, Wunambal Gaambera Rangers, Dambimangari Rangers, Mayala Rangers, Bardi Jawi Rangers, Nyul Nyul Rangers, Yawuru Rangers, Karajarri Rangers, Nyangumarta Rangers, Ngarla Rangers (2021) Regional Ranking of Marine Turtle Nesting in Remote Western Australia by Integrating Traditional Ecological Knowledge and Remote Sensing. Remote Sensing 13: 4696. Available at: https://doi.org/10.3390/rs13224696

Thums M, Jenner C, Waples K, Salgado-Kent C, Meekan M (2018) Humpback whale use of the Kimberley: understanding and monitoring spatial distribution. WAMSI Kimberley Marine Research Program Report 1.2.1. Western Australian Marine Science Institution, Perth. Available at: https://wamsi.org.au/wp-content/uploads/bsk-pdf-manager/2019/07/Final-Report-WAMSI-KMRP-Whales-Humpback-Whale-Use-of-the-Kimberley-Thums-et-al.pdf

Udyawer V, D'Anastasi B, McAuley R, Heupel M (2016) Exploring the status of Western Australia's sea snakes. National Environmental Science Programme

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

Whiting S, Tucker T, Pendoley K, Mitchell N, Bentley B, Berry O, FitzSimmons N (2018) Marine Turtles in the Kimberley: key biological indices required to understand and manage nesting turtles along the Kimberley coast. WAMSI Kimberley Marine Research Program Final Report 1.2.2. Western Australian Marine Science Institution, Perth. Available at: https://wamsi.org.au/wp-content/uploads/bsk-pdf-manager/2021/01/Marine-Turtles-in-the-Kimberley_WAMSI-KMRP-Report-1_2_2_Whiting-et-al-2018r.pdf

Appendix D: OSM Baseline Data Sources

Table D-1: Baseline Data Sources

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
Water and sediment quality	Hydrocarbon abundance and distribution (including natural seeps) in the vicinity of the Prelude/Ichthys fields of the Browse Basin	CSIRO/AIMS	East Browse Basin
	McAlpine, KW, Sim, CB, Masini, RJ and Daly, T (2010), Baseline petroleum hydrocarbon content of marine water, shoreline sediment and intertidal biota at selected sites in the Kimberley bioregion, Western Australia. Marine Technical Report Series No. MTR3, Office of the Environmental Protection Authority (OEPA), Perth, Western Australia.	WA EPA	Kimberley bioregion (16 shoreline sites, mainland and islands, spanning 340 km)
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment (also described in Ecological studies of the Bonaparte Archipelago and Browse Basin – Cetacean survey – additional detail on a 2006 aerial survey in contained in this report)	INPEX	Browse Basin Region (Ichthys Field to Echuca Shoal)
	Montara Reports 'Control site water quality data' (Operational Monitoring Study O2 – Monitoring of Oil Character, Fate and Effects, Report 02 Water Quality and Monitoring of Oil Character, Fate and Effects, Report 03 Dispersant Treated Oil Distribution)	PTTEP	Broome to Darwin (Mainland) Islands – Browse, Ashmore, Cartier, Hibernia Reef
Shorelines and intertidal habitats	Inpex and Shell: Applied Research Program (ARP) 2- Baseline hydrocarbon surveying in the Browse Basin Ross, A., Mainson, M., Trefry, C., Stalvies, C., Talukder, A., Cooper, L., Yuen, M., Palmer, J. (2018) Hydrocarbon	INPEX, Shell, CSIRO	Browse Basin Ichthys Field Prelude area

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	abundance and distribution in the vicinity of the Prelude/Ichthys fields of the Browse Basin. Applied Research Program Project 2 Task 5b Final Report. CSIRO confidential report EP187643. Pp 154.		Browse Island Heywood Shoal Echuca Shoal
	Inpex and Shell: Applied Research Program (ARP) 2- Baseline hydrocarbon surveying in the Browse Basin Ross, A., Stalvies, C., Talukder, A., Trefry, C., Mainson, M., Cooper, L., Yuen, M., Palmer, J. (2017) Interpretive geochemical data report on samples obtained during ARP2 Trip 6184, May 2015.	INPEX, Shell, CSIRO	Browse Basin Ichthys Field Prelude area Browse Island Heywood Shoal Echuca Shoal
	Neptune (2019) Proposed Browse to North West Shelf Project, Appendix D.1: Browse to NWS Project Trunkline Route Surveys (2019) Environmental Survey Report.	Woodside	Kimberley Marine Park Continental Slope Demersal Fish KEF Argo-Rowley Terrace Marine Park Ancient Coastline at 125 m Depth Contour KEF
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment	INPEX	Browse Island
	Montara Reports: Shoreline Ecological Assessment Aerial and Ground Surveys 7-19 November 2009 (Kimberley Coast)	PTTEP	Kimberley Coast

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Shoreline Assessment Ground Survey: An operational component of the Monitoring Plan for the Montara Well Release Timor Sea (Ashmore, Cartier and Hibernia Islands).	PTTEP	Ashmore, Cartier and Hibernia Islands
Benthic communities and fish assemblages	Scott Reef Research Project - Long-term monitoring of shallow water coral and fish communities at Scott Reef	AIMS	Scott Reef (South Reef, North Reef and Seringapatam Reef)
	The composition and structure of shallow benthic reef communities in the Kimberley, north-west Australia	WA Museum (Link to report)	Kimberley Region
	Montara: Vulcan, Barracouta East and Goeree Shoals Survey 2013; Heyward et al 2013; Report for PTTEP Australasia (Ashmore Cartier) Pty Ltd. Australian Institute of Marine Science, Perth.	PTTEP (Link to report)	Barracouta, Goeree and Vulcan Shoals
	Montara: Barracouta, Goeree and Vulcan Shoals Survey 2016 Report for PTTEP Australasia (Ashmore Cartier) Pty Ltd. Australian Institute of Marine Science, Townsville.	PTTEP (Link to report)	Barracouta, Goeree and Vulcan Shoals
	Montara reports: Final Report on Benthic Surveys at Ashmore, Cartier and Seringapatam Reefs (post-spill)	PTTEP (Link to report)	Ashmore, Cartier and Seringapatam Reefs
	Applied Research Program (ARP7): Subtidal Benthos: towards benthic baselines in the Browse Basin. Final report – Submerged Shoals	Shell/INPEX	Echuca and Heywood shoals

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Marine Biodiversity Survey of Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef	Western Australian Museum (Link to report)	Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reef
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment	INPEX (2010) (Link to report)	Browse Island, Echuca Shoal, Ichthys Field
	ARP7: Subtidal Benthos: towards benthic baselines in the Browse Basin - Quantitative information on the abundance, diversity and temporal variability of benthos and associated fish – Browse Island reef	AIMS (Shell/INPEX)	Browse Island
	Benthic primary productivity: production and herbivory of seagrasses, macroalgae and microalgae	WAMSI	Bardi Jawi Indigenous Protected Area (IPA), encompassing Cygnet Bay, One Arm Point, Jalan (Tallon Island) and Iwany (Sunday Island)
	Baselines of benthic communities, herbivory and reef metabolism at Browse Island	CSIRO/UWA/AIMS	Browse Island
	Foster, T., Gilmour, J (2020) Egg size and fecundity of biannually spawning corals at Scott Reef. Sci Rep 10, 12313. https://doi.org/10.1038/s41598-020-68289-4	AIMS - Foster, T and Gilmour, J (Link to report)	Scott Reef
Marine reptiles	Gilmour JP, Cook KL, Ryan NM, Puotinen ML, Green, RH, Shedrawi G, Hobbs J-P A, Thompson, DP, Badcock, R, Buckee J, Foster T, Richards ZT, Wilson SK, Barnes PB, Coutts TB, Radford BT, Piggott CH, Depczynski M, Evans SN, Schoepf V, Evans RD, Halford AR, Nutt CD, Bancroft KP, Heyward AJ,	AIMS	Western Australia Cocos Keeling Islands Ashmore Reef Scott Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Oades D (2019) The state of Western Australia's coral reefs. Coral Reefs https://doi.org/10.1007/s00338-019-01795-8		Rowley Shoals Montebello Islands Group Barrow Island Ningaloo Reef Shark Bay
	Gilmour J, Ryan N, Cook K, Puotinen M, Green R. (2019) Long-term monitoring at Scott Reef and Rowley Shoals 2017: Summary Report. Report prepared by the Australian Institute of Marine Science (AIMS) for Woodside as operator for and on behalf of the Browse Joint Venture. (47pp)	AIMS	Scott Reef Rowley Shoals Imperieuse Reef Clerke Reef Mermaid Reef Seringapatam Reef
	Gilmour J, Sahin D, Ryan N, Birt M (2023) Long Term Monitoring of Coral and Fish Communities at Scott Reef and Rowley Shoals: 2021. Report prepared for Woodside Energy Limited. Australian Institute of Marine Science, Perth (50 pp)	AIMS	Scott Reef Rowley Shoals Mermaid Reef Clerke Reef Imperieuse Reef
	Edgar GJ, Mellin C, Turak E, Stuart-Smith RD, Cooper AT, Ceccarelli DM (2020) Reef Life Survey Assessment of Coral Reef Biodiversity in the North-west Marine Parks Network. Reef Life Survey Foundation Incorporated.	Reef Life	Ashmore Reef Ashmore Reef Marine Park Hibernia Reef Scott Reef Mermaid Reef Clerke Reef Imperieuse Reef
	Abeysiri Wickrama Liyanaarachchige, P. T., Fisher, R., Thompson, H., Menendez, P., Gilmour, J., & McGree, J. M.	Queensland University of Technology	Scott Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	(2022). Adaptive monitoring of coral health at Scott Reef where data exhibit nonlinear and disturbed trends over time. Ecology and Evolution, 12, e9233. https://doi.org/10.1002/ece3.9233		
	Grimaldi, C. M., Faubel, C., Thomas, L., Şahin, A. D., Ryan, N. M., Rayson, M., Green, R., Cuttler, M. W., Treml, E. A., Lowe, R. J., & Gilmour, J. P. (2024). Local coral connections within an atoll reef system underlie reef resilience and persistence. Limnology and Oceanography, 69(12), 3020–3032. https://doi.org/10.1002/lno.12720	University of Western Australia	Scott Reef Seringapatam Reef
	Payet SD, DiBattista JD, Newman SJ, Rushworth KJ, Wakefield CB, Evans RD et al. (2023). Sympatric species of coral trout (Plectropomus) show contrasting patterns of genomic structure across isolated atoll reefs. Reviews in Fish Biology and Fisheries 34 239-252	DPIRD - Western Australian Fisheries and Marine Research Laboratories	Ashmore Reef Scott Reef Seringapatam Reef Rowley Shoals Imperieuse Reef Clerke Reef Mermaid Reef
	Bessey C, Jarman SN, Berry O, Olsen YS, Bunce M, Simpson T, Power M, McLaughlin J, Edgar G, Keesing J (2020) Maximizing fish detection with eDNA metabarcoding. Environmental DNA. 2020; 2: 493–504. https://doi.org/10.1002/edn3.74	CSIRO	Browse Island
	Parks Australia (2022). Satellite mapping of bathymetry and habitats of Ashmore Reef and Cartier Island Marine Parks. Accessed via Australian Ocean Data Network (AODN)	Parks Australia	Ashmore Reef Cartier Island
	Keesing J, Thomson D, Haywood M, Babcock R, Doropoulos C, Bessey C; Tonks M, Westlake E, Miller M, Ceccarelli D, Hardiman L (2020): Child Ashmore Reef Marine Park	CSIRO	Ashmore Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Environmental Assessment 2019 - Marine. v1. CSIRO. Data Collection. https://doi.org/10.25919/0kfd-az26		
	Keesing JK, Webber BL, Hardiman LK (Eds) Ashmore Reef Marine Park Environmental Assessment. Report to Parks Australia. CSIRO, Crawley, Australia	CSIRO	Ashmore Reef Marine Park Ashmore Reef
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley saltwater communities, supported by Western Science partners	Kimberley
	Heyward A, Miller K, Fromont J, Keesing J, Parnum I (EDS.) (2018). Kimberley Benthic Biodiversity Synthesis Report of Project 1.1.1 prepared for the Kimberley Marine Research Program, Western Australian Marine Science	AIMS WAMSI	Kimberley Camden Sound Bonaparte Archipelago Eclipse Archipelago Lalang-garram Marine Park Reefs
	Neptune Document (2019) Proposed Browse to North West Shelf Project, Appendix D.1: Browse to NWS Project Trunkline Route Surveys (2019) Environmental Survey Report.	Woodside	Kimberley Marine Park Continental Slope Demersal Fish KEF Argo-Rowley Terrace Marine Park Ancient Coastline at 125 m Depth Contour KEF

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	DBCA coral and fish monitoring 2023		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)
	DBCA coral and fish monitoring 2024		North Kimberley Marine Park Cape Londonderry (North Kimberley Marine Park) Niiwalara (North Kimberley Marine Park) Angel Bay (North Kimberley Marine Park)

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
			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) Hedley Island (North Kimberley Marine Park) Keraudren Island (North Kimberley Marine Park)
	AIMS (2020). Bardi-Jawi Rangers and AIMS Sea Country Monitoring Partnership. https://apps.aims.gov.au/metadata/view/85a50758-069b-4402-8e35-db300233ed92, accessed 07-Oct-2024.	AIMS	Dampier Peninsula
	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

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Morgan DL, Lear KO, Dobinson E, Gleiss AC, Fazeldean T, Pillans RD, Beatty SJ and Whitty JM (2021) Seasonal use of a macrotidal estuary by the endangered dwarf sawfish, Pristis clavata. Aquatic Conservation Marine and Freshwater Ecosystems 31(8):2164–2177. doi: 10.1002/aqc.3578	CSIRO	Kimberley Fitzroy River King Sound
	West K, Travers MJ, Stat M, Harvey ES, Richards ZT, DiBattista JD, Newman SJ, Harry A, Skepper CL, Heydenrych M, Bunce M (2021) Large-scale eDNA metabarcoding survey reveals marine biogeographic break and transitions over tropical north-western Australia. Divers Distrib. 27: 1942–1957. https://doi.org/10.1111/ddi.13228	Trace and Environmental DNA (TrDNA) Laboratory, Curtin University	Kimberley
	Cure K, Barneche DR, Depczynski M. Fisher R, Warne DJ, McGree J, Underwood J, Weisenberger F, Evans-Illidge E, Ford B, Oades D, Howard A, McCarthy P, Pyke D, Edgar Z, Maher R, Sampi T, Dougal K and Bardi Jawi Traditional Owners (2024)Incorporating uncertainty in Indigenous sea Country monitoring with Bayesian statistics: Towards more informed decision-making. Ambio 53, 746–763. https://doi.org/10.1007/s13280-024-01980-2	AIMS	Dampier Peninsula
	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
	Long term monitoring of the marine turtles of Scott Reef	SKM/Woodside (Link to report)	Scott Reef

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Marine Turtles in the Kimberley: key biological indices required to understand and manage nesting turtles along the Kimberley coast	WAMSI	Near complete coverage of Kimberley Coast and Islands (>44,000 georeferenced images)
	Ecology of Marine Turtles of the Dampier Peninsula and the Lacepede Island Group, 2009–2010	RPS/Woodside (Link to report)	Dampier Peninsula and the Lacepede Islands
	Ecological studies of the Bonaparte Archipelago and Browse Basin – Marine Turtles	INPEX (Waayers, D) (Link to report)	Maret Islands and other islands in the Bonaparte Archipelago
	Keesing J, Thomson D, Haywood M, Babcock R, Doropoulos C, Bessey C; Tonks M, Westlake E, Miller M, Ceccarelli D, Hardiman L (2020): Child Ashmore Reef Marine Park Environmental Assessment 2019 - Marine. v1. CSIRO. Data Collection. https://doi.org/10.25919/0kfd-az26	CSIRO	Ashmore Reef
	Liston J (21 April 2021) "Thought to be lost forever": locally extinct sea snake re-discovered during deep-sea expedition [media release], Australian Institute of Marine Science, accessed December 2023	AIMS	Ashmore Reef
	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	AIMS	Pilbara Coast Kimberley Northern Territory coastline

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	north-west Australia. Front. Ecol. Evol. 11:1229803. doi: 10.3389/fevo.2023.1229803		
	North West Shelf Flatback Turtle Monitoring Program	North West Shelf Flatback Turtle Monitoring Program	Thevenard Island Delambre Island Cape Lambert Port Hedland Eighty Mile Beach Eco Beach Roebuck Bay Cable Beach Cape Domett
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley Saltwater Communities, supported by Western Science Partners	Kimberley
	Tucker AD, Pendoley KL, Murray K, Loewenthal G, Barber C, Denda J, Lincoln G, Mathews D, Oades D, Whiting SD, et al. (2021) Regional Ranking of Marine Turtle Nesting in Remote Western Australia by Integrating Traditional Ecological Knowledge and Remote Sensing. Remote Sensing. 13(22):4696. https://doi.org/10.3390/rs13224696	DBCA WAMSI	Kimberley
	Peel, L.R., Whiting, S.D., Pendoley, K., Whittock, P.A., Ferreira, L.C., Thums, M., Whiting, A.U., Tucker, A.D., Rossendell, J., McFarlane, G., Fossette, S., (2024). I still call Australia home: Satellite telemetry informs the protection of flatback turtles in	DBCA	Ashburton Island Thevenard Island Locker Island

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Western Australian waters. Ecosphere 15, e4847. https://doi.org/10.1002/ecs2.4847		Montebello Islands Group Barrow Island Delambre Island Bells Beach (Karratha) Port Hedland Bedout Island Eighty Mile Beach Cable Beach Slate Island Maret Island West Govenor Island Cape Domett
Seabirds and shorebirds	The status of seabirds and shorebirds at Ashmore Reef, Cartier Island and Browse Island. Monitoring Program for the Montara Well Release. Pre-Impact Assessment and First Post-Impact Field Survey	PTTEP (Clarke, R. et al) (Link to report)	Ashmore Reef (including Cartier Island) and Browse Island
	Evaluating the impacts of local and international pressures on migratory shorebirds in Roebuck Bay and Eighty Mile Beach	WAMSI (Rogers et al.)	Roebuck Bay and Eighty Mile Beach
	Adele Island Bird Survey Report	DBCA (Boyle, et al.) (Link to report)	Adele Island
	Shell/INPEX ARP6 Milestone Report #7- Lacepede Islands: Report comparing the diet composition, foraging habitat and breeding between species and between years on Lacepede islands	Monash/UWA/AIMS	Lacepede Islands

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Ecological studies of the Bonaparte Archipelago and Browse Basin – Seabird survey	INPEX (Link to report)	Browse Island and Maret Islands
	Keesing J, Thomson D, Haywood M, Babcock R, Doropoulos C, Bessey C; Tonks M, Westlake E, Miller M, Ceccarelli D, Hardiman L (2020): Child Ashmore Reef Marine Park Environmental Assessment 2019 - Marine. v1. CSIRO. Data Collection. https://doi.org/10.25919/0kfd-az26	CSIRO	Ashmore Reef
	Bird population surveys and sampling for High Pathogenicity Avian Influenza	CSIRO Parks Australia Monash University	Ashmore Reef Ashmore Reef Marine Park
	Studying seabirds: recording biodiversity above ocean waves	CSIRO	Australia wide
Marine mammals	Humpback Whale Survey Report. Browse Marine Mammal Fauna Survey	Woodside (RPS) (Link to Humpback Whale report 2010) (Link to Humpback Whale report 2011) (Link to dugong report 2009)	Browse Basin – James Price Point Migration Corridor, Pender Bay, Gourdon Bay, Scott Reef
	Humpback whale use of the Kimberley: understanding and monitoring spatial distribution (analysis of historical data, including other reports mentioned in this review. Also provides analysis of whale survey techniques and recommendations for future monitoring)	WAMSI	Kimberley region

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Browse Island habitat descriptions – Draft EIS Technical Appendices - Appendix 4 Ichthys Gas Field Development Project Studies of the Offshore Marine Environment (also described in Ecological studies of the Bonaparte Archipelago and Browse Basin – Cetacean survey – additional detail on a 2006 aerial survey in contained in this report)	INPEX (Link to report)	Browse Basin Region (Browse Island to Scott Reef)
	Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (*Dugong dugon*) management in the Kimberley	WAMSI	North Kimberley (Broome to NT border) South Kimberley (Broome to Port Hedland)
	Ferreira LC, Thums M, Whiting S, Meekan M, Andrews-Goff V, Attard CRM, Bilgmann K, Davenport A, Double M, Falchi F, Guinea M, Hickey SM, Jenner C, Jenner M, Loewenthal G, McFarlane G, Möller LM, Norman B, Peel L, Pendoley K, Radford B, Reynolds S, Rossendell J, Tucker A, Waayers D, Whittock P, Wilson P and Fossette S (2023) Exposure of marine megafauna to cumulative anthropogenic threats in north-west Australia. Front. Ecol. Evol. 11:1229803. doi: 10.3389/fevo.2023.1229803	AIMS	Shark Bay Ningaloo Coast World Heritage Area Kimberley
	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.	University of St Andrews DBCA	Kimberley Roebuck Bay Cygnet Bay Prince Regent River Cambridge Gulf
	Brown AM, Bejder L, Pollock KH, Allen SJ (2016) Site-specific assessments of the abundance of three inshore dolphin	Murdoch University	Kimberley Roebuck Bay

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	species to inform conservation and management, Frontiers in Marine Science, 3(FEB), pp. 1–18.		Beagle Bay Cygnet Bay Cone Bay Cambridge Gulf Buccaneer Archipelago
	Brown AM, Smith J, Salgado Kent C, Marley S, Allen SJ, Thiele D, Bejder L, Erbe C, Chabanne D (2017) Relative abundance, population genetic structure and acoustic monitoring of Australian snubfin and humpback dolphins in regions within the Kimberley, Report of Project 1.2.4 for the Kimberley Marine Research Program. Western Australian Marine Science Institute, Perth.	Murdoch University	Kimberley Roebuck Bay Beagle Bay Cygnet Bay Cone Bay Cambridge Gulf Buccaneer Archipelago
	Lincoln G, Mathews D, Oades D with the Balanggarra, Bardi Jawi, Dambimangari, Karajarri, Mayala, Nyangumarta, Nyul Nyul, Wunambal Gaambera & Yawuru ISWAG members (2021) The Kimberley Indigenous Turtle & Dugong Initiative 2021-2031. Prepared by Mosaic Environmental for the Kimberley Indigenous Saltwater Advisory Group (ISWAG) Broome 2021	Coordinated by the Kimberley Indigenous Saltwater Advisory Group, implemented by Kimberley saltwater communities, supported by Western Science partners	Kimberley
	Bayliss P, Hutton M (2017). Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (*Dugong dugon*) management in the Kimberley: Final Report of project 1.2.5 of the Kimberley Marine Research Program Node of the Western Australian Marine Science Institution, WAMSI, Perth, Western Australia, 98 pp.	CSIRO	Kimberley

Receptor	Existing baseline monitoring	Source / Data Custodian	Spatial extent
	Thums M, Jenner C, Waples K, Salgado Kent C and Meekan M (2018) Humpback whale use of the Kimberley; understanding and monitoring spatial distribution. Report of Proposal 1.2.1 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 78pp. Tourism WA. Shire of Broome visitor factsheet. Three-year average 2015/2016/2017. Produced by Tourism WA – Strategy and Research.	AIMS WAMSI	Kimberley
Commercial fisheries	Commercial Fisheries data collected by DPIRD and Australian Fishing Management Authority (AFMA)	DPIRD / Australian Fishing Management Authority	Australia wide
	Montara Well Release: Olfactory analysis of Timor Sea fish fillets	Curtin University/PTTEP (Link to report)	Timor Sea
	Montara Well Release Monitoring Study S4A - Assessment of Effects on Timor Sea Fish	Curtin University/PTTEP (Link to report)	Vulcan Shoal, Heywood Shoal, Browse Island, Echuca Shoal, Scott Reef
	Montara Well Release: Assessment of Fish catch for the presence of Oil	PTTEP (Link to report)	Northern Demersal Scalefish Managed Fishery (NDSF)
	Monitoring the Northern Demersal Scalefish Managed Fishery: Establishing Baseline Biomarker Levels in Commercially Important Demersal Fishes	Curtin/AIMS	East Browse Basin
	Monitoring the Northern Demersal Scalefish Managed Fishery: accounting for spatial variability and detecting change in key fish populations	Curtin/CSIRO/AIMS	East Browse Basin

Appendix E: OSRL Call Off Order Form

OSRL

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

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

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

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

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

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

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

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

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

Invoice Address if available	
Purchase Order Number	

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

Signature:		Date / Time (UTC+8):		

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