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Van Gogh Infill Phase 2 Drilling and Completions Extension Oil Pollution Emergency Plan

PROJECT / FACILITY	Drilling and Completions
REVIEW INTERVAL (MONTHS)	60 Months
SAFETY CRITICAL DOCUMENT	NO

Rev	Owner	Reviewer/s Managerial/Technical/Site	Approver
0	Senior Oil Spill Response Coordinator	Team Leader – Security & Emergency Response	Manager – HSE Offshore Division 2/6/21

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Rev	Rev Date	Author / Editor	Amendment
A			Internal review
0			Issued to NOPSEMA

Distribution	Oil Pollution Emergency Plan	
	Electronic	Hardcopy
Intranet – Emergency Preparedness	link only	
Manager – HSE Offshore Division	link only	
Drilling Superintendent	link only	
Drilling Supervisor	link only	
Senior Oil Spill Response Coordinator	link only	
Santos Company Site Representative (CSR)	link only	
IMT Room – Perth office		● x 4
AMOSC	●	
DoT	●	
AMSA	●	
OSRL	●	

How to use this OPEP in the event of a spill

Sections 1 to 4 contain general information only:

- **Activity description and location**
- **OPEP requirements**
- **Legislative requirements**
- **Chain of command**
- **Roles and responsibilities**
- **Interfaces with external support**
- **Identified spill risks**
- **Hydrocarbon description**
- **Spill modelling and Protection Priorities**
- **Worst case spill response resourcing needs**

Sections 5 to 18 contain directions on how to respond to the spill:

IN EVENT OF A SPILL, GO TO SECTION 5

- **Initial actions**
- **Notifications**
- **IAP planning and NEBA**
- **Spill Response Plans:**
  - **Source Control Plan**
  - **Monitor & Evaluate Plan**
  - **Chemical Dispersion Plan**
  - **Containment and Recovery Plan**
  - **Shoreline Protection and Deflection Plan**
  - **Shoreline Clean-up Plan**
  - **Oiled Wildlife Response Plan**
  - **Waste Management Plan**
  - **Operational and Scientific Monitoring Plan**
  - **Forward Operations Plan**
- **Environmental Performance Outcomes and Performance Standards**

Sections 19 to 20 contain general information:

- **Training and exercise requirements**
- **Testing of the OPEP**
- **Maintenance of the OPEP and response capability**

Contents

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Acronyms and abbreviations

Name	Description
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blow out Preventer
CEO	Chief Executive Officer
CM	Crisis Management
CMT	Crisis Management Team
CSR	Company Site Representative
CTD	Conductivity-Temperature-Depth
DBCA	Department of Biodiversity, Conservation and Attractions
DISC	Drilling Industry Steering Committee
DISER	Department of Industry, Science, Energy and Resources
DMIRS	Department of Mines, Industry Regulation and Safety
DO	Dissolved Oxygen
DOT	Department of Transport
DPIRD	Department of Primary Industry and Regional Development
DWER	Department of Water and Environmental Regulation
EAP	Employee Assistance Program
EHS	Environment, Health and Safety
EP	Environment Plan
ESC	Environmental Scientific Coordinator
ESD	Emergency Shutdown
ETL	Environment Team Leader
EVP	Executive Vice President
EVPO	Executive Vice President - Offshore Oil and Gas
FOB	Forward Operating Base
G&PA	Governmental & Public Affairs
GC	Gas Chromatography
GDS	Global Dispersant Stockpiles
GIS	Geographic Information System
GPS	Global Positioning System

Name	Description
HDPE	High Density Polyethylene
HMA	Hazard Management Agency
HQ	Hazard Quotient
HR	Human Resources
IAP	Incident Action Plan
ICC	Incident Command Centre
ICMM	Incident Command and Management Manual
IMT	Incident Management Team
IR	Industrial Relations
IRP	Incident Response Plan
IRT	Incident Response Team
ITOPF	International Tanker Owners Pollution Federation
JSCC	Joint Strategic Coordination Committee
KSAT	Kongsberg Satellite Services
LOWC	Loss of Well Control
m	Meters
m^3	Cubic Meters
MARPOL	International Convention for the Prevention of Pollution from Ships
MCT	Monitoring Coordination Team
MDO	Marine Diesel Oil
SHP - MEE	State Hazard Plan for Maritime Environmental Emergencies
MEECC	Maritime Environmental Emergency Coordination Centre
MEER	Maritime Environmental Emergency Response
MMscf	Million standard cubic feet
MNES	Matters of National Environmental Significance
MOP	Marine Pollution Incidents
MODU	Mobile Offshore Drilling Unit
MOU	Memorandum of Understanding
MS	Mass Spectrometry
MSP	Monitoring Service Providers
NATA	National Association of Testing Authorities
NATPLAN	National Plan for Maritime Environmental Emergencies
NEBA	Net Environmental Benefit Analysis
NOK	Next of Kin

Name	Description
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NRT	National Response Team
NWA	North West Alliance
OASG	Operational Area Support Group
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OIW	Oil in Water
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OPICC	Oil Pollution Incident Command Centre
OSCP	Oil Spill Contingency Plan
OSR	Oil Spill Response
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisation
OST	Oil Spill Trajectory
OSTM	Oil Spill Trajectory Modelling
OWA	Oil Wildlife Advisor
OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
PAHs	Polycyclic Aromatic Hydrocarbons
PEARL	People, Environment, Assets, Reputation, Liability
POB	Persons on Board
PPE	Personal Protective Equipment
PS	People Support
RCC	Rescue Coordination Centre
ROV	Remotely Operated Vehicle
SAR	Synthetic Aperture Radar
SIMA	Spill Impact Mitigation Assessment
SITREP	Marine Pollution Situation Report
SLA	Service Level Agreement
SME	Subject Matter Expert
SMEEC	State Maritime Environmental Emergency Coordinator
SMP	Scientific Monitoring Plan

Name	Description
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plan
SRT	State Response Team
SSD	Species Sensitivity Distribution
SSDI	Subsea Dispersant Injection
TRP	Tactical Response Plan
UAV	Unmanned Aerial Vehicles
UHF	Ultra-High Frequency
VOC	Volatile Organic Compound
VOO	Vessels of Opportunity
WA	Western Australia
WAOWRP	Western Australian Oiled Wildlife Response Plan
WSP	Waste Service Provider

1 Quick reference information

<table>
<tr><th>Parameter</th><th>Description</th><th>Further Information</th></tr>
<tr><td>Petroleum Activity</td><td>Drilling a single production well from the Van Gogh DC 2 and any well intervention scopes required at previously drilled wells at the Van Gogh DC 1</td><td>Section 2 of the Environment Plan (EP)</td></tr>
<tr><td>Location (Lat/Long)</td><td>
<table>
<tr><th>Location</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td rowspan="4">Operational area</td><td>21° 22' 6.02" S</td><td>114° 2' 57.45" E</td></tr>
<tr><td>21° 22' 8.97" S</td><td>114° 5' 46.56" E</td></tr>
<tr><td>21° 24' 55.36" S</td><td>114° 5' 43.27" E</td></tr>
<tr><td>21° 24' 55.07" S</td><td>114° 2' 54.05" E</td></tr>
<tr><td>Van Gogh Drill Centre 1 (DC1)</td><td>21° 23'51.34"S</td><td>114°04'04.75"E</td></tr>
<tr><td>Van Gogh Drill Centre 2 (DC2)</td><td>21°23'12.71"S</td><td>114°04'35.91"E</td></tr>
</table>
</td><td>Table 2-1 of the EP</td></tr>
<tr><td>Petroleum Title/s (Blocks)</td><td>WA-35-L</td><td>-</td></tr>
<tr><td>Water Depth</td><td>360 m</td><td>N/A</td></tr>
<tr><td>Maximum Credible Spill Scenarios</td><td>
<table>
<tr><th>Credible Scenario</th><th>Hydrocarbon Type</th><th>Maximum Credible Volume</th></tr>
<tr><td>Surface release of crude as a result of LOWC</td><td rowspan="2">Theo 3 crude</td><td>350,566 m^3 over 77 days</td></tr>
<tr><td>Seabed release of crude as a result of LOWC</td><td>319,723 m^3 over 77 days</td></tr>
<tr><td>External damage to the NV operated subsea system within the WA-35-L permit *</td><td>Van Gogh crude blend</td><td>1,681 m^3 over 24 hours on an exponential rate of decline</td></tr>
<tr><td>Surface release of MDO as a result of vessel collision</td><td>MDO</td><td>1519 m^3 over 1 hour</td></tr>
</table>
*Note: Response is managed through the Ningaloo Vision Operations OPEP (TV-00.RI-00003.02)
</td><td>Section 6.1</td></tr>
<tr><td>Hydrocarbon Properties</td><td>Theo 3 crude
Density kg/m^3 at 15°C = 951
Dynamic viscosity (cSt) = 145.7 @ 40° C
Marine Diesel Oil
Density kg/m^3 at 25°C = 829
Dynamic viscosity (cP) = 3.9 @ 20° C
API Gravity = 37.6</td><td>Section 6.2
Appendix A</td></tr>
</table>

Parameter	Description	Further Information
Protection Priorities	Ningaloo Coast North; Ningaloo Coast South; Muiron Islands; Exmouth Gulf Coast; Outer Shark Bay Coast; and Carnarvon – Inner Shark Bay Eighty Mile Beach	**Section 6.4.3**

2 First strike response actions

The initial response actions to major oil spill incidents will be undertaken by the relevant Vessel Master or the Offshore Installation Manager, depending on the nature of the incident (vessel or MODU based).

If the spill is related to the MODU, the rig Offshore Installation Manager (hereafter referred to as the On-Scene Commander or OSC) will be notified, or in the case of a support vessel, the Vessel Master will be notified.

Following those initial actions undertaken by the On-Scene Commander or Vessel Master to ensure the safety of personnel on the vessel or MODU, and to control the source of the spill, the Santos Company Site Representative will assess the situation based on:

+ what has caused the spill?
+ is the source under control?
+ what type of hydrocarbon has been spilled?
+ how much has been spilled?

For spills from support vessels, initial response actions to major incidents are under the direction of the Vessel Master and in accordance with vessel-specific procedures (e.g., Shipboard Oil Pollution Emergency Plans (SOPEPS)).

Response information contained within this Oil Pollution Emergency Plan is concerned primarily with a large scale (Level 2/3) hydrocarbon spill where the Perth-based Incident Management Team (IMT) and Santos Crisis Management Team (CMT) are engaged for support and implementation of response strategies. Level 1 spills are managed through on-site response and IMT is available to assist with regulatory requirements/notifications and support as required. Therefore, the immediate response actions listed in **Table 2-1** are relevant for any spill. Once sufficient information is known about the spill, the Incident Commander will classify the level of the spill. If the spill is classified as a Level 1 spill, then the actions related to Level 2/3 spills do not apply, unless specified by the Incident Commander.

Table 2-1: First strike activations

When (indicative)	Activations		Who
	Objective	Action	
All spills			
Immediate	Manage the safety of personnel	Implement site incident response procedures (MODU Operator's Emergency Response Plan and Santos MODU Operator Emergency Response Bridging Plan) or vessel-specific procedures, as applicable	On-Scene Commander/Vessel Master
Immediate	Control the source using site resources, where possible	Control the source using available onsite resources (MODU/vessel) Refer to source control plan – Section 9	On-Scene Commander/Vessel Master
30 minutes of incident being identified	Notify Santos Offshore Duty Manager	Verbal communication to Offshore Duty Manager's duty phone	On-Scene Commander via CSR
As soon as practicable	Obtain as much information about the spill as possible	Provide as much information to the IMT (Incident Commander or delegate) as soon as possible	On-Scene Commander via CSR
60 minutes	Gain situational awareness and begin onsite spill surveillance	If spill reaches marine waters gain further situational awareness by undertaking surveillance of the spill from vessel or MODU Refer to Monitor and Evaluate Plan – **Section 10**	On-Scene Commander via CSR Incident Commander
Refer timeframes Go to Section 7	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures – **Section 7**	Initial notifications by Environment/ Safety Team Leads – **Table 7-1**
Level 2/3 spills (in addition to actions above)			

When (indicative)	Activations		Who
	Objective	**Action**	
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Duty Manager Incident Commander
IMT actions (0 to 48 hours)			
Within 90 minutes from IMT callout	Set-up IMT room	Refer to IMT tools and checklists for room and incident log set-up	Incident Commander IMT Data Manager
	Gain situational awareness and set incident objectives, strategies and tasks	Begin reactive Incident Action Planning process Go to **Section 8** Review First Strike Activations (this table)	Incident Commander Planning Team Leader
Refer timeframes **Section 7**	Make regulatory notifications as required Notify and mobilise/put on standby external oil spill response organisations and support organisations, as required	Go to **Section 7**	Initial notifications by Environment/ Safety Team Leads Oil Spill Response Organisations (Australian Marine Oil Spill Centre [AMOSC] and Oil Spill Response Ltd [OSRL]) activation by designated call-out authorities (Incident Commanders/Duty Managers)
Refer timeframes **Section 10**	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	Vessel Surveillance (**Section 10.1**) Aerial Surveillance (**Section 10.2**) Satellite imagery (**Section 10.5**) Tracking Buoys (**Section 10.3**) Oil Spill Trajectory Modelling (**Section 10.4**) Initial Oil Characterisation (**Section 10.5**) Operational Water Quality Monitoring (**Section 10.7**) Shoreline and Coastal Habitat Assessment (**Section 10.8**)	IMT Operations Team Leader IMT Logistics/Supply Team Leaders IMT Environment Team Leaders

When (indicative)	Activations		Who
	Objective	Action	
Activate on Day 1 for applicable scenarios	Source control support to stop the release of hydrocarbons into the marine environment. **Degree of IMT support will be scenario-dependent**	Go to **Section 9**	IMT Operations Team Leader (IMT Drilling Team Leader as appropriate to scenario) IMT Logistics/Supply Team Leaders
Activate on Day 1 for applicable scenarios Refer **Section 11**and **12**	Reduce exposure of shorelines and wildlife to floating oil through mechanical/ chemical dispersion	For crude spills: Activate the Mechanical and/or Chemical Dispersion Plan Go to **Section 11**and **12**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
Activate on Day 1 for applicable scenarios Refer Section 13	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities	Activate the Containment and Recovery Plan Go to **Section 13**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
Day 1	Identify environmental sensitivities at risk and conduct Net Environmental Benefit Analysis (NEBA)	Review situational awareness and spill trajectory modelling Review strategic NEBA and begin operational NEBA (**Section 6.9**)	IMT Environmental Team Leader
Day 1	Develop forward operational base/s to support forward operations	Begin planning for forward operations base as per Forward Operations Plan (**Section 19**)	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
Day 1	Ensure the health and safety of spill responders	Identify relevant hazards controls and develop hazard register Begin preparation Site Health and Safety Management requirements Refer Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)	IMT Safety Team Leader
If/when initiated Refer **Section 14**	Protect identified shoreline protection priorities	Activate the Shoreline Protection and Deflection Plan Go to **Section 14**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders IMT Environment Team Leader

When (indicative)	Activations		Who
	Objective	Action	
If/when initiated Refer **Section 16**	Prevent or reduce impacts to wildlife	Activate the Oiled Wildlife Response Plan Go to **Section 16**	IMT Environment Team Leader IMT Operations Team Leader IMT Logistics/Supply Team Leaders
If/when initiated Refer **Section 17.7**	Assess and monitor impacts from spill and response	Activate the Scientific Monitoring Plan Go to **Section 17.7**	IMT Environment Team Leader IMT Logistics/Supply Team Leaders IMT Operations Team Leader
If/when initiated	Clean-up oiled shorelines	Activate Shoreline Clean-Up resources Go to **Section 15**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
If/when initiated	Safely transfer, transport and dispose of waste collected from response activities.	Activate the Waste Management Plan. Go to **Section 17**	IMT Operations Team Leader IMT Logistics/Supply Team Leaders
IMT Actions (48+ hours)			
Ongoing	For ongoing incident management – indicatively 48 + hours – a formal incident action planning process is to be adopted to continue with spill response strategies identified above. An Incident Action Plan (IAP) is to be developed for each successive operational period. Santos will maintain control for those activities for which it is the designated Control Agency/Lead IMT. Depending on the specifics of the spill, Australian Maritime Safety Authority (AMSA) and/or Western Australia (WA) Department of Transport (DoT) may be relevant Control Agencies (refer **Section 4.2**). Where another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos' support to DoT for a State waters response is detailed in **Section 5.2.3**.		Control Agency IMT Santos to provide the following roles to DoT MEECC/IMT for State waters response: CMT Liaison Officer Intelligence Support Officer Deputy Planning Officer Environmental Support Officer Public Information Support & Media Liaison Officer Deputy Logistics Officer Facilities Support Officer Deputy Finance Officer Deputy On Scene Commander (Forward Operating Base [FOB])

3 Introduction

This document is the accompanying Oil Pollution Emergency Plan (the OPEP) to Van Gogh Infill Phase 2 Drilling and Completions Environment Plan (TV-35-BI-20003) (the EP), as required by Regulation 14(8) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS (E) Regulations).

3.1 Description of activity

Santos proposes to drilling a single production well from the Van Gogh Drill Centre (DC) 2 and undertake any intervention scopes at Van Gogh DC 1 wells, within permit WA-35-L (described as the operational area)

All activities will be undertaken within an operational area, defined as a 2 km x 2 km square, encompassing the Van Gogh DC 1 and 2 (**Figure 3-1**).

3.2 Scope

The OPEP is an operational document and contains all information necessary to carry out a Santos response to an emergency oil spill scenario resulting from the drilling and completions activities described within the EP.

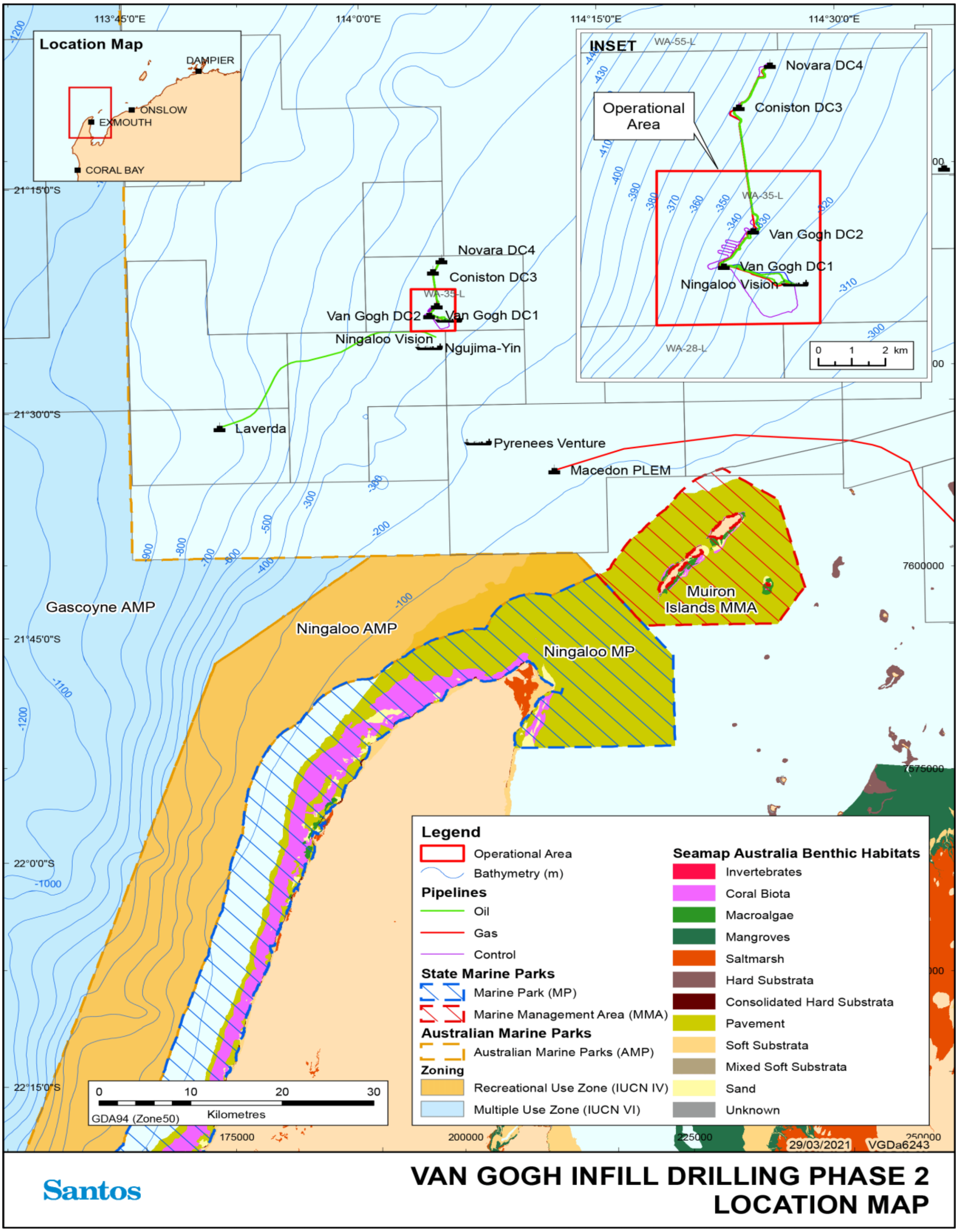

Figure 3-1: Location of Operational Area

3.3 Interface with internal documents

In addition to this OPEP, a number of other Santos documents provide guidance and instruction relevant to spill response, including:

+ Incident Command & Management Manual (SO-00-ZF-00025);
+ Van Gogh Phase 2 Drilling and Completions Extension Environment Plan (TV-35-BI-20003);
+ MODU Operator's Emergency Response Plan;
+ Santos-MODU Operator Emergency Response Bridging Plan;
+ Incident Response Telephone Directory (SO-00-ZF-00025.020);
+ Refuelling and Chemical Management Standard (QE-91-IQ-00098);
+ Santos Offshore Source Control Planning and Response Guideline (DR-00-ZF-20001);
+ Source Control Plan (document numbers to be confirmed);
+ Oil Pollution Waste Management Plan (QE-91-IF-10053);
+ Oil Spill Response Health and Safety Manual (SO-91-RF-10016);
+ Oil Spill Scientific Monitoring Plan (EA-00-RI-10099);
+ Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162);
+ Oil Spill Scientific Monitoring Baseline Data Review (QE-00-BI-20001); and
+ Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

Relevant Tactical Response Plans are made available within the 'First Strike Resources' folder within the Offshore Emergency Response on Santos intranet site.

4 Oil spill response framework

The OPEP has been developed to meet all relevant requirements of the OPGGS (E) Regulations and the Santos Emergency Preparedness and Response Standard (SO-91-ZF-10001). It is consistent with the national system for oil pollution preparedness and response; the National Plan for Maritime Environmental Emergencies (NatPlan) managed by the Australian Maritime Safety Authority (AMSA). It is also consistent with the WA State system for oil pollution preparedness; the State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE) managed by the Western Australia Department of Transport (DoT).

This OPEP is made available to the following Regulatory agencies:

+ National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA);
+ Australian Maritime Safety Authority (AMSA); and
+ Western Australia Department of Transport (DoT).

4.1 Spill response levels

Santos uses a tiered system of incident response levels consistent with the NatPlan and SHP-MEE. Spill Response Levels help to identify the severity of an oil spill incident and the scale and complexity of the response required to manage the incident and mitigate environmental impacts. Incident Response levels are outlined within the Santos Incident Command and Management Manual (SO-00-ZF-00025) and further detailed in **Table 4-1** for hydrocarbon spills.

Table 4-1: Assessing the level of response

<table>
<tr><th colspan="2">Level 1</th></tr>
<tr><td colspan="2">An incident which will not have an adverse effect on the public or the environment which can be controlled by the use of resources normally available onsite without the need to mobilise the Santos IMT or other external assistance.</td></tr>
<tr><td>+ Oil is contained within the incident site.
+ Spill occurs within immediate site proximity.
+ Discharge in excess of permitted oil in water (OIW) content (15 ppm).
+ Incident can be managed by the Emergency Response Team and its resources.</td><td>+ Source of spill has been contained.
+ Oil is evaporating quickly and no danger of explosive vapours.
+ Spill likely to naturally dissipate.
+ No media interest/not have an adverse effect on the public.</td></tr>
<tr><th colspan="2">Level 2</th></tr>
<tr><td colspan="2">An incident that cannot be controlled by the use of onsite resources alone and requires external support and resources to combat the situation; or
An incident that can be controlled onsite but which may have an adverse effect on the public or the environment.</td></tr>
<tr><td>+ Danger of fire or explosion.
+ Possible continuous release.
+ Concentrated oil accumulating in close proximity to the site or vessel.
+ Potential to impact other installations.</td><td>+ Level 1 resources overwhelmed, requiring additional regional resources.
+ Potential impact to sensitive areas and/or local communities.
+ Local/national media attention/may adversely affect the public or the environment.</td></tr>
<tr><th colspan="2">Level 3</th></tr>
</table>

An incident which has a wide-ranging impact on Santos and may require the mobilisation of external state, national or international resources to bring the situation under control.	
+ Loss of well integrity. + Actual or potentially serious threat to life, property, industry. + Major spill beyond site vicinity. + Significant shoreline environmental impact.	+ Level 2 resources overwhelmed, requiring international assistance. + Level 3 resources to be mobilised. + Significant impact on local communities. + International media attention.

4.2 Jurisdictional authorities and control agencies

During a spill response there will be both a Jurisdictional Authority and a Control Agency assigned to the incident for all levels (previously Tiers) (**Table 4-2**). The Jurisdictional Authority is the relevant Statutory Authority that has responsibilities to verify that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Control Agency is the agency or company assigned by legislation, administrative arrangements or within the relevant contingency plan to control response activities to an oil pollution emergency.

The proposed activities for which this OPEP applies are in Commonwealth waters. For an offshore petroleum activity oil spill in Commonwealth waters the Jurisdictional Agency is NOPSEMA for facility incidents and AMSA for vessel (ship-sourced) incidents. Under the OPGGS Act definitions (Vol. 3, Schedule 3, Part 1, Clause 4) a MODU being used, or prepared for use, for the drilling or servicing of a well, is considered to be a facility.

For spill response in Commonwealth waters, Santos, as the Petroleum Titleholder, is the nominated Control Agency for facility incidents while AMSA is the nominated Control Agency for vessels spills (**Table 4-2**).

If a spill enters into State waters then cross-jurisdictional arrangements apply; DoT is both the Hazard Management Agency (HMA) (i.e. Jurisdictional Authority) and the Control Agency for that part of a Level 2/3 response in State waters (**Table 4-2**).

For all spill incidents, Santos will remain in control of the response (i.e. undertake 'first-strike response') until such time that a designated Control Agency with authority for spill response (if different from Santos), assumes control.

Table 4-2: Marine oil pollution arrangements

Role	Spill Level	State waters/shoreline oil pollution		Commonwealth waters oil pollution	
		Petroleum Activity[1]	Vessel[2]	Petroleum Activity	Vessel
Control Agency	1	Petroleum Titleholder (Santos)	DoT	Petroleum Titleholder (Santos)	AMSA
	2/3	DoT	DoT	Petroleum Titleholder (Santos)	AMSA

[1] Includes a 'Facility', such as a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel. As defined by Schedule 3, Part 1, Clause 4 of the OPGGSA 2006.

[2] Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA, 2017) as a seismic vessel, supply or support vessel, or offtake tanker.

Jurisdictional Authority	1/2/3	DoT	DoT	NOPSEMA	AMSA

4.2.1 Facility spill in Commonwealth Waters

For a facility oil spill incident in Commonwealth waters the Jurisdictional Authority is NOPSEMA. NOPSEMA is responsible for the oversight of response actions to pollution events from offshore Petroleum Activities, in areas of Commonwealth jurisdiction. During a spill incident, NOPSEMA's role will be to implement regulatory processes to monitor and secure compliance with the *OPGGS Act 2006* and *OPGGS (E) Regulations*, including the issuing of directions as required, and investigate accidents, occurrences and circumstances involving deficiencies in environment management.

Under the *OPGGS (E) Regulations* and the *OPGGS Act 2006*, the Petroleum Titleholder (i.e. Santos) is responsible for responding to an oil spill incident as the Control Agency in Commonwealth waters, in accordance with its OPEP.

Santos is responsible as Control Agency until such a time as the relevant Jurisdictional Agency (NOPSEMA) identifies the need to delegate control. In this situation, Control Agency responsibility may be delegated to AMSA who will assume control of the incident and respond in accordance with AMSA's NatPlan. In such an occurrence, Santos would assume a Support Agency role and make available all necessary resources to support AMSA in AMSA's performance of their Control Agency responsibilities.

4.2.2 Cross-jurisdiction facility spills

For a Level 2/3 Petroleum Activity spill, there is the possibility of the spill crossing jurisdictions between Commonwealth and State waters. In these instances, the Jurisdictional Authority remains true to the source of the spill (i.e., NOPSEMA for Commonwealth waters and DoT for State waters). Where a Level 2/3 spill originating in Commonwealth waters moves into State waters two Control agencies will exist: DoT and the Petroleum Titleholder (Santos).

The arrangements between DoT and Santos for sharing resources and coordinating a response across Commonwealth and State waters are further detailed in **Section 5.2.3.**

4.2.3 Vessel spills in Commonwealth Waters

For a vessel spill originating in Commonwealth waters, the Jurisdictional Authority and designated Control Agency is AMSA. AMSA is the national shipping and maritime industry regulator and was established under the *Australian Maritime Safety Authority Act 1990*.

Upon notification of an incident involving a ship, AMSA will assume control of the incident and respond in accordance with AMSA's Marine Pollution Response Plan which is the operational response plan for the management of ship-sourced incidents. AMSA is to be notified immediately of all ship-sourced incidents through RCC Australia (Santos Incident Response Telephone Directory [SO-00-ZF-00025.020]).

As with facility spills, Santos is required to have adequate preparedness arrangements for spills from vessels supporting Petroleum Activities within Commonwealth waters under *OPGGS Act 2006* and *OPGGS (E) Regulations*.

Santos will be responsible for coordinating a first-strike response to a vessel based spill in Commonwealth waters until such time as AMSA takes over the role as Control Agency, at which time Santos would provide all necessary resources as a Supporting Agency.

4.2.4 Cross-jurisdiction vessel spills

For a large vessels spill (Level 2/3) that crosses jurisdictions between Commonwealth and State waters there will be two Jurisdictional Authorities (AMSA and DoT) and two Control Agencies (AMSA and DoT). Control Agency responsibilities will be determined through consultation between DoT and AMSA with Santos providing first-strike response and all necessary resources (including personnel and equipment) as a Supporting Agency.

5 Santos incident management

The Santos IMT (Perth) and Crisis Management Team (CMT) will be activated in the event of a Level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. As outlined above, control of the response may be taken over by the relevant Controlling Agency as the incident progresses. The Santos response structure to a major emergency incident is detailed in the Incident Command and Management Manual (ICMM) (SO-00-ZF-00025). The ICMM describes response planning and incident management that would operate under emergency conditions – describing how the Santos IMT operates and interfaces with the CMT and external parties.

The first priority of an escalating oil spill response to a Level 2/3 spill is the formation of an IMT and establishment of an Incident Command Centre (ICC). The ongoing involvement of the IMT and CMT will be dependent on the severity and type of spill and the obligations of Santos and other agencies/authorities in the coordinated spill response.

Santos' incident response structure relevant to an incident within the operational area includes:

+ facility-based IRT;
+ Santos Incident Management Team (IMT)– Perth based to coordinate and execute responses to an oil spill incident;
+ Santos Crisis Management Team (CMT) - to coordinate and manage threats to the company's reputation and to handle Santos's corporate requirements as an operator in conjunction with the Perth Based Santos- Executive Vice President Offshore Oil and Gas (EVP Offshore); and
+ other field-based command, response and monitoring teams for implementing strategies outlined within the OPEP.

The first priority of an escalating oil spill response is the formation of an IMT to establish an Incident Operations Centre. The establishment and involvement of the CMT will be dependent on the severity of the spill.

The Santos incident response organisational structure is defined in the Incident Command and Management Manual (SO-00-ZF-00025), and in **Figure 5-1** for reference.

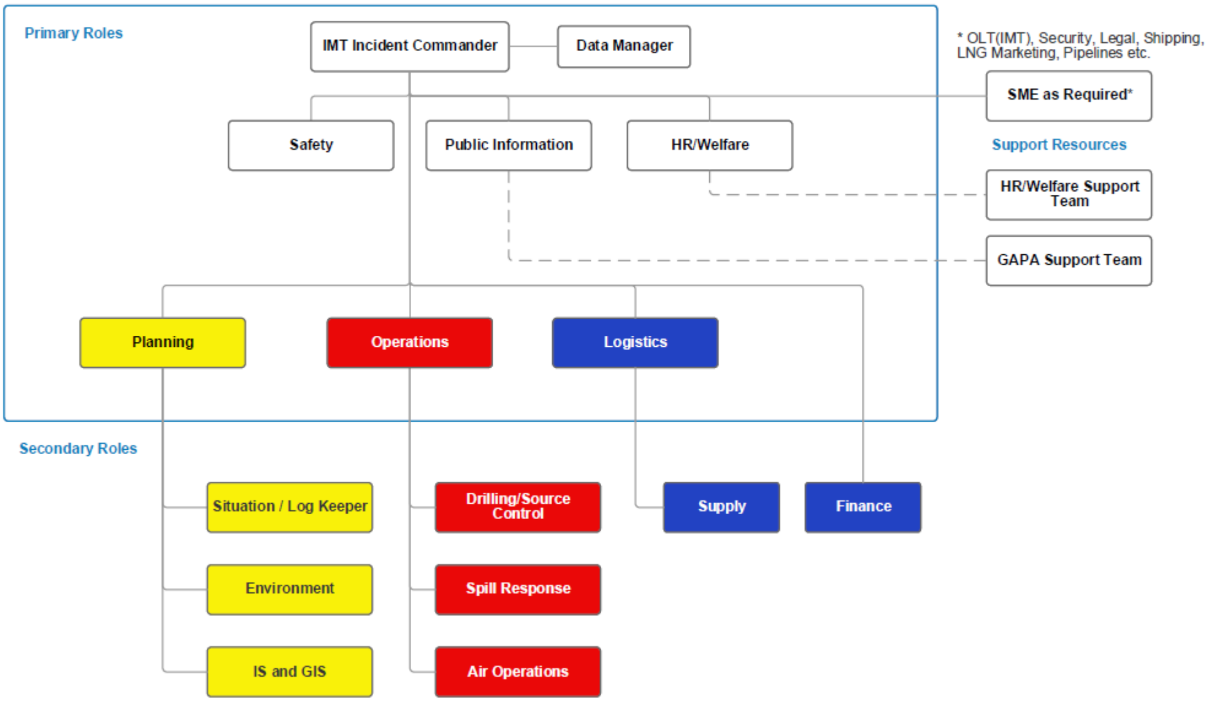

Figure 5-1: Santos Incident Management Team organisational structure

Note: For a Level 2/3 facility spill whereby DoT is involved as a Control agency, either within a single jurisdiction (State water only spills) or cross-jurisdictional (spills from Commonwealth to State waters), Santos will work in coordination with DoT in providing spill response capability. Santos' expanded organisational structure for these situations is detailed in Section 5.2.3.

5.1 Roles and responsibilities

The tables below provide an overview of the responsibilities of the Santos CMT (**Table 5-1**), IMT (**Table 5-2**), and field-based response team members in responding to an incident (**Table 5-3**).

Also provided are the roles and responsibilities of Santos personnel required to work within DoT's organisational structure (**Table 5-5**), where DoT has responsibilities for spill response as a Control Agency, as per DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements..

DoT will provide a Liaison officer / Duty Incident Commander to the Santos IMT in a coordinated response, as outlined for reference in **Table 5-4**.

The details on IMT resourcing for roles identified in **Table 5-2** and **Table 5-5** are provided in **Appendix B.**

Santos

Table 5-1: Roles and responsibilities in the Crisis Management Team (CMT)

Santos CMT Role	Main Responsibilities
CMT Leader	+ Maintains contact with IMT or Issue Notification stakeholder until the CMT is fully functional + Articulate the overall response priorities and required actions using the PEARL (People Environment Assets Reputation Liability) approach + Consider response options to achieve priorities, including mitigating the potential worst-case scenario + Determine Key Messages and Stakeholders, assigning Santos points of contact for each stakeholder + Ensure Chief Executive Officer (CEO) or delegate is engaged for all internal (staff) and external communications + Confirm frequency of CMT reports and meetings and coordination with CEO, IMT and other stakeholders + Consider how a change in the situation over time may alter the most likely and worst-case scenarios originally identified, and how this impacts response options and priorities + Consider CMT requirements for the next phase of activity, allocating actions as appropriate
Administrator-EHS & Governance	+ Provide location, time and meeting medium details (i.e. telecon etc) to CMT members + Work with the CMT Log Keeper to maintain an accurate CM Log with key situation details, meeting decisions/actions and next meeting time/location details + Disseminate approved briefing material to personnel following CMT Leader's direction + Liaise with Public Affairs/Safety & Security/Facilities on any reception, premises security or media/advisor briefing requirements + Ensure role discipline of CMT representatives, monitoring action progress and any coordination + At each CMT meeting summarise and record any change/handover in CMT representatives + the situation reviews and actions since last CMT meeting + any issues raised between meetings requiring escalation to, or coordination with, the CMT
Duty Manager	+ With CEO agreement and appointment of a CMT Leader, assist with/oversee activation of the CMT + Ensure that the core CMT and specialist members are given details for the initial CMT meeting including location, time and meeting medium (i.e. telecon etc) + Where applicable contact IMT Leader or Issue Notification stakeholder and gain latest update for team + Articulate the overall response priorities and required actions using the PEARL approach. Ensure ongoing monitoring for hidden or emerging risks + Determine Key Messages and Stakeholders, assigning Santos points of contact for each stakeholder + Ensure appropriate Legal Protocols are established on advice from CMT Legal + Ensure CEO or delegate is engaged for all internal (staff) and external communications + Consider how a change in the situation over time may alter the most likely and worst-case scenarios originally identified, and how this impacts response options and priorities

Santos CMT Role	Main Responsibilities
Government & Public Affairs	+ Without delaying CMT attendance, gain advice from Government and Public Affairs teams on main and social media situation, government stakeholder requests and requirements, and immediate strategy + Gain requirements from the CEO or delegate on strategy, timings, and media representation + Follow the Crisis Management Process using the nominated support tools + At initial CMT meeting take the lead role setting out and updating the stakeholder communications plan + Identify current and immediate messaging needs (i.e. Holding Statements, internal communications, industry advices, government notifications, media releases) and ongoing issues management + Advise on Government and Public Affairs recommendations and other considerations to support company sustainability and resilience + Advise on and coordinate the stakeholder management approach across all levels of Santos, including media monitoring and media inquiry + Engage and oversee any specific asset or sub teams required for stakeholder management
Risk & Audit	+ Advise on current and potential company risk issues + Determine if additional specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated + Advise on Santos risk options and recommendations, other mitigation controls to company sustainability, and resilience requirements + Monitor and assess cumulative risk consequences and potential exposures to Santos. + Engage and oversee any specific sub teams or specialists required for Risk and Audit support + Between meetings liaise with sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed
Safety and Security	+ Identify current and potential safety and security response, support or regulatory issues. + Determine if additional safety or security specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated + Advise on safety and security recommendations and other considerations to support company sustainability and resilience + Advise on notifications to any safety or security related stakeholders, including mandatory regulatory advice or reports + Monitor and assess safety and security consequences, advise on strategies and potential penalties and financial exposures to Santos + Engage and oversee any specific sub teams or specialists required for Safety and Security support + Between meetings liaise with sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed.

Santos CMT Role	Main Responsibilities
Human Resource Team Leader	+ Identify current and potential Human Resources (HR), People Support (PS) and Industrial Relations (IR) response, support (including incident site deployment) or regulatory issues + Determine if additional HR, PS or IR specialists are needed. If so, coordinate and monitor their implementation (via the IMT where active with the respective IMT Leader) and keep the CMT updated + Advise on and coordinate the personnel and next of kin communication approach across all levels of Santos with support from the Government and Public Affairs representative + Advise on HR, PS and IR recommendations and other considerations to support company sustainability and resilience + Monitor and report on any casualty condition, movement and health tracking to support injured parties (staff, contractors, and community as applicable) + Advise and coordinate management of HR, PS and IR stakeholders (via the IMT Leader where an IMT is active), including emergency services, union representation + Monitor any HR or IR consequences, advise on strategies and potential penalties and financial exposures to Santos + Engage and oversee any specific asset or sub teams used for HR, PS and IR stakeholder management + Between meetings liaise with asset and sub teams and specialist advisors to ensure an effective response. Ensure confidentiality and authorised comment is continually observed.
Legal & Company Secretariat	+ Identify current and potential legal and company secretary issues + Determine if additional legal specialists are needed. If so, coordinate and monitor their implementation (via the IMT Leader where an IMT is active) and keep the CMT updated + Advise on Legal Professional Privilege matters for the CMT and coordinate with other groups (including IMT representation) to ensure company information and personnel are appropriately advised + Advise the CMT, asset and sub teams about contractual obligations, including Joint Venture and supply agreements, as required + Advise on legal and company secretariat recommendations and other considerations to support company sustainability and resilience + Advise on notifications to regulatory or legal related stakeholders, including mandatory advice or reports + Monitor and assess legal consequences, advise on strategies and potential penalties and financial exposures to Santos

Santos CMT Role	Main Responsibilities
Additional CMT support available as required – + Environment and Land Access + Assets and Operations + Engineering and Technical + Exploration + Finance + Information Systems + Insurance + Marketing and Trading + Treasury + Commercial and Procurement	

Table 5-2: Roles and Responsibilities in the Santos Management and Incident Management Team (IMT)

Santos Management / IMT Role	Main Responsibilities
Executive Vice President - Offshore Oil and Gas (EVPO)	+ Depending on the level of the incident, the EVPO (and/or their delegate) will act as the primary liaison to the CMT Duty Manager + On the activation of the IMT, the EVPO is advised by the Incident Commander
Incident Commander	+ Coordinate all onshore support in accordance with the Incident Response Plan (IRP) and/or activity specific Oil Spill Contingency Plan or Oil Pollution Emergency Plan + Set the response objectives and strategic direction + Oversee the development and implementation of Incident Action Plans + Oversee implementation of Memorandum of Understanding (MoUs) and contracted support for 'mutual aid' + Ensure co-ordination with external organisations/police, etc. + Prepare and review strategic and tactical objectives with the EVPO + Liaise with the EVP Offshore and provide factual information + Set response termination criteria in consultation with regulatory authorities + Coordinate authorities for search and rescue
Planning Team Leader	+ Collect and document situational awareness information of the incident + Develop, document, communicate and implement Incident Action Plans to achieve incident objectives + Determine the status of action/s or planned activities under the Incident Action Plans and assess and document performance against the objectives + Manage the Geographic Information System (GIS) Team in a response

Santos Management / IMT Role	Main Responsibilities
Operations Team Leader/Drilling Team Leader	+ Coordinate operational aspects of Incident Response + Provide the key contact for On-Scene Commanders + Liaise with contractors or third parties + Mobilise additional Santos staff and external experts to form Technical Support Team + Assist Planning Team Leader with overall general plan preparation and preparation of Incident Action Plans + Implement Incident Action Plans + Manage field response teams and activities
Public Information	+ Manage all communication with media & government + Prepare media releases for CMT approval + Ensure timely approve by CMT & release of communications briefs to the Crisis Call Centre
Logistics Team Leader	+ Mobilise response equipment, helicopters, vessels, supplies and personnel + Provide transport and accommodation for evacuated personnel + Oversee the implementation of the Waste Management Plan throughout a Tier 2 or Tier 3 oil spill response. + Liaise with the Supply Team to activate supply contracts and arrange procurements
Supply Team Leader	+ Arrange fast track procurement + Activate supply contracts as required + Implement and maintain Cost Tracking System to enable the tracking of all costs associated to the response of the incident
Environmental Team Leader	+ Manage notification to Designated Environmental Authorities and liaise as required + Assist in the development of Incident Action Plans + Advise on the Net Environmental Benefit Analysis of oil spill response strategies and tactics + Oversee the implementation of scientific monitoring programs in an oil spill response + Provide liaison for implementation of the WA Oiled Wildlife Response Plan in an oil spill response

Santos Management / IMT Role	Main Responsibilities
HR / Welfare Team Leader	+ Obtain personnel status involved in the incident + Review Persons on Board (POB) lists and clarify accuracy through Safety Team Leader + Obtain list of Contactor Companies involved in the incident and obtain 3rd-Party Contractor contact to advise of situation and safety of personnel when appropriate + Obtain employee's emergency contact list (NOK) to advise of situation and safety of personnel when appropriate + Liaise with the CMT HR Team Leader + Work with Logistics Team Leader to arrange transport for affected families to hospitals etc + Assist with arrangements through Employee Assistance Program (EAP) to support families/employees + Validate media and holding statements information with regards to personnel matters + Work with Public Information on content of internal statements to staff and approved by CMT + Put EAP on alert if appropriate + Work with Police welfare person or doctors as required + Be prepared to accompany police to provide initial company support + Arrange NOK notifications for affected personnel (excluding Police managed fatalities); + Determine NOK assistance required i.e. family travel to hospital, child support, etc; + Arrange for dedicated management support for families and next-of-kin, if appropriate; and + Arrange EAP counselling at airports and homes where required – HR personnel to attend where possible.
Safety Team Leader	+ Manage notification to Designated Safety Authorities and liaise as required + Assist in the development of IAPs + Oversee the development and implementation of incident Safety Management Plans as required + Work with the HR / Welfare Team Leader to support personnel safety
IMT Data Manager	+ Ensure IMT resources are in place and functional in the ICC + Oversee the setting up of communications systems + Establish the incident/exercise specific electronic folder system for records/information management + Distribute manuals, contact lists and supporting information to IMT personnel + Record and collect all information associated with the response to the incident + Maintain filing system for Incident Response

Santos Management / IMT Role	Main Responsibilities
GIS	+ Manage and keep up-to-date facility and asset drawings, data sets, and photos in the 'GIS in IMT Database' + Manage and keep up-to-date environmental features and sensitivity data sets in the 'GIS in IMT Database' + Manage and keep up-to-date marine maps in the 'GIS in IMT Database' + Provide IMT with quick access to up-to-date drawings and data sets in the ICC + Provide software system to IMT that allows tactical response mapping overlays on facility drawings and area maps
Finance	+ Handle accounting services and financial record-keeping, track and report on incident costs + Facilitate all procurement requirements and ensure that expenditures are properly audited + May be tasked with handling the receipt and processing of IMT third party claims.
Drilling/Source Control	+ Provide specific advice and support to the IMT on source control matters. + Activates and supervises drilling/source control elements in accordance with the Incident Action Plan (IAP) and directs its execution. + Directs dedicated source control equipment, requests or releases resources, approves group operational plans, and approves source control changes to the IAP as necessary.
Spill Response	+ Provide specific advice and support to the IMT on spill response matters, excluding source control. + Activates and supervises spill response elements in accordance with the Incident Action Plan (IAP) and directs its execution. + Directs dedicated spill response equipment, requests or releases resources, approves group operational plans, and approves spill response changes to the IAP as necessary.
Air Operations	+ Provide specific advice and support to the IMT on air operation matters. + Activates and supervises air operation elements in accordance with the Incident Action Plan (IAP) and directs its execution. + Directs dedicated air operations equipment, requests or releases resources, approves group operational plans, and approves air operations changes to the IAP as necessary.
Situation /Log Keeper	+ Maintain the IMT main event log. + Collate inputs from other IMT members into the main event log. + Assist with updating status boards, and other visual displays. + Collate IMT information on stand down.
Information Systems (IS)	+ Provide specific advice and support to the IMT on IS matters. + Activate and lead IS support resources as required.

Santos Management / IMT Role	Main Responsibilities
Subject Matter Expert	+ Provide specific advice to the IMT on your area of expertise. + Develop assessments and strategies to address the incident. + Activate and lead an SME support team as required.

Table 5-3: Roles and Responsibilities in the field-based response team

Field-Based Position	Main Responsibilities
On-Scene Commander (MODU)	+ Assess facility-based situations + Single point of communications between facility/site and IMT + Communicates the incident response actions and delegates actions to the Incident Coordinator + Manage the incidents in accordance with MODU IRP + Coordinates medical evacuations as required + Refer to the MODU IRP for detailed descriptions of roles and responsibilities
Company Site Representative (CSR)	+ Notifies the Perth based Incident Commander of oil spills + Coordinates onsite monitoring of oil spill and ongoing communication with Incident Commander
Off-Asset On Scene Commander	+ Coordinates the field response as outlined in the Incident Action Plan developed by the IMT + Commands a FOB for the coordination of resources mobilised to site
Off-Asset Oil Spill Response Teams	+ Respond to oil spills at sea to minimise the impacts to as low as reasonably practical + Refer to activity specific Oil Spill Contingency Plans (OSCP) and Oil Pollution Emergency Plans (OPEP) for detailed descriptions of roles and responsibilities within the Off-Asset Oil Spill Response Team
Source Control Team	+ Respond to incidents involving well loss of containment to stop the flow of oil to sea + Refer to the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) for detailed descriptions of roles and responsibilities within the Source Control Team
Oiled Wildlife Response Team	+ Respond to oiled wildlife incidents to minimise the impacts to wildlife + Refer to the Western Australia Oiled Wildlife Response Plan for detailed descriptions of roles and responsibilities within the Oiled Wildlife Response Team
Scientific Monitoring Teams	+ Monitor the impacts and recovery to sensitive receptors from an oil spill and associated response actions + Refer to the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162) for detail on Scientific Monitoring Team roles and responsibilities

Table 5-4: Department of Transport (DoT) roles embedded within Santos' CMT/IMT

DoT roles embedded within Santos IMT	Main Responsibilities
DoT Liaison Officer (prior to DoT assuming role of Control Agency) Deputy Incident Controller – State waters (after DoT assumes Controlling Agency)	+ Facilitate effective communications between DoT's State Marine Pollution Coordinator (SMPC) / Incident Controller and Santos' appointed CMT Leader/ Incident Commander + Provide enhanced situational awareness to DoT of the incident and the potential impact on State waters + Assist in the provision of support from DoT to Santos + Facilitate the provision of technical advice from DoT to Santos Incident Commander as required
Media Liaison Officer	+ Provide a direct liaison between the Santos Media team and DoT IMT Media team + Facilitate effective communications and coordination between the Santos and DoT media teams + Assist in the release of joint media statements and conduct of joint media briefings + Assist in the release of joint information and warnings through the DoT Information & Warnings team + Offer advice to the Santos Media Coordinator on matters pertaining to DoT and wider Government media policies and procedures

Table 5-5: Santos Personnel Roles Embedded within the State Maritime Environmental Emergency Coordination Centre (MEECC)/ Department of Transport (DOT) IMT

Santos roles embedded within the State MECC/ DoT IMT	Main Responsibilities
CMT Liaison Officer[3]	+ Provide a direct liaison between the Santos IMT and the State MEECC + Facilitate effective communications and coordination between the Santos CMT Leader and the SMPC + Offer advice to SMPC on matters pertaining to Santos crisis management policies and procedures
Deputy Incident Controller	+ Provide a direct liaison between the DoT IMT and the Santos IMT + Facilitate effective communications and coordination between the Santos Incident Commander and the DoT Incident Controller + Offer advice to the DoT Incident Controller on matters pertaining to the Santos incident response policies and procedures

[3] The role described as the Santos Liaison Officer (CMT) in Figure 5-2

Santos roles embedded within the State MECC/ DoT IMT	Main Responsibilities
	+ Offer advice to the Safety Coordinator on matters pertaining to Santos safety policies and procedures particularly as they relate to Santos employees or contractors operating under the control of the DoT IMT
Deputy Intelligence Officer	+ As part of the Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness + Facilitate the provision of relevant modelling and predications from the Santos IMT + Assist in the interpretation of modelling and predictions originating from the Santos IMT + Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the Santos IMT + Facilitate the provision of relevant mapping from the Santos IMT + Assist in the interpretation of mapping originating from the Santos IMT + Facilitate the provision of relevant mapping originating from the Santos IMT
Deputy Planning Officer	+ As part of the Planning Team, assist the DoT Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans + Facilitate the provision of relevant IAP and sub plans from the Santos IMT + Assist in the interpretation of the Santos OPEP from Santos IMT + Assist in the interpretation of the Santos WA IAP and sub plans from the Santos IMT + Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the Santos IMT + Assist in the interpretation of Santos' existing resource plans + Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the Santos IMT + (Note this individual must have intimate knowledge of the relevant Santos OPEP and planning processes)
Environment Support Officer	+ As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process + Assist in the interpretation of the Santos OPEP and relevant Tactical Response Plans (TRPs) + Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the Santos IMT + Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the Santos IMT

Santos roles embedded within the State MECC/ DoT IMT	Main Responsibilities
Deputy Public Information Officer[4]	+ As part of the Public Information Team, provide a direct liaison between the Santos team and DoT IMT Media team + Facilitate effective communications and coordination between Santos and DoT media teams + Assist in the release of joint media statements and conduct of joint media briefings + Assist in the release of joint information and warnings through the DoT Information & Warnings team + Offer advice to the DoT Media Coordinator on matters pertaining to Santos media policies and procedures + Facilitate effective communications and coordination between Santos and DoT Community Liaison teams + Assist in the conduct of joint community briefings and events + Offer advice to the DoT Community Liaison Coordinator on matters pertaining to Santos community liaison policies and procedures + Facilitate the effective transfer of relevant information obtained from through the Contact Centre to the Santos IMT
Deputy Logistics Officer	+ As part of the Logistics Team, assist the Logistics Officer Supply in the performance of their duties in relation to the provision of the management and disposal of waste collected in State-waters. + Facilitate the acquisition of appropriate supplies through Santos's existing OSRL, AMOSC and private contract arrangements + Collects Request Forms from DoT to action via the Santos IMT (Note this individual must have intimate knowledge of the relevant Santos logistics processes and contracts)
Deputy Waste Management Co-ordinator	+ As part of the Logistics Team, assist the Logistics Officer Supply in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters; + Facilitate the acquisition of appropriate services and supplies through Santos' existing private contract arrangements related to waste management; and + Collects Waste Collection Request Forms from DoT to action via the Santos IMT.
Deputy Finance Officer	+ As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through Santos' existing OSRL, AMOSC and private contract arrangements

[4] In the event of an incident, access to media and communications response strategy and a comprehensive stakeholder list inclusive of all potentially relevant stakeholders, including indigenous organisations are contained via Santos internal intranet site for use by CMT/IMT members

Santos roles embedded within the State MECC/ DoT IMT	Main Responsibilities
	+ Facilitate the communication of financial monitoring information to the Santos to allow them to track the overall cost of the response + Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to Santos
Deputy Operations Officer	+ As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident; + Facilitate effective communications and coordination between the Santos Operations Section and the DoT Operations Section; + Offer advice to the DoT Operations Officer on matters pertaining to Santos incident response procedures and requirements; and + Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of Santos and DoT response efforts.
Deputy Division Commander (FOB)	+ As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction; + Provide a direct liaison between Santos' FOB/s and the DoT FOB; + Facilitate effective communications and coordination between Santos FOB Operations Commander and the DoT FOB Operations Commander + Offer advice to the DoT FOB Operations Commander on matters pertaining to Santos incident response policies and procedures + Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to Santos employees or contractors + Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to Santos safety policies and procedures

5.2 Regulatory arrangements and external support

5.2.1 Australian Marine Oil Spill Centre (AMOSC)

Santos is a Participating Company of AMOSC and as such has access to AMOSC's Level 2 and 3 resources as outlined in the AMOSPlan.

AMOSC has contracts with all its member companies to enable the immediate release of Oil Spill Response Core Group personnel to be made available for any Santos requirements, as outlined in Santos' *Master Service Contract* and *Principle and Agency Agreement* with AMOSC.

The mutual aid arrangements that AMOSC operates under are collaborated under the AMOSPlan. This provides the mechanism for members of AMOSC to access oil spill response capability of other members. To further enhance the mutual aid arrangements, Santos, BHPB, Chevron and Woodside have signed a Memorandum of Understanding (MOU) that defines the group's mutual aid arrangements. Under this MoU, Santos, BHPB, Chevron and Woodside have agreed to use their reasonable endeavours to assist in the provision of emergency response services, personnel, consumables and equipment.

5.2.2 Australian Maritime Safety Authority (AMSA)

AMSA is the designated Control Agency for oil spills from vessels within Commonwealth jurisdiction.

Upon notification of an incident involving a ship, AMSA will assume control of the incident and response in accordance with AMSA's Marine Pollution Response Plan. AMSA's Marine Pollution Response Plan is the operational response plan for the management of ship-source incidents. AMSA is to be notified immediately of all ship-source incidents through RCC Australia (Santos Incident Response Telephone Directory (SO 00 ZF 00025.020)).

An MoU has been established between Santos and AMSA, outlining respective roles and responsibilities when responding to vessel-sourced marine pollution incidents and petroleum activity related marine pollution incidents.

AMSA manages the NatPlan, Australia's key maritime emergency contingency and response plan. All resources under the NatPlan are available to Santos through request to AMSA under the arrangements of the MoU.

For any oil pollution event, Santos agrees to notify AMSA immediately in the interests of facilitating the most efficient and effective response to the incident.

5.2.3 Western Australia Department of Transport (DoT)

In the event that a Level 2/3 Marine Oil Pollution Incident enters, or has potential to enter, State waters, the HMA (DoT Director General or proxy) will take on the role as the State Marine Pollution Coordinator (SMPC) and DoT will take on the role as a Control Agency.

Santos will notify the DoT Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable (within two hours of spill occurring) of such an incident. On notification, the HMA will activate their MEECC and the DoT IMT.

For facility oil spills entering State waters (i.e. across jurisdictions) both Santos and DoT will be Control Agencies. Santos will work in partnership with DoT during such instances, as outlined within the DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements Available online: [DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements].

Santos will conduct initial response actions in State waters as necessary in accordance with its OPEP and continue to manage those operations until formal handover of incident control is completed. Appendix 1 within DoT’s Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements provides a checklist for formal handover.

For a cross-jurisdictional response, there will be a Lead IMT (DoT or Santos) for each spill response activity, with DoT’s control resting primarily for State waters activities.

Appendix 2 within DoT’s *Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements* provides guidance on the allocation of a Lead IMT to response activities for a cross jurisdictional spill.

To facilitate coordination between DoT and Santos during a cross jurisdictional response, a Joint Strategic Coordination Committee (JSCC) will be established. The JSCC will be jointly chaired between the SMPC and a nominated senior representative of Santos and will ensure alignment of objectives and provide a mechanism for de-conflicting priorities and resourcing requests.

For a cross jurisdictional response Santos will be responsible for ensuring adequate resources are provided to DoT as Control Agency, initially 11 personnel to fill roles in the DoT IMT or FOB and operational personnel to assist with those response strategies where DoT is the Lead IMT. Concurrently DoT will also provide two of their personnel to the Santos IMT as described in **Figure 5-2**. Santos’ CMT Liaison Officer and the Deputy Incident Controller are to attend the DoT Fremantle ICC as soon as possible after the formal request has been made by the SMPC. It is an expectation that the remaining initial cohort will attend the DoT Fremantle ICC no later than 8am on the day following the request being formally made to Santos by the SMPC.

Figure 5-2 shows the organisational structure of Santos incident management personnel within Santos IMT and embedded within DoT’s MEECC/IMT.

Figure 5-3 shows the overall cross jurisdictional organisational structure referenced from the SHP-MEE.

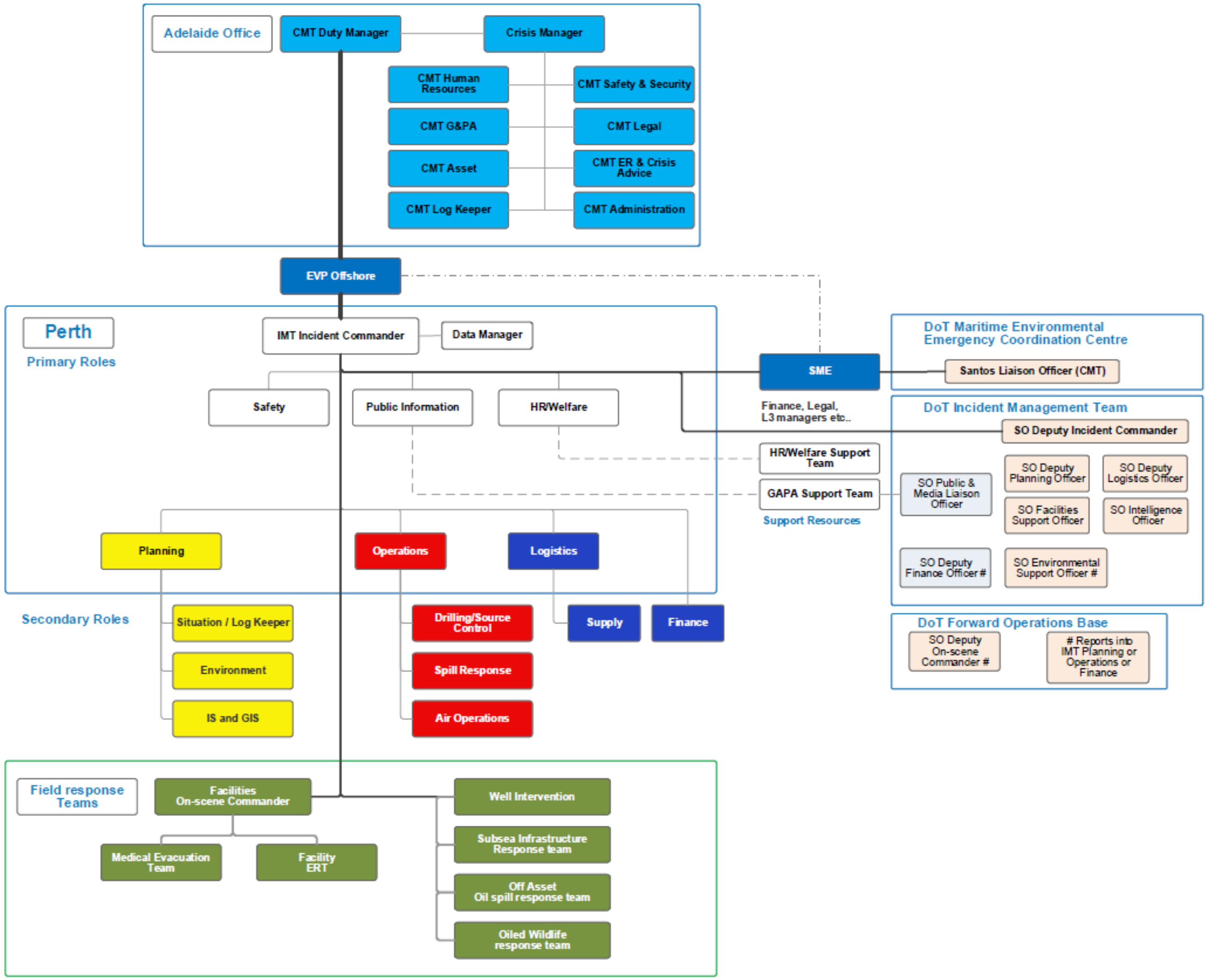

Figure 5-2: Cross jurisdictional incident management structure for Commonwealth waters Level 2/3 facility oil pollution incident entering State waters

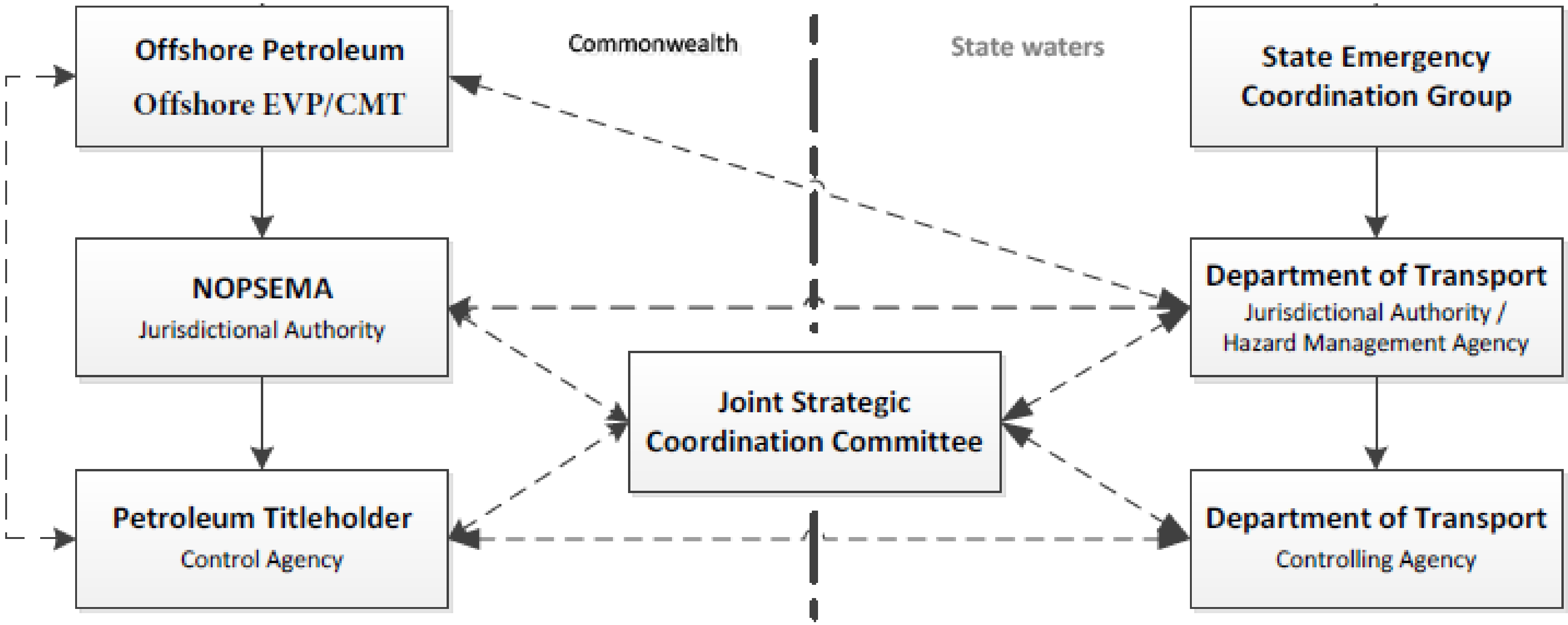

Figure 5-3: Overall control and coordination structure for offshore petroleum cross-jurisdiction incident

5.2.4 WA Department of Biodiversity, Conservation and Attractions (DBCA)

The Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) is a Statutory Authority responsible for the management of State national parks, reserves and marine parks. and for the conservation of native wildlife, including protected marine and coastal fauna. The *Biodiversity Conservation Act 2016* (WA) is the legislation that provides DBCA with the responsibility and Statutory Authority to treat, protect and destroy wildlife. In State waters, DBCA is the Jurisdictional Authority for Oiled Wildlife Response (OWR), providing advice to the Control Agency (DoT). The role of DBCA in an OWR is outlined in the Western Australian Oiled Wildlife Response Plan (WAOWRP) and regional sub-plans.

For a Level 2/3 petroleum spill that originates within or moves into State waters, DoT will be the Control Agency responsible for overall command of an oiled wildlife response. Santos will provide all necessary resources (equipment and personnel primarily through AMOSC membership) to DoT to facilitate this response.

For matters relating to environmental sensitivities and scientific advice in State waters DBCA may provide an Environmental Scientific Coordinator to support the SMPC and/or DoT Incident Controller. This may include advice on priorities for environmental protection, appropriateness of proposed response strategies and the planning and coordination of scientific monitoring for impact and recovery assessment.

5.2.5 Department of Foreign Affairs & Trade

In the event of a spill predicted to migrate into neighbouring countries Exclusive Economic Zone (EEZ), Santos will notify the Department of Foreign Affairs and Trade (DFAT), who will in turn notify the affected government(s) and engage on the preferred method for Santos to respond to minimise the impacts to ALARP. In most cases, NOPSEMA, DISER and DFAT will form an Inter-agency panel; the Australian Government Crisis Control Centre, who may request AMSA to coordinate the response operations across the trans-national boundary. Santos remain willing to respond as per the directions of the affected government and designated Control Agency, following approvals established between DFAT and the affected countries Government.

5.2.6 Oil Spill Response Limited

Through an associate membership, Santos has access to spill response services from OSRL with offices in Perth, Singapore, UK and at other various locations around the. In the event of a Level 2/3 response, Santos could access OSRL's international personnel, equipment and dispersants, primarily through OSRL's Singapore stockpile, to supplement resources available within Australia. Santos may also call on OSRL for technical services to support its IMT.

Response equipment and personnel are allocated on a 50% of inventory basis under OSRL's Service Level Agreement. Santos also has access to additional dispersant stockpiles held by OSRL through a Global Dispersant Stockpile Supplementary Agreement.

5.2.7 Department of Industry, Science, Energy and Resources

The Department of Industry, Science, Energy and Resources (DISER) will be the lead Commonwealth Agency for the provision of strategic oversight and Commonwealth government support to a significant offshore petroleum incident (including oil spill incidents). DISER will be notified by NOPSEMA of a significant oil pollution incident and under the Offshore Petroleum Incident Coordination Framework will stand up the Offshore Petroleum Coordination Committee as the mechanism to provide Commonwealth strategic advice and support to the incident. To facilitate information between the Petroleum Titleholder IMT and Offshore Petroleum Incident Coordination Committee (OPICC), Liaison Officer/s will be deployed from DISER to the Petroleum Titleholders IMT.

For incidents that are classified at a greater level than Significant (i.e. Crisis level) a whole of government crisis committee will be formed under the Australian Government Crisis Management Framework to provide strategic advice and support and the OPICC will not be convened, although DISER will remain as the lead agency.

5.3 External plans

Information from the following external documents have been used or referred to within this Plan:

AMOSPlan – Australian Industry Cooperative Spill Response Arrangements:

+ Details the cooperative arrangements for response to oil spills by Australian oil and associated industries.

Offshore Petroleum Incident Coordination Framework:

+ Provides overarching guidance on the Commonwealth Government's role and responsibilities in the event of an offshore petroleum incident in Commonwealth waters.

NatPlan - National Plan for Maritime Environmental Emergencies and National Marine Oil Spill Contingency Plan:

+ Sets out national arrangements, policies and principles for the management of maritime environmental emergencies. The Plan provides for a comprehensive response to maritime environmental emergencies regardless of how costs might be attributed or ultimately recovered.

SHP-MEE- Western Australia State Hazard Plan for Maritime Environmental Emergencies:

+ Details the management arrangements for preparation and response to a marine pollution incident occurring in State waters.

DoT Oil Spill Contingency Plan:

+ Defines the steps required for the management of marine oil pollution responses that are the responsibility of the DoT; and
+ DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (available online: DoT's Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements).

Ship-board Oil Pollution Emergency Plans:

+ Under the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements, all vessels of over 400 gross tonnage are required to have a current Ship-board Oil Pollution Emergency Plans (SOPEP). The SOPEP includes actions to be taken by the crew in the event of an oil spill including steps taken to contain the source with equipment available onboard the vessel.

Western Australia Oiled Wildlife Response Plan (WAOWRP):

+ Defines the steps, personnel, equipment and infrastructure required for the management of wildlife in an oil pollution response. Each region has a Regional Oiled Wildlife Response Plan that gives further details on sensitivities and available resources. The Pilbara Region Oiled Wildlife Response Plan is the relevant regional plan for OWR associated with the Van Gogh phase 2 drilling and completions activities.

Oil Spill Response Limited Associate Agreement:

+ Defines the activation and mobilisation methods of OSRL spill response personnel and equipment allocated under contract.

Australian Government Coordination Arrangements for Maritime Environmental Emergencies:

+ Provides a framework for the coordination of Australian Government departments and agencies in response to maritime environmental emergencies.

5.4 Cost Recovery

As required under Section 571(2) of the *OPGGS Act 2006*, Santos has financial assurances in place to cover any costs, expenses and liabilities arising from carrying out its Petroleum Activities, including major oil spills. This includes costs incurred by relevant Controlling Agencies (e.g. DoT) and third party spill response service providers.

5.5 Training and Exercises

In order to refresh IMT roles and responsibilities and provide familiarisation with OPEP processes and arrangements, IMT workshops are conducted as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

To familiarise the IMT with functions and processes, an OPEP Desktop and Activation Exercise is undertaken as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

All workshops and exercises undertaken are recorded in the Santos EHS Toolbox, with the key recommendations recorded and tracked.

5.5.1 Incident Management Team Training and Exercises

Santos provides training to its personnel to fill all required positions within the IMT.

Competency is maintained through participation in regular response exercises and workshops. Exercise and training requirements for Santos IMT members are summarised in **Table 5-6**.

Table 5-6: Training and Exercise Requirements for IMT Positions

IMT Role	Exercise	Training
Incident Commander Operations/ Drilling Team Leader	1 x Level 2 exercise annually or 2 x Level 2 desktop exercises annually.	PMAOMIR320; PMAOMIR418; and AMOSC – IMO3 Oil Spill Command & Control
Planning Team Leader Logistics Team Leader Environmental Team Leader		PMAOMIR320; and AMOSC – IMO2 Oil Spill Management Course
Safety Team Leader Supply Team Leader GIS Team Leader Data Manager HR/ Welfare Team Leader		PMAOMIR320; and AMOSC – Oil Spill Response Familiarisation Training

5.5.2 Oil Spill Responder Training

Santos has an internal capability of trained oil spill responders who can be deployed in the field in a spill response and has access to external, trained spill responder resources (**Table 5-7**).

Table 5-7: Spill Responder Personnel Resources

Responder	Role	Training	Available Number
Santos AMOSC Core Group Responders	Santos personnel trained and competency assessed by AMOSC as the AMOSC Core Group. Deployed by IMT for spill response operations	AMOSC Core Group Workshop (refresher training undertaken every 2 years). AMOSC – IMO1 Oil Spill Operators Course	12
Santos Aerial Observers	Undertake aerial surveillance of spill. Deployed by IMT in the aerial surveillance aircrafts.	AMOSC – Aerial Surveillance Course (refresher training undertaken tri-annually).	7
AMOSC Core Group Oil Spill Responders	Industry personnel as the AMOSC Core Group, available to Santos under the AMOSPlan. For providing incident management (IMT) and operations (field response) assistance.	AMOSC Core Group Workshop (refresher training undertaken every 2 years). AMOSC – IMO1 Oil Spill Operators Course and/or IMO2 Oil Spill Management Course.	As defined in Core Group Member Reports[5] Target to maintain at least 84 members (Ref: *AMOSC Core Group Program and Policies*)
OSRL Oil Spill Response Personnel	Oil Spill Response Ltd professionals, providing technical, incident management and operational advice and assistance available under Santos OSRL contract.	As per OSRL training and competency matrix.	18
AMOSC Oil Spill Response Specialists	Professionals providing technical, incident management and operational advice and assistance available under Santos-AMOSC contract.	As per AMOSC training and competency matrix.	8
Oiled Wildlife Response Roles (Level 5)	Refer **Section 16**.		
Monitoring Service Provider: Monitoring Coordination Team	MCT SMP Teams: Technical Advisers Field Team Leader	As defined in the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Capability defined in Monthly Capability Reports.

[5] An average of 41 personnel plus 16 AMOSC staff members available as of 5th May 2021.

Responder	Role	Training	Available Number
(MCT) and SMP Teams	Field Team Member		MCT – 5 personnel SMP Teams 12+ per team
Level 1 Oiled Wildlife Responders (Workforce Hire)	Provide oiled wildlife support activities under supervision.	No previous training required; on the job training provided.	Nominally over 1,000.
Shoreline clean-up personnel (Workforce Hire)	Manual clean-up activities under supervision.		

In addition to the resources listed in **Table 5-7**, the following resources are available for spill response and may be activated by the relevant Controlling Agency:

+ National Plan: National Response Team (NRT) – Trained oil spill response specialists, including aerial observers and shoreline clean-up personnel, deployed under the direction of AMSA and the IMT in a response. The NRT is trained and managed in accordance with the National Response Team Policy, approved by the National Plan Strategic Coordination Committee (AMSA, 2013b); and
+ State Hazard Plan for Maritime Environmental Emergencies (SHP – MEE): State Response Team (SRT)– Oil pollution response team available to assist under the jurisdiction of the DoT. SRT members remain trained and accredited in line with the SHP - MEE requirements.

In the event of a spill, the trained spill responders listed in **Table 5-7** would be required to undertake various roles in key spill response operations, including operational monitoring, shoreline protection, shoreline clean-up, oiled wildlife response and scientific monitoring.

In the event of a spill, Team Leader roles for protection and deflection and shoreline clean-up would be filled through Santos AMOSC Core Group Responders and then industry Core Group Responders.

5.5.3 Testing Arrangements

Santos has oil spill response testing arrangements in place in accordance with the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG- 10001). Testing of key response provider arrangements may be done as part of larger exercises or as standalone tests where the capability and availability of resources through the response provider are assessed against the performance requirement.

The testing arrangements are captured within the Testing Arrangements Plan in **Appendix C**.

5.5.4 Testing Arrangements Plan

Santos has developed a Testing Arrangements Plan (**Appendix C**) appropriate to the nature and scale of activities covered in this OPEP, for the following response arrangements as identified in this OPEP:

1. Source Control
2. Monitor & Evaluate
3. Mechanical Dispersion
4. Shoreline Deflection & Protection

5. Shoreline Clean-Up
6. Oiled Wildlife Response
7. Waste Management
8. Scientific Monitoring
9. IMT

Not all spill preparedness and response arrangements will be tested simultaneously. The frequency of testing will relate to the potential spill level, spill risk and complexity of response.

The testing for the above response arrangements forms part of the wider *Testing of Spill Response Arrangements* for Santos identified in the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG- 10001).

Santos employs a range of tests to ensure that the various response arrangements function as required. These tests include;

1. Contract/Plan Review
2. Audit
3. Notification/Communication Check
4. Desktop Exercise
5. Deployment Exercise
6. Level 2/3 IMT Exercise

Objectives are set for each of the tests identified for various response arrangements and the effectiveness of the response arrangements against these objectives are examined using pre-identified Key Performance Indicators (KPI). The objectives and KPIs for testing the response arrangements specified in this OPEP are detailed in **Appendix C**.

All testing activities are documented, and corrective actions or recommendations are tracked to closure. This is achieved through the Santos EHS Toolbox system. Once completed, records of testing arrangements are entered into Santos EHS Toolbox and any actions or recommendations identified are assigned a responsible party for completion. The status of completion is tracked through the 'Action module' in the EHS Toolbox and communicated widely through monthly EHS KPI reporting.

5.6 Oil Spill Audits

Oil spill response audits will follow the Santos Assurance Management Standard (SMS-MS15.1) and are scheduled as per the Santos annual assurance schedule. Audits will assist in identifying and addressing any deficiencies in systems and procedures. At the conclusion of the audit, any opportunities for improvement and/or corrective actions required (non-conformances) will be formally noted and discussed, with corrective actions developed and accepted. In some instances, audits may conclude with potential amendments to the OPEP.

The deployment readiness and capability of AMOSC's oil spill response equipment and resources in Geelong and Fremantle are audited every two years under the direction of AMOSC's participating members. The intent of this audit is to provide assurances to Santos and associated members about AMOSC's ability to respond to an oil spill incident as per the methods and responsibilities defined in Oil Pollution Emergency Plans and AMOSC's Service Level Statement.

The deployment readiness and capability of OSRL's oil spill response equipment and personnel are audited every two years by the Emergency & Oil Spill Coordinator. The intent of this audit is to provide assurances to Santos of OSRL's ability to respond to an oil spill incident as per the methods and responsibilities defined in Santos' OPEPs and OSRL's SLA.

6 Response strategy selection

6.1 Spill scenarios

This OPEP outlines strategies, actions and supporting arrangements applicable for all credible oil spill events associated with the Van Gogh Phase 2 drilling activities. Of the credible spill scenarios identified in the Van Gogh Phase 2 Drilling and Completions EP (TV-35-BI-20003), all have been selected to represent worst case spills from a response perspective, taking into account the following characteristics:

+ they represent all hydrocarbon types that could be spilt during activities;
+ they represent maximum credible release volumes;
+ those scenarios that represent the greatest spatial extent from a response perspective based on surface oil and shoreline accumulation as these are the key factors contributing to response; and
+ proximity to sensitive receptors, shorelines, State/Commonwealth boundaries etc.

Table 6-1 summarises the hydrocarbon spill risks that have been identified for activities under the EP.

Table 6-1: Hydrocarbon spill risks

<table>
<tr><th>Credible Scenario</th><th>Hydrocarbon Type</th><th>Maximum Credible Volume</th><th>Comment</th><th>EP Section</th></tr>
<tr><td>Surface release of crude as a result of LOWC</td><td rowspan="2">Theo 3 crude</td><td>350,566 m³ over 77 days</td><td rowspan="2">Maximum credible volume modelled – with highest flow potential derived by combining the highest reservoir flow parameters for the well</td><td rowspan="2">7.6</td></tr>
<tr><td>Seabed release of crude as a result of LOWC</td><td>319,723 m³ over 77 days</td></tr>
<tr><td>External damage to the NV operated subsea system within the WA-35-L permit</td><td>Van Gogh crude blend</td><td>1,681 m³ over 24 hours on an exponential rate of decline</td><td>This scenario been modelled (GHD, 2019) and presented in the Ningaloo Vision Operations EP (TV-00-RI-00003)

Response is managed through the Ningaloo Vision Operations OPEP (TV-00.RI-00003.02)</td><td>7.6</td></tr>
<tr><td>Surface release of MDO as a result of vessel collision</td><td>MDO</td><td>1519 m³ over 1 hour</td><td>Maximum credible volume based on vessels MDO bunker tanks, with the largest bunker tank having a capacity of 1519 m³</td><td>7.7</td></tr>
<tr><td>Release of MDO due to leaking or ruptured bunker transfer equipment</td><td>MDO</td><td>15 m³ over 15 minutes</td><td>-</td><td>7.7</td></tr>
</table>

Credible Scenario	Hydrocarbon Type	Maximum Credible Volume	Comment	EP Section
Minor hydrocarbon release (surface and subsea)	Hydraulic fluids, lubricant oils and (stored) waste oils	1 m^3	Includes: + hydraulic fluids, lubricant oils + ROV failure + loss of primary containment (drums, tanks, IBCs, etc.) due to handling, storage and dropped objects + vessel or MODU pipework failure or rupture, hydraulic hose failure, inadequate bunding + lifting – dropped objects damaging diesel infrastructure	7.8

6.2 Hydrocarbon characteristics

6.2.1 Theo-3 crude oil

Credible oil spills could involve releases of Theo-3 crude oil. A summary of Theo-3 crude oil properties is provided in **Table 6-2** based on assay data (**Appendix A**).

Assay data shows the oils are highly biodegradable and contain a very small proportion of volatiles (<7%), a relatively low proportion of semi-volatile components (29-32.5%) and a high proportion of persistent compounds (60.7-67%). Theo-3 has a negligible proportion of aromatic compounds (<1%) and wax content (<5%). Full assay results are available on the Emergency Response Intranet Page.

Theo-3 can be categorised as heavy Group IV oils (AMSA, 2015). They are fluid at winter and summer sea temperatures and are relatively viscous with a persistent fraction of oil remaining during weathering. They have a high flash point that presents a low fire and explosion hazard when fresh.

Table 6-2: Summary of Theo-3 crude oil properties

Hydrocarbon Type	Initial density (kg/m^3) @ 15°C	Viscosity (cSt)	Component by Volume (%)	Non-Persistent		Persistent		Aromatic content (v/v %)
				Volatiles (%)	Semi-volatiles (%)	Low Volatility	Residual (%)	
			BP (°C)	IBP–260	260–360	360–540	>540	
Theo-3 (Van Gogh)	951	@ 40 °C: 145.7	% of total	5.8	29.5	44.4	20.3	0.3

Source: Intertek (2009, 2010, 2012, 2016, 2019)

Weathering characteristics

RPS Group (2015) conducted an assessment on Theo-3 well for weathering properties and applicable spill response strategies, drawing on assay data and a laboratory weathering study (Leeder Consulting, 2007a, b). Key results are summarised below.

Oil appearance on water

Theo-3 has a dark brown colour and would appear as dark brown to black slicks which may sit low near the water surface due to the relatively high viscosity and high density.

Although sheens may be visible spreading from thicker slicks initially, indicating the spread of lower density components, sheens will likely be absent after the oil has weathered for 6-12 hours.

Evaporation/flammability

All oils have a high flash point (> 110°C) with low representation by highly volatile components (<10%), indicating low risk of flammable vapour concentrations being generated. Evaporation will occur slowly and only partially with a high proportion of low volatility/residual compounds (60-70%). Based on laboratory weathering studies losses from evaporation over a period of 3 days are expected to be less than 50% although there were some differences observed among oils (**Table 6-3**). Losses through evaporation levelled within or at approximately 3 days.

Table 6-3– Laboratory weathering results (% volume loss) for Theo-3

Oil	% volume loss after 24 hours		% volume loss after 3 days	
	Winter conditions[1]	Summer conditions[1]	Winter conditions[1]	Summer conditions[1]
Theo-3 (Van Gogh) (Leeder Consulting 2007a)	15	36	26	52

[1] Representative air and water temperatures for Summer and Winter at Ningaloo Vision site were used – refer to reports for specific details.

Viscosity, pour point and density

Theo-3 has a low initial pour point (-18 to 4 °C) which after 3 days of weathering, under summer and winter conditions, remain low and under the ambient temperatures at the spill site indicating that oils will remain liquid during initial weathering (**Table 6-4**). The viscosity of Theo-3 when fresh and after 3 days weathering indicate high viscosity and low spreading rates will occur due to gravity and surface tension. Viscosity and pour point increases during weathering (**Table 6-4**). For very weathered residues of these oils, assay derived pour point data indicates that highly weathered residues may be solid at ambient sea and air temperatures given residue pour points are typically above 50 °C.

Density also increases with weathering for Theo-3 (**Table 6-4**), but fresh and weathered oil densities are <1 and therefore oils should remain buoyant in sea water. Measurements of density of Theo-3 (Van Gogh) crude with weathering indicate stabilisation at around 0.985 kg/l, suggesting that the oil density would remain below seawater density (i.e. <1.025 kg/l) for weeks to months.

The high viscosity and lower density than seawater will also resist physical break-up and entrainment into the water column (as oil droplets). Consequently, the oil will tend to remain afloat as slicks of liquid oil on the water surface even under rough sea conditions, most likely separating into patches under rough conditions.

Exception to this expectation might occur if the oil gets churned by wave action along a sandy shoreline and suspended sediment binds with the oil to raise the density of the sediment/oil mixture above that of seawater. This might result in sinking of the oil/sediment mixture near shorelines.

Table 6-4 – Viscosity, pour point and density of Van Gogh oils during weathering

Oil	Season[2]	Viscosity[1] (Cst)			Pour point (°C)			Density @ 15° (mg/L)		
		0 h	24 h	3 d	0 h	24 h	3 d	0 h	24 h	3 d
Theo-3 (Van Gogh) (Leeder Consulting 2007a)	summer	48.5	248	885	-18	3	14	0.94	0.97	0.98
	winter	48.5	88.1	158	-18	-11	-4	0.94	0.97	0.98

[1] Viscosity measured at 60°C for Theo-3 oil

Emulsification potential

Emulsification testing has been conducted on Theo-3 (Van Gogh) crude. Laboratory results vary across these oils; laboratory testing (tumbling of oil sample and sea water) indicated no significant take up of water for Theo-3 oil.

Adhesion

The relatively high viscosity of Theo-3 (Van Gogh) crude e oil suggests that the oil will be cohesive and would adhere to surfaces such as sediment, infrastructure and the feathers of sea birds. The adhesion rate of the oil to a steel surface was observed to increase on weathering, consistent with the rise in viscosity. This indicates that the oil could be more problematic, in terms of physical impacts on biota, and for response (removal from surfaces, pumping etc.) as the oil weathers.

Dissolution of soluble, toxic, components

Theo-3 (Van Gogh) crude contains only a low proportion of soluble hydrocarbons. Where BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene) have been measured over weathering (Leeder, 2007a; Intertek, 2018), none of these compounds were detected above detection limits.

The high viscosity and tendency to remain as slicks instead of breaking up into droplets will also slow the rate of release of any soluble compounds that are present; by reducing the surface area available for exchange, indicating that soluble compounds that do leach from the oil would be widely spread, limiting concentrations that could occur.

Potential for oiled wildlife

The high viscosity of Theo-3 (Van Gogh) crude indicates the potential for physical smothering of intertidal fauna and habitats. The high viscosity also indicates a high potential physical effect of the oil on seabirds that come into contact with the oil, physically restricting their flight and swimming movement and coating their feathers to cause matting of the feather structure and impairing the waterproofing and thermoregulation properties they provide. Preening by the birds in response would expose them to ingestion of oil.

Dispersant amenability

Dispersant amenability studies have been performed on Theo-3 (Van Gogh) (Leeder, 2007b). Theo-3 oil was tested with Slickgone NS and Corexit 9527 dispersants. The testing of Theo-3 (Van Gogh) oil involved six weathered states of the oil ranging from 4 hours to 10 days old. Oil testing looked at dispersant efficacy immediately and 15 minutes after dispersant was applied. Summer and winter conditions (sea and air temperature) indicative of the Ningaloo Vision location were used for dispersant tests of Theo-3 (Van Gogh).

Dispersant efficacy results from 15 minutes following dispersant application are summarised in **Table 6-5** below. More comprehensive results and description of methods are available in the testing reports available on the Santos Emergency Response Intranet Page.

Table 6-5: Dispersant efficacy results for Van Gogh oils

Oil	Weathered state	Percentage of oil dispersed (%) by chemical dispersant at 15 mins			
		Corexit 9527	Corexit 9500	Slickgone NS	Finasol OSR 52
Theo-3 (Van Gogh) (Leeder Consulting 2007a)	Fresh	72 (s), 36 (w)	NR	45 (s), 28 (w)	NR
	24 h	38 (s), 25 (w)	NR	10 (s), 31 (w)	NR

Dispersant efficacy results at 15 minutes after application ranged from 10% to 72% noting that the dispersant result of 72% dispersion of Theo-3 crude was with Corexit 9527 which is currently not available.

Efficacy of Theo-3 (Van Gogh) has a range across testing (10 – 72%). For Corexit 9527 efficacy on Theo-3 (Van Gogh) ranged from 25 to 72% with greater efficacy in summer conditions and on fresh oil. For Slickgone NS, efficacy on Theo-3 crude ranged from 10 to 45% (**Table 6-5**) with better or equivalent efficacy on fresh oil than 24-hour weathered oil. Further testing on more weathered oils revealed that efficacy declined on oils weathered more than 24 hours under summer conditions; for oil weathered for 3 days efficacy had declined to 4-5% under these conditions (Leeder Consulting, 2007b). This effect was less noticeable under winter conditions; efficacy declined to 16 to 34% (Leeder Consulting, 2007b).

This rapid decline in efficacy following application may be attributable to the dispersant behaviour, coalescence of oil droplets and gravitational separation over time, however this may be in part due to the experimental set-up. It is noted that in the open ocean the dilution of a dispersed oil can happen very quickly. However, this is highly dependent on environmental conditions such as wind and wave action. This dilution and transportation through the water column (both vertically and laterally) can have a significant effect on preventing re- coalescence and can offset the factors described above. The results discussed above do not factor in any dilution of the dispersed oil/emulsions and therefore should be treated accordingly.

6.2.2 Marine diesel fuel oil

In the marine environment, marine diesel oil will generally:

+ Spread rapidly in the direction of prevailing wind and current;
+ Evaporate rapidly from the sea surface (under calm conditions this will be the dominant process removing oil from the marine environment);
+ The evaporation rate of diesel will increase in warmer air and sea temperatures;
+ As wind speed increases and breaking waves form, entrainment and dispersion of diesel under the sea surface, and biodegradation processes will increase; and
+ Diesel residues (5% of total volume) are made up of larger carbon chain compounds that are likely to degrade over a longer period of time in the environment.

Marine diesel is characterised as a light Group II hydrocarbon under the AMSA Hydrocarbon Characterisation System (**Table 6-6**).

Table 6-6: Characteristics of marine diesel

Initial density (kg/m^3)	Viscosity (cP) @ 25°C	Component	Volatiles	Semi-volatiles	Low volatility	Residual
		BP (°C)	<180	180–265	265–380	>380
836.8	4.0	% of total	6.0	34.6	54.4	<5.0

The weathering assessment of an instantaneous 100 m^3 surface release of marine diesel oil under different wind conditions is presented graphically in **Figure 6-1.**

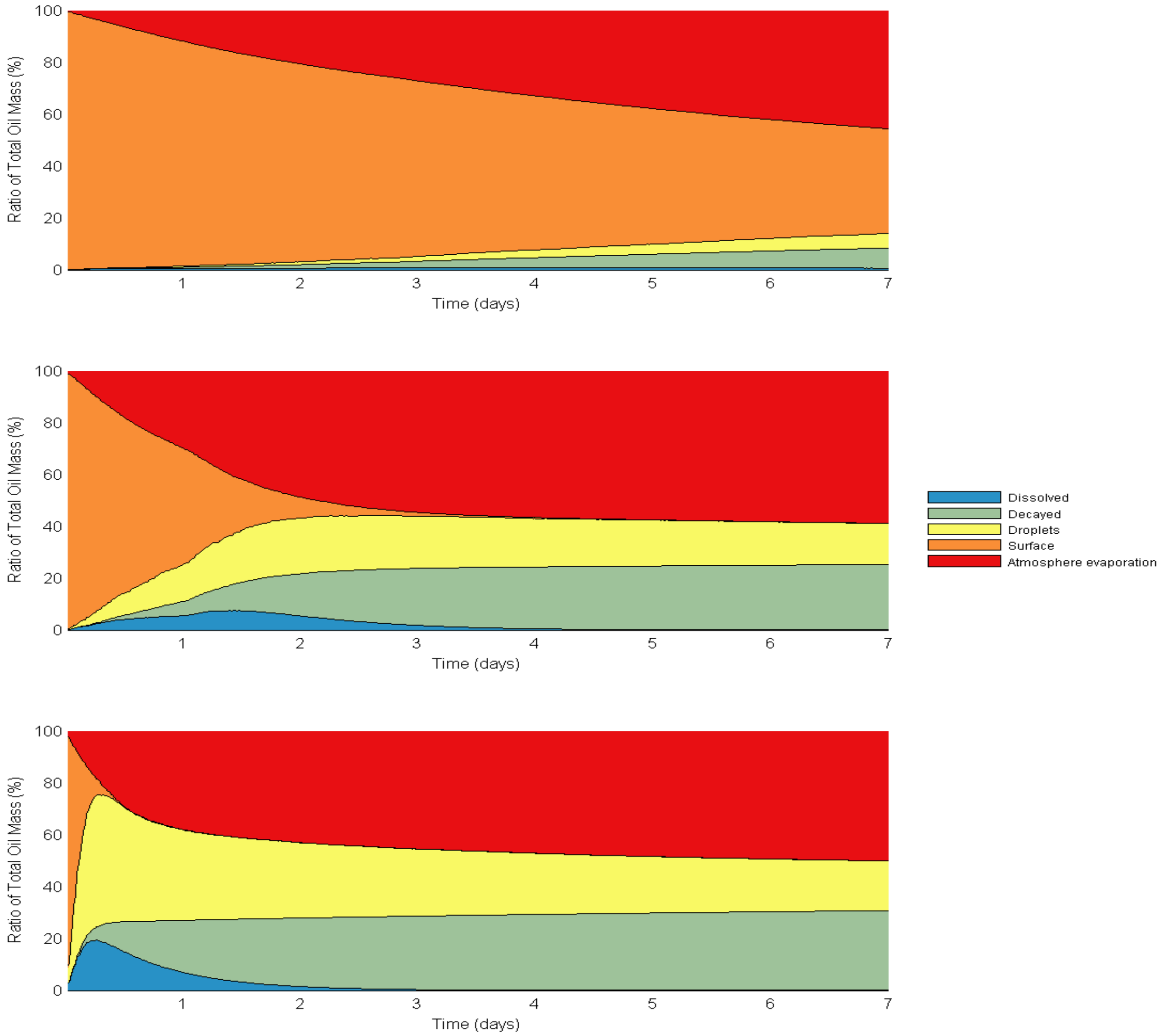

Figure 6-1: Partitioning of Marine Diesel mass - wind speeds of $5ms^{-1}$ (top) $10ms^{-1}$ (middle) and $20ms^{-1}$ (bottom)

With a constant $5ms^{-1}$ wind, the surface film spreads over the first several days after which the rate of entrainment increases. The entrained (droplet) hydrocarbon component reaches a peak of 10% after 22 days. By this point, the surface hydrocarbons account for only 4% of the total mass. The surface hydrocarbons initially decrease below 1% of the total mass at day 28 at which point approximately 74% of the hydrocarbons have evaporated, 9% are entrained (droplet) hydrocarbons, 16% have biodegraded and less than 1% is dissolved.

With a constant $10ms^{-1}$ wind, both the initial evaporation and entrainment/dissolution rates increase relative to the $5ms^{-1}$ winds. The proportion of entrained (droplet) hydrocarbons rises rapidly to a peak of 22% after 52 hours. By this point, the surface hydrocarbons account for only 6% of the total mass. The surface hydrocarbons initially decrease below 1% of the total mass after 3 days at which point approximately 55% of the hydrocarbons have evaporated, 20% exists as entrained (droplet) hydrocarbons, 23% have biodegraded and 1% are dissolved. This represents approximately more than double the mass of entrained (droplet) hydrocarbons than predicted with 5ms^{-1} winds at the 1% surface oil threshold.

With a constant 20ms^{-1} wind, both the initial evaporation and entrainment/dissolution rates are further increased relative to the 10 ms^{-1} winds. The proportion of entrained hydrocarbons peaks at 51% at around 7 hours at which point the surface component accounts for 6% of the mass. At this point, the proportion of entrained oil is more than double compared to the 10ms^{-1} case. The mass of surface hydrocarbons initially decreases below 1% of the total mass after 10 hours, at which point approximately 26% has evaporated, 47% is entrained (droplet), 10% has biodegraded and 17% is dissolved.

6.2.3 Hydraulic and lubricating Oils

Hydraulic oils and lubricating fluids are expected to behave similarly to marine diesel when released to the marine environment, although lubricating oils are more viscous and so the spreading rates would be slightly slower. Hydraulic oils are medium oils of light to moderate viscosity and have a relatively rapid spreading rate and will dissipate quickly, particularly when high sea states afford rapid mixing.

6.3 Response planning thresholds

Environmental impact assessment thresholds are addressed in Section 7.5.4 of the EP. In addition to the environmental impact assessment thresholds, response thresholds have been developed for response planning to determine the conditions that response strategies would be effective. These are shown in **Table 6-7**.

Table 6-7: Surface hydrocarbon thresholds for response planning

Hydrocarbon concentration (g/m²)	Description
>1	+ Estimated minimum threshold for commencing some scientific monitoring components (refer to **Appendix D-F**)
>50	+ Estimated minimum floating hydrocarbon threshold for containment and recovery and surface dispersant application
>100	+ Estimated floating hydrocarbon threshold for effective containment and recovery and surface dispersant application + Estimated minimum shoreline accumulation threshold for shoreline clean-up

Containment and recovery effectiveness drops significantly with reduced oil thickness (McKinney and Caplis, 2017; NOAA, 2013). McKinney and Caplis (2017) tested the effectiveness of various oil skimmers at different oil thicknesses. Their results showed that the oil recovery rate of skimmers dropped significantly when oil thickness was less than 50 g/m².

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50 to 100 g/m² on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes Bonn Agreement Oil Appearance Codes (BAOAC) 1 to 3 (EMSA, 2010) (**Table 12-1**).

6.4 Spill modelling

To inform the risk assessment process, stochastic spill modelling has been conducted to identify spill trajectories for the level 2 and level 3 spill scenarios detailed in **Table 6-1**. Further detail on this modelling is available within the Van Gogh Phase 2 Drilling and Completions EP; refer to relevant EP sections as identified in **Table 6-1.** Stochastic spill modelling involves repetitive modelling of a spill scenario (spill runs) using representative historical environmental conditions to predict a number of potential spill trajectories.

6.4.1 Well blowout of crude oil

While a number of spill scenarios have been identified for this OPEP, the worst-case spill scenarios, in terms of volume spilled, area affected, and sensitive receptors contacted, are the following well blowout scenarios:

+ Well blowout at seabed releasing 319,723 m^3 of Theo-3 crude oil over a period of 77 days; and
+ Well blowout at MODU floor (sea surface) releasing 350,566 m^3 of Theo-3 crude oil over a period of 77 day (note, a larger volume of 352,185 m^3 was modelled for the surface release of crude over 77 days, however, is considered representative of the surface blowout release of 350,566 m^3 over 77 days).

The Environment that May Be Affected (EMBA) has been identified for these spill scenarios, along with key habitats, protected areas, EPBC Act listed threatened/migratory fauna, and socio-economic receptors (Section 3 of the EP).

Within the EMBA, Priority for Protection areas have been identified to guide spill response planning process. By focussing on these Priority for Protection areas, and investigating the modelled worst case blowout events and environmental conditions that could impact on these areas, the spill response needs have been identified for oil spill response preparation as defined within this OPEP.

This methodology behind this process is explained within Section 5 of the EP and the full process is detailed in Section 7.5 of the EP.

6.4.2 Worst case regional results

From all the replicated model runs for the well surface and seabed LOWC scenarios (150 runs were modelled per scenario), single runs (also referred to as deterministic runs) were selected on the basis of providing worst case results against the following criteria:

+ Maximum oil volume loading on shorelines;
+ Maximum length of shoreline oiled; and
+ Minimum time for contact (emergent receptors) by floating oil at >10 g/m^2.

Table 6-8 provides the results for these criteria for both sea surface and seabed LOWC scenarios.

Table 6-8: Worst case LOWC results for selected criteria

Criteria	Sea surface LOWC	Seabed LOWC
Maximum oil volume loading of shorelines (modelled run)	28,153 m^3 (SC1 Transition 050)	34,431 m^3 (SC2 Transition 027, Note 1)
Maximum length of shoreline oiled (modelled run)	982 km (SC1 Transition 050)	1,624 km (SC2 Transition 028)
Minimum contact time (>10 g/m^2) at emergent receptor (modelled run)	2.6 days (SC1 Winter 004)	1.2 days (SC2 Winter 001)

Source: RPS APASA (2015b) (Sea Surface blowout) ; RPS Group (2020) (Seabed blowout)

Note 1: Based on the recent update to the WCD for seabed release, 34,431m^3 is the new maximum oil ashore volume from the re-modelling done (RPS Group, 2020)

In terms of the volume of oil that could accumulate across all shorelines from a LOWC scenario, the environmental conditions associated with the 'SC1 Transition 050' run provided the worst-case results. The code 'SC1 Transition 050' refers to a Scenario 1 (sea surface) spill influenced by the 50th replicate set of historical environmental conditions within the transitional season (conditions starting in April or September). Although the seabed blowout oil ashore volume is higher, based on the deterministic modelling needs analysis, the surface worst case is still indicative of the worst-case requirement for the purpose of response planning.

The spill trajectory of this modelled run is illustrated in **Figure 6-2**, while the shoreline loading volumes are provided in **Figure 6-3**.

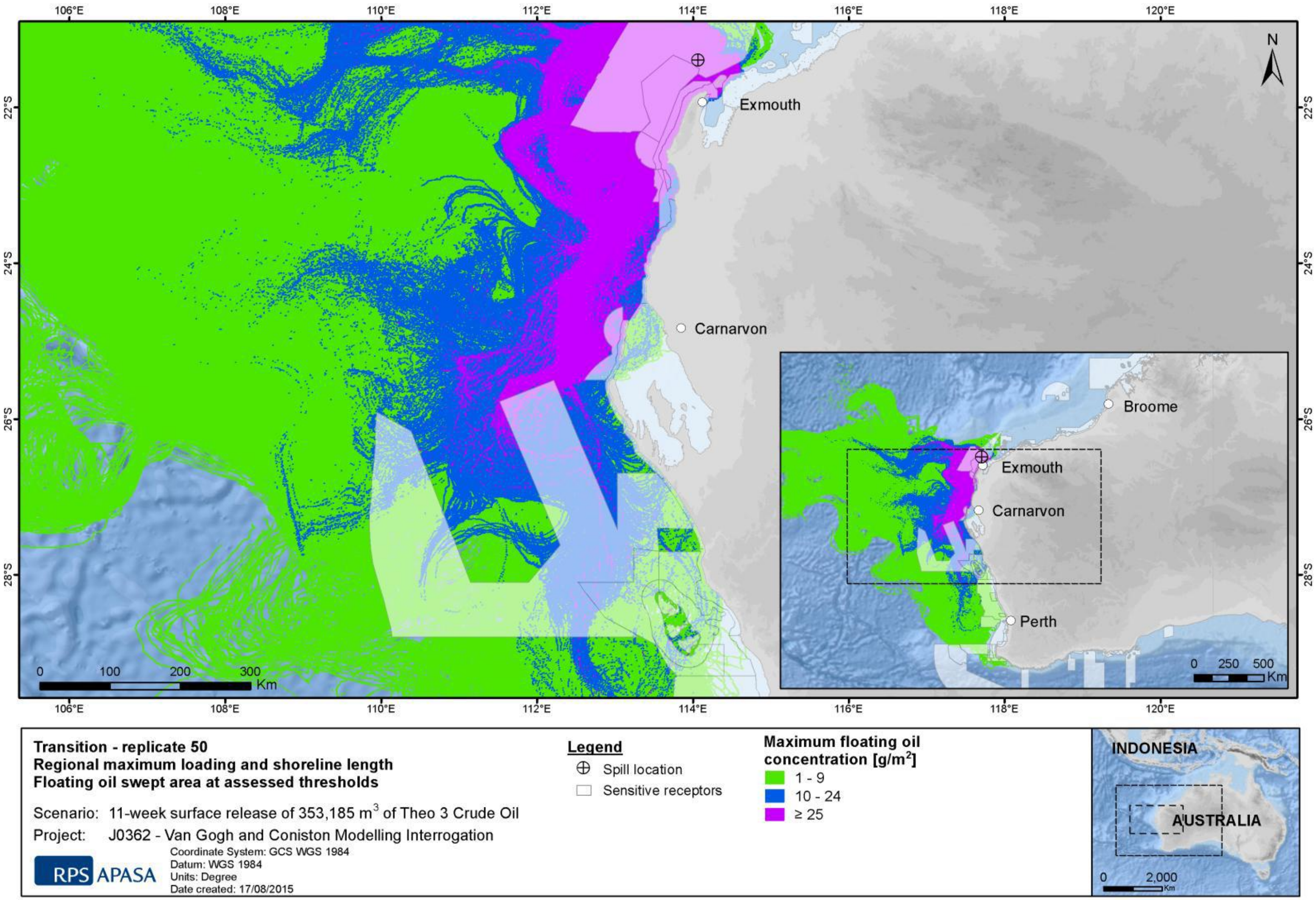

Figure 6-2: Spill trajectory of the modelled spill run - 'SC1 Transition 050'. Source: RPS APASA (2015c)

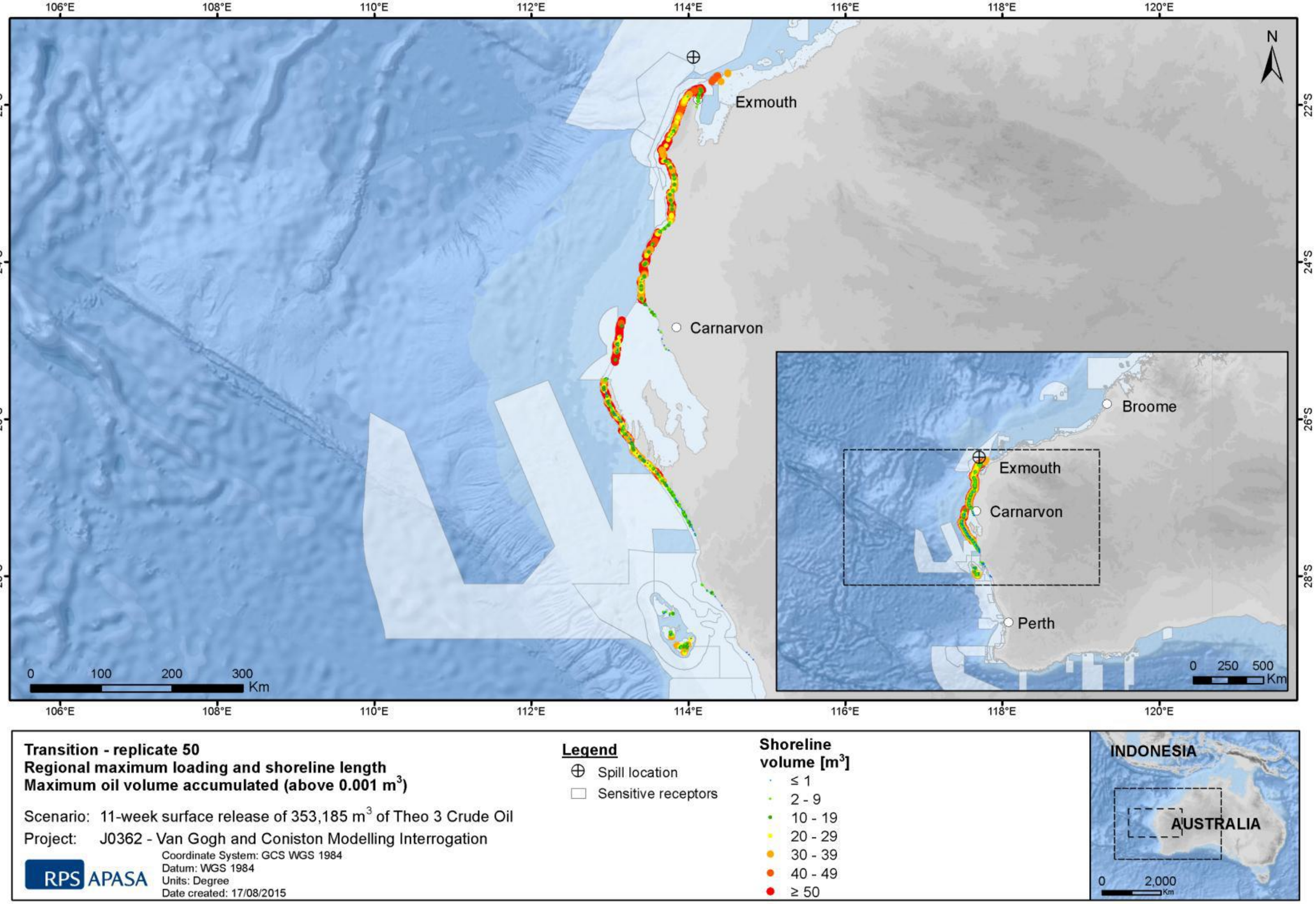

Figure 6-3: Shoreline loading distribution for the modelled spill run - 'SC1 Transition 050'. Source: RPS APASA (2015c)

6.4.3 Priority for Protection areas

The following Priority for Protection areas for spill response have been defined, as outlined in Section 7.5 of the EP:

- Ningaloo Coast North;
- Ningaloo Coast South;
- Muiron Islands;
- Exmouth Gulf Coast;
- Outer Shark Bay Coast;
- Carnarvon – Inner Shark Bay; and
- Eighty Mile Beach.

Spill modelling results have been interrogated to provide area-specific data for each of these Priority for Protection areas (RPS APASA, 2015c). As a basis for guiding spill response needs, area-specific data for the single worst-case volume of oil ashore run, i.e. the 'SC1 Transition 050' run, has been presented for each Priority for Protection area.

A summary of this data is provided in **Table 6-9**.

Shoreline loading graphs for each Priority for Protection area, showing oil arrival, oil loss and remaining oil volumes over time, have also been developed for the 'SC1 Transition 050' run and are presented in **Figure 6-4** to **Figure 6-9.** SC1 Transition 050 has been determined as the run provided the worst-case results (refer **Section 6.4.2**).

Table 6-9: Summary of modelled run results for Priority for Protection areas

Priority for Protection area	Criteria	'SC1 Transition 050' data
Ningaloo Coast North	Minimum time for floating oil contact at >10 g/m^2	6.7 days
	Maximum volume of oil loading on shorelines over the oil release period	11,180 m^3
	Maximum length of shoreline oiled over the oil release period	226 km
	Maximum entrained oil concentration over the oil release period	47 ppb
	Maximum DAH concentration over the oil release period	<1 ppb
Ningaloo Coast South	Minimum time for floating oil contact at >10 g/m^2	27 days
	Maximum volume of oil loading on shorelines over the oil release period	7,026 m^3
	Maximum length of shoreline oiled over the oil release period	154 km
	Maximum entrained oil concentration over the oil release period	4 ppb
	Maximum DAH concentration over the oil release period	NC
Muiron Islands	Minimum time for floating oil contact at >10 g/m^2	26 days
	Maximum volume of oil loading on shorelines over the oil release period	586 m^3
	Maximum length of shoreline oiled over the oil release period	8 km
	Maximum entrained oil concentration over the oil release period	3 ppb
	Maximum DAH concentration over the oil release period	NC
Exmouth Gulf Coast	Minimum time for floating oil contact at >10 g/m^2	27 days
	Maximum volume of oil loading on shorelines over the oil release period	354 m^3
	Maximum length of shoreline oiled over the oil release period	16 km
	Maximum entrained oil concentration over the oil release period	<1 ppb
	Maximum DAH concentration over the oil release period	<1 ppb
Outer Shark Bay Coast	Minimum time for floating oil contact at >10 g/m^2	41.2 days
	Maximum volume of oil loading on shorelines over the oil release period	8, 314 m^3
	Maximum length of shoreline oiled over the oil release period	246 km
	Maximum entrained oil concentration over the oil release period	4 ppb
	Maximum DAH concentration over the oil release period	NC
Carnarvon – Inner Shark Bay	Minimum time for floating oil contact at >10 g/m^2	44.2 days
	Maximum volume of oil loading on shorelines over the oil release period	344 m^3
	Maximum length of shoreline oiled over the oil release period	31 km
	Maximum entrained oil concentration over the oil release period	6 ppb
	Maximum DAH concentration over the oil release period	NC
	Minimum time for floating oil contact at >10 g/m^2	62 days

Eighty Mile Beach	Maximum volume of oil loading on shorelines over the oil release period	1, 313 m^3
	Maximum length of shoreline oiled over the oil release period	220 km
	Maximum entrained oil concentration over the oil release period	NC
	Maximum DAH concentration over the oil release period	NC

Note: NC denotes 'no contact'Source: RPS APASA (2015c)

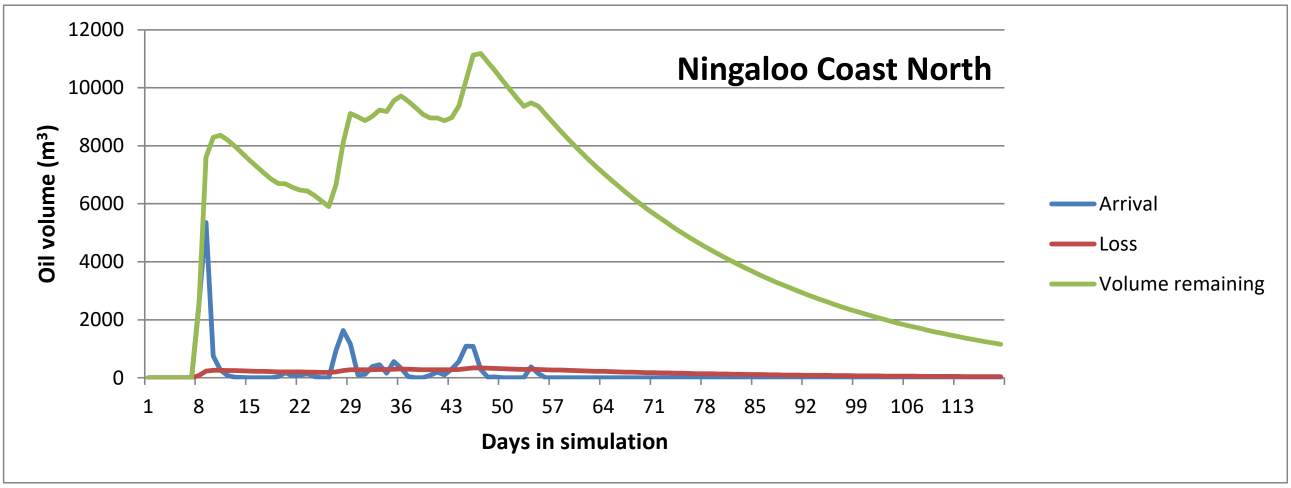

Figure 6-4: Shoreline loading over time at Ningaloo Coast North from spill run - 'SC1 Transition 050'

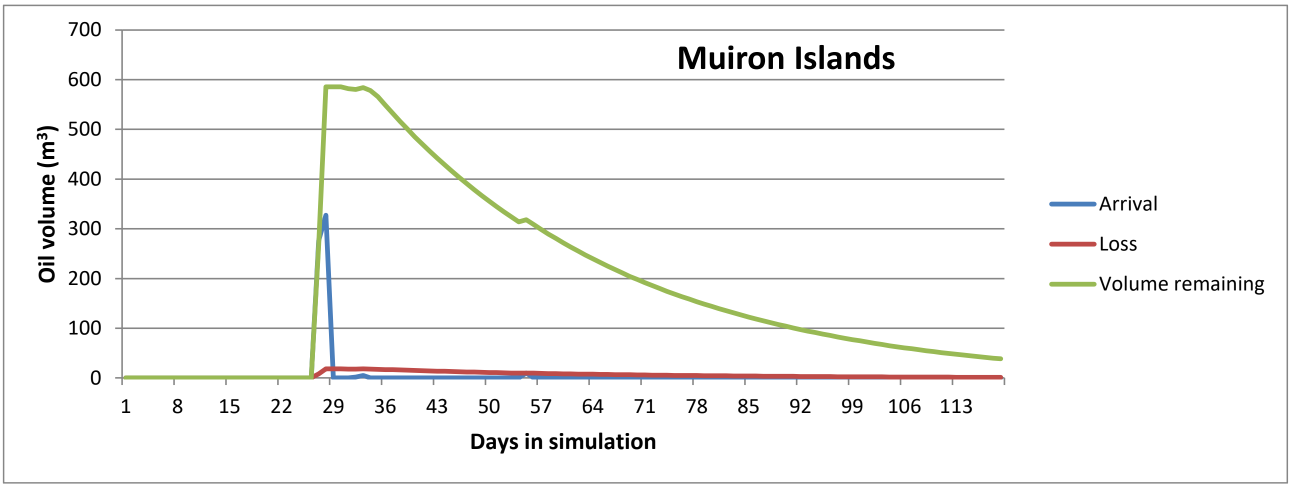

Figure 6-5: Shoreline loading over time at Muiron Islands from spill run - 'SC1 Transition 050'

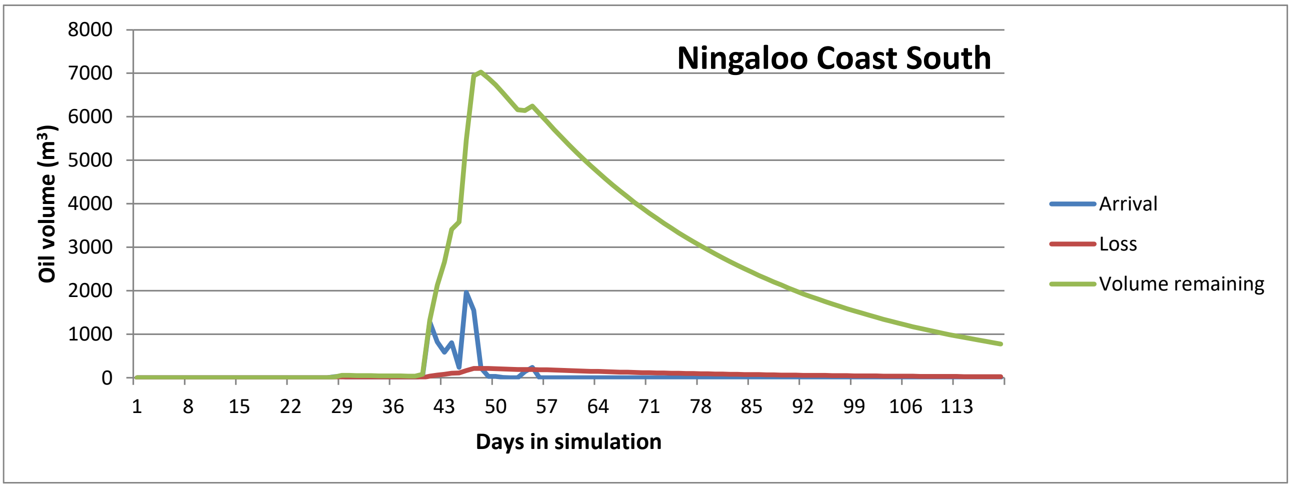

Figure 6-6: Shoreline loading over time at Ningaloo Coast South from spill run - 'SC1 Transition 050'

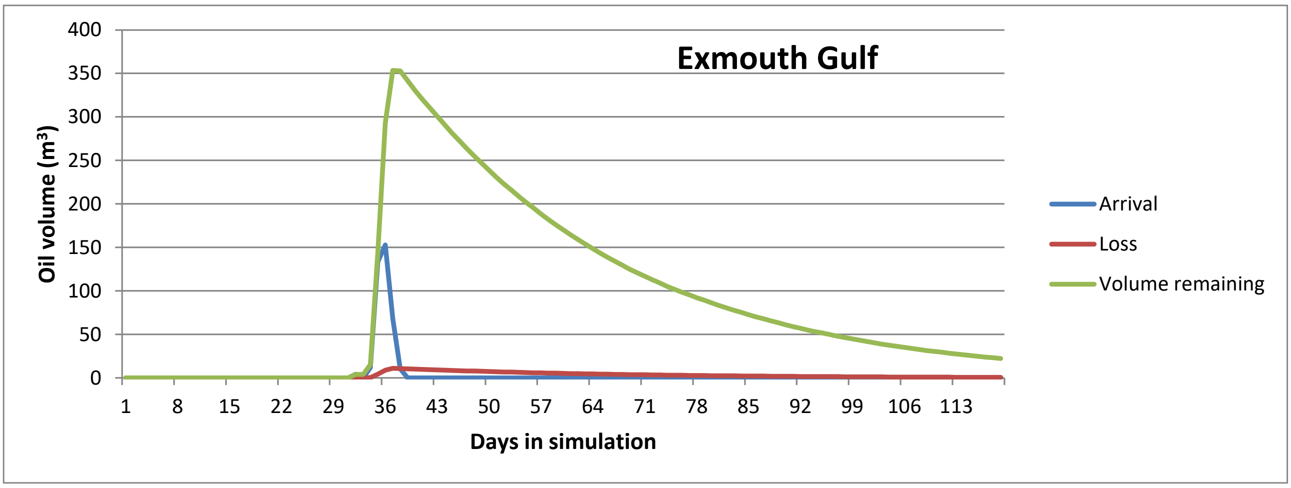

Figure 6-7: Shoreline loading over time at Exmouth Gulf from spill run - 'SC1 Transition 050'

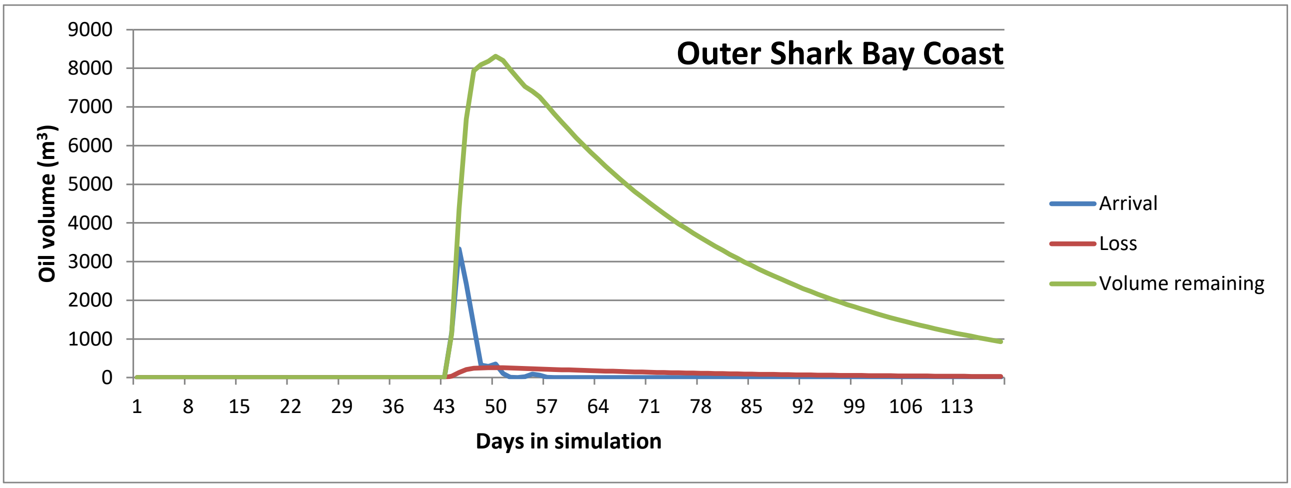

Figure 6-8: Shoreline loading over time at Outer Shark Bay Coast from spill run - 'SC1 Transition 050'

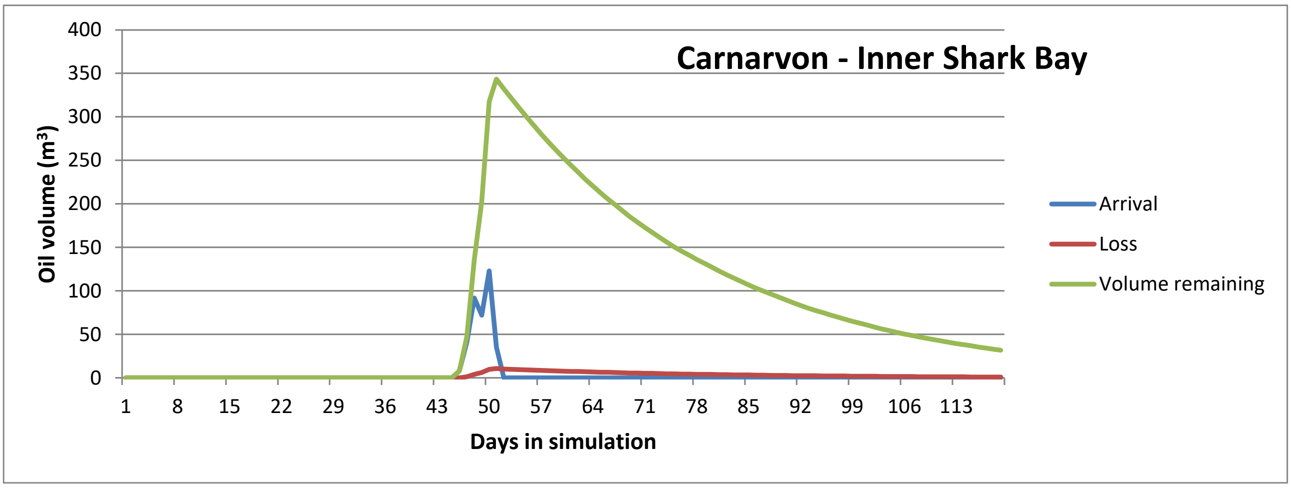

Figure 6-9: Shoreline loading over time at Carnarvon-Inner Shark Bay from spill run - 'SC1 Transition 050'

6.5 Response strategies - constraints and considerations

The following sections give summaries of the response strategies to be implemented along with constraints and considerations.

6.5.1 Source control

Drilling undertaken under the Van Gogh Phase 2 Drilling and Completions EP will be undertaken by a semi-submersible drilling rig.

As part of a source control strategy for loss of well control, the following controls are available:

+ deployment of subsea first response toolkit (SFRT);
+ installation of a capping stack (for subsea blowout only); and
+ drilling of a relief well.

A SFRT provides the ability to clear the area around the wellhead, to enable intervention and allow capping stack installation. This also includes the subsea dispersant kit, which will be utilised for subsea chemical dispersant application (refer **Section 12.2**).

Prior to the drilling of production sections, a blowout preventer (BOP) will be installed on the well head at the sea floor. In the event of a loss of well control, a capping stack may be connected to the flanges of the BOP. Installation of a capping stack is considered feasible for wells drilled under the Van Gogh Phase 2 Drilling and Completions EP and Santos has access to two units (Singapore and Aberdeen) available under existing contracts.

The drilling of relief well is considered to be the primary control in event of a loss of well control and will be implemented regardless of any other controls in place. This control when implemented successfully will prevent further loss of hydrocarbon to the environment. Resources required for installation of the relief well and plugging of the main well, together with time frames required, are contained in the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001).

The source control plan is provided in **Section 9**.

6.5.2 Monitor and evaluate

The monitor and evaluate strategy includes a number of methods to identify oil, predict the direction of movement and extent of oil, measure oil volume on water, locate oil within difficult terrain (e.g. mangroves) and detect the presence of oil in the water column. Selected methods include:

+ vessels on the water to visually identify oil;
+ dedicated small vessels for monitoring in mangrove and tidal creek areas;
+ aerial rotary-wing (helicopter) and/or fixed-wing observations;
+ deployment of Tracking Buoys;
+ deployment of fluorometers for measuring the presence of entrained oil in the water column;
+ trajectory modelling for predicting the movement of the oil over time;
+ remote sensing satellites; and
+ Unmanned Aerial Vehicles (UAVs).

Theo-3 is expected to appear as dark brown to black slicks which may sit low near the water surface due to the relatively high viscosity and high density. Although sheens may be visible spreading from thicker slicks initially, indicating the spread of lower density components, sheens will likely be absent after the oil has weathered for 6-12 hours.

The monitor and evaluate plan is provided in **Section 10**.

6.5.3 Chemical dispersants

Dispersant addition modelling

Dispersant addition modelling was undertaken for selected modelled runs for both sea surface (MODU drill floor) and seabed loss of well control scenarios outlined in **Section 6.1** (RPS APASA, 2015b, c). The aim of the dispersant modelling was to determine whether the addition of chemical dispersant would reduce the volume of oil loading on Priority for Protection shorelines under worst-case environmental conditions. A secondary aim was to determine if the addition of dispersant would potentially create additional impacts from increasing concentration of entrained oil and dissolved aromatic hydrocarbons above threshold levels near sensitive receptors (e.g., shallow nearshore habitats such as coral reefs).

<u>Sea surface (MODU floor) LOWC dispersant addition</u>

A combination of vessel and aircraft sea surface application of chemical dispersants was modelled for a LOWC at the sea surface. **Table 6-10** summarises key input parameters used for the modelling.

Table 6-10: Spill modelling input parameters – surface loss of well control (RPS APASA, 2015b)

Application Type	Surface	
Delivery platform type	Vessel	Aircraft
Delay before application could commence (days)	0	1
Number of individual dispersant applications per platform type per day	2 to 5	1 to 16
Volume of dispersant delivered per individual application (m^3)	10	15
Average encounter rate (%)	75	92
Duration of dispersant application (days)	78	

Application Type	Surface
Time of day for dispersant application	6am to 6pm
Dispersant application ratio (dispersant:oil)	1:25
Assumed average dispersant efficiency (%) for oil age (hours)	52% (more than 12 hours)
Total volume of dispersant delivered per day (m^3)	20 to 290
Volume of oil treated* per day (m^3/day)	460 to 5,650
Volume of oil released per day (m^3)	12,798 to 1,500
Volume of oil that could entrain (due to treatment) per day (m^3)	239 to 2,938
Proportion of oil released per day that could entrain (due to treatment) (%)	1.9% to 50.9%
Volume (m^3) and proportion (%) of release that could entrain due to treatment	106,686 (34%)

Overall, the results of the modelling indicate that the dispersant application treatment proposed is likely to be partially effective at dispersing oil released at the surface in the marine environment and decreasing the exposure of shoreline features. Decrease in total volume loaded onto shorelines at some Priorities for Protection, including the Ningaloo coast (Ningaloo Coast South and North Hot Spots) was estimated at up to approximately 30%, although for other Priorities for Protection, the decrease in loading was negligible or even increased slightly. Exposure to entrained oil and dissolved components in the water column is predicted to increase for some environmentally sensitive areas. Entrained oil may increase from below threshold concentrations to above threshold concentrations.

The application of dispersant is not forecast to result in large changes to the minimum times to contact by floating oil with shorelines. Reduction of shoreline exposures are predicted in terms of maximum local shoreline concentration, volume accumulated ashore and length of shoreline oiled. Increases on maximum concentrations of entrained oil and dissolved aromatic hydrocarbons are predicted for several receptors.

Seabed LOWC dispersant addition

A combination of vessel, aircraft (sea surface) and subsea injection (seabed) application of chemical dispersants was modelled for a LOWC at the seabed. **Table 6-11** summarises key input parameters used for the modelling.

Table 6-11: Dispersant addition modelling input parameters for a seabed loss of well control (RPS APASA, 2015c)

Application Type	Surface		Subsurface
Delivery platform type	Vessel	Aircraft	Injection
Delay before application could commence (days)	0	1	7
Number of individual dispersant applications per platform type per day	2 to 5	1 to 16	Continuous
Volume of dispersant delivered per individual application (m^3)	10	15	Average
Average encounter rate (%)	75%	92%	95%
Duration of dispersant application (days)	78		71
Time of day for dispersant application	6am to 6pm		Continuous
Dispersant application ratio (dispersant:oil)	1:25		1:80

Application Type	Surface	Subsurface
Assumed average dispersant efficiency (%) for oil age (hours)	52% (more than 12 hours)	77%
Total volume of dispersant delivered per day (m^3)	20 to 200	16 to 71
Volume of oil treated* per day (m^3/day)	460 to 3,963	1,188 to 5,397
Volume of oil released per day (m^3)	12,798 to 1,500	12,798 to 1,500
Volume of oil that could entrain (due to treatment) per day (m^3)	239 to 2,061	914 to 4,155
Proportion of oil released per day that could entrain (due to treatment) (%)	5.1% to 40.4%	73.2%
Volume (m^3) and proportion (%) of release that could entrain due to treatment	45,536 (16.8%)	164,385 (60.7%)

** Treatment refers to the delivery of dispersant onto oil. The volume of treated oil that is effectively dispersed will then vary with the dispersant efficiency and other controlling factors.*

Overall, the simulation results indicate that the dispersant application treatment proposed is likely to be effective at dispersing the released oil in the marine environment and decreasing maximum shoreline loading and length oiled, reducing exposure for shoreline features. For most shoreline receptors the addition of dispersant reduced the worst-case volume ashore for the selected runs, with decreases of up to approximately 90% modelled. For a few receptors, typically at a greater distance from the spill site, there was limited reduction or an increase in volume, likely due to the increased entrained oil and changed droplet size moving more oil near these areas. However, exposure to entrained oil is predicted to increase for some environmentally sensitive areas, typically up to a four-fold increase, which in some instances was predicted to increase entrained oil from below to above the impact threshold.

The results presented above are based on hypothetical single modelled runs and are not a substitute for running spill fate modelling in the event of a spill to inform decisions about the suitability of chemical dispersant addition. The results do, however, confirm the potential benefits and environmental impacts associated with the use of chemical dispersants and provide indicative values on the level of benefit that applying dispersant may have on the volume of oil loading onto shorelines.

Section 6.2 describes the dispersant amenability including the efficacy.

Surface application

Surface application of dispersants is applicable for surface oil arising from a surface or subsea blowout. Dispersants can be applied via vessels to target smaller patches of oil, or by aerial operations through the deployment of small Air Tractor aircraft through the Fixed Wing Aerial Dispersant Contract (FWADC) or larger aircraft platforms (Hercules C130 and Boeing 727) activated through OSRL for larger areas of oil. As oil moves away from the spill site, there is likely to be breaking up of oil and spreading of oil into wind rows. This will likely reduce the effective encounter rate (proportion of oil treated by dispersants) for aerial application as distance from the spill site increases and may favour the use of dispersant application from vessels by comparison.

For Van Gogh oil, dispersant testing indicates chemical dispersants will likely be most effective on fresh oil under both summer and winter conditions if wave action is present to mix the oil and dispersant (Leeder Consulting 2007). Dispersant efficacy was found to generally decrease with weathering and therefore the most effective area of application for surface dispersant addition will be as close as possible to where the oil is expressed at surface.

Spill fate modelling of selected oil spill runs with the addition of chemical dispersant (discussed above) indicates that the addition of dispersant at the sea surface, using aircraft and vessels, has the potential to reduce the volume of oil loading on shorelines from a surface or subsea release of oil (RPS APASA, 2015c, d). Decreases in the total volume loaded onto shorelines at some Priority for Protection areas for a surface release, including the Ningaloo coast (Ningaloo Coast South and Ningaloo Coast North), was estimated at up to ~30%, although for other Priority for Protection areas, the decrease in loading was negligible.

A dispersant supply plan has been developed based on the requirements to respond to worst case daily release rates from a surface blowout (**Section 12.5**).

Subsea application

Subsea chemical dispersant is applicable for a subsea blowout and involves dispersant applied directly into the wellhead location at the release point using the subsea first response toolkit (SFRT). Subsea chemical dispersant injection is used to disperse oil either to enable safe implementation of the subsequent controls (e.g. capping stack installation) and/or to enhance dispersion in the water column and avoid/reduce floating oil reaching shorelines. The application of dispersants at the release site provides a targeted and therefore efficient means of dispersing oil and is likely to have greater effectiveness than the application of dispersants to oil at the surface.

Spill fate modelling of selected oil spill runs with the addition of chemical dispersant (discussed above) indicates that the addition of dispersant injected subsea has the potential to reduce the volume of oil loading on shorelines (RPS APASA, 2015d). For most shoreline receptor areas the addition of dispersant reduced the worst case volume ashore for the selected runs, with decreases of up to ~90% modelled. For some receptor areas, typically at a greater distance from the spill site, there was limited reduction or an increase in volume.

A dispersant supply plan has been developed based on the requirements to respond to worst-case daily subsea release rates (**Section 12.5**).

6.5.4 Containment and recovery

Theo-3 (Van Gogh) crude oil is expected to be amenable to booming and skimming since these oils are expected to be present as thick liquid slicks rather than thin slicks spread out over large areas that would afford low encounter rates for booms towed by vessels.

The viscosity of these crude oils will be relatively high and increase over time. It is not expected that the rise in oil viscosity would exceed the capacity of recovery equipment such as Oleophilic disc and belt skimmers, elevating skimmers or submersion skimmers, but pumping equipment should be selected for capacity to pump high viscosity oil.

Booms and skimmers, expected to be suitable for oil collection, are expected to cover up to 5kms per day and collecting up to 30m^3 per day for each operation. However, strong currents, large waves, and wind chop all decrease the effectiveness of this strategy. This level of recovery is consistent with recovery rates reported for collection of heavy crude oils of 1 to 20 m^3/hr, depending on the size and design of the collecting device (Fingas, 2011).

For response planning, worst case daily oil arrival volumes have been calculated for Priority for Protection areas. This data is displayed in **Figure 6-4** to **Figure 6-9** based on the single worst case deterministic run for regional shoreline loading.

The containment and recovery plan is provided in **Section 13.**

6.5.5 Shoreline protection

Shoreline protection is typically in the form of inflatable booms, fixed floatation booms, earthen berms, and sandbags for tidal creek inlets. Booms are expected to be effective in forming a barrier to floating crude oil given that these slicks are expected to be thick, viscous with high adherence and a low tendency to entrain.

It may be possible to install fixed floatation booms to protect high debris locations from oil deposits, to minimise the waste in shoreline clean-up.

Some tidal creeks may be conducive to effective sandbagging to prevent oil ingress to low energy environments, and some floatation booms might be effective around the low energy environments of mangroves.

While oil is expected to remain buoyant throughout weathering it is expected to sit low in the water at the surface. When transported through shallow wave impacted areas the oil will tend to break up and roll along the bottom, collecting sand on the surface to stabilise as patches of oil. Protection nets may be effective in collecting tar balls and patches in the lower intertidal zone, preventing spread of the oil into the upper intertidal zone.

In some offshore locations the water may be sufficiently calm to install fixed booms in deep water to assist in the protection of highly sensitive areas where shoreline clean-up may be very difficult to effectively achieve. This will be considered in the event that shorelines are sensitive and difficult to access.

High volume water flushing can be used to create a water barrier to prevent oil depositing on rock boulder shorelines, where recovery in rock crevices is difficult.

Modelling does not provide for accurate representations of near-shore currents, and as such it does not provide a basis for detailed shoreline protection pre-planning. The present modelling capability does not provide strong enough probability of deposition locations and the angle of oil approach so cannot be used as a basis for detailed tactical shoreline booming response plans. In an incident response, site-specific shoreline protection plans will be a result of the defined process plan contained in this OPEP using real-time information taking into account the outputs of the operational NEBA(s) and IAP(s).

The shoreline protection plan is provided in **Section 14**.

6.5.6 Shoreline clean-up

Due to the high viscosity and adhesion of weathered Theo-3 (Van Gogh) oil, stranding of this material onto unconsolidated sediments on shorelines has the potential to result in large quantities of sediment binding to the viscous oil.

Manual and mechanical recovery of the oil and contaminated sediments is considered the primary clean-up strategy.

Although the viscous nature of the oil will tend to reduce penetration into the subsoil or subsoil aquifer, subsurface oil deposits could occur if the oil becomes buried by sediment turned over by wave action, or the oil percolates into sediments, if the viscosity is lowered by heating in the sun. Heavy machinery will be required to uncover oil sediments for removal.

The high cohesive properties of the oil indicate that the oil would be difficult to physically remove from contaminated vegetation on shorelines so that these habitats should be given high priority for protection from stranding oil.

Natural recovery and bioremediation may be very limited and slow for the long carbon chains that make up the bulk of this oil type but may have net benefit over physical removal from vegetated habitats where physical disturbance and damage to natural drainage might result in higher and longer-term impacts, given the absence of soluble (bioavailable) hydrocarbons in the weathered oil mixture.

When calculating the resources required to clean shorelines of oil, to be conservative it is assumed that no response strategies (both chemical dispersants and containment & recovery) have been effective at reducing the modelled worst-case shoreline loads.

Calculated shoreline clean-up resource ‘needs’ are based on total waste pickup rates of $1m^3$ per day per person and $50m^3$ per day per heavy machinery, with an average bulking factor of x10 to account for sands and debris.

The present modelling capability does not provide strong enough probability of deposition locations and deposition volumes at specific locations so cannot be used as a basis for detailed site-specific shoreline clean-up response plans. In an incident response, detailed site-specific shoreline clean-up plans will be a result from the defined process plan contained in this OPEP.

The shoreline cleanup plan is provided in **Section 15**.

6.5.7 Oiled wildlife response

Theo-3 (Van Gogh) oil is a heavy, viscous oil which are expected to strongly adhere to bird feathers, potentially impacting bird flight, buoyancy and thermoregulation. Shoreline oil may be ingested by birds during preening.

Given the characteristics of the oil and the high potential volume of oil that could accumulate on shorelines (e.g. Ningaloo coastline) the level of oiled wildlife response is assessed at being a potential Level 6 incident as per the WA Oiled Wildlife Response Plan (WAOWRP), with the potential to be greater than Level 6.

To support an adaptive approach, the level of the OWR can be raised or lowered based on the actual circumstances of the spill, with sufficient resources available from AMOSC, AMOSC service providers, mutual aid industry, DBCA, registered wildlife volunteers, internationally, and through the Santos Workforce Labour Hire providers.

The oiled wildlife response plan is provided in **Section 16**.

6.5.8 Waste management

Waste will be collected through containment and recovery Operations, shoreline clean up and from oiled wildlife facilities. Waste bins and containers will be provided by the Licensed Waste Contractor, North West Alliance.

The evidence that the oil will not emulsify indicates that the volume of oily waste is not likely to increase significantly due to take up of seawater. However, the oil will likely show strong adhesive properties to sediments and organic debris and a bulking factor of 10x is considered appropriate to apply to oil volumes to determine volume and mass of oily waste.

Under the requirements of the Shoreline Clean-up Plan, waste is moved to laydown areas behind the shoreline. At this point the Waste Management Plan is activated through the pick-up by a Licenced Waste Contractor for transport and disposal. For marine operations the waste is picked up from port-side following unloading from vessels. For Oiled Wildlife Facilities, the waste is collected from the facility.

Under the requirements of licenced waste transport, the waste is categorised, weighed, transported and disposed of at a licenced waste disposal facility. The Licensed Waste Contractor (North West Alliance) is responsible for regulated waste consignment tracking.

In the event that the Waste Contractor Disposal facility reaches maximum capacity, the Santos Devil Creek Gas Plant has 4 x 50,000 m^3 lined evaporation ponds that can be licensed as a temporary waste disposal facility to be used in an emergency event. Licencing of the ponds is subject to DER regulations, and capacity is subject to water carrying volume at the time.

The waste management plan is provided in **Section 17.**

6.6 Evaluation of applicable response strategies

There are numerous oil spill response strategies available to be implemented in the event of a spill. These are generally based on strategies which have been implemented in the past or considered to be good industry practice. **Table 6-12** is the outcome of the first level screening (Phase 1) undertaken to provide situation specific information on suitability of the broad response strategies available. The screening process is not to compare and prioritise controls as this is done in the subsequent step (Phase 2) of the overall assessment. The Phase 1 step is to produce 'pass or fail' suitability results for the selection of each of the response strategies available.

The evaluation of the suitable response strategies was conducted based on the credible spill scenarios identified. The key considerations taken into account for the evaluation were:

+ the properties and weathering profile of the spilled oil;
+ the philosophy of the responses; i.e., what is the aim of the response based on the hydrocarbon properties, such as, is the oil easily entrained or better to contain and recover;
+ the nature and scale of the credible spill scenario; and
+ the potential safety and environmental impacts involved with the selected responses.

Note: The information contained in **Table 6-12** has been developed by Santos for preparedness purposes. Santos may not be the Control Agency or Lead IMT for implementing a spill response. For example, for Level 2/3 spills within or entering State waters, DoT will ultimately determine the strategies and controls implemented for most State water activities with Santos providing resources and planning assistance.

Table 6-12: Spill response strategies considered for the mitigation of contacts from hydrocarbon spills

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Source Control	Spill kits	✓ 1	✓ 1	Relevant for containing spills that may arise on board a vessel or MODU.
	Secondary containment	✓ 1	✓ 1	Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment on board a vessel or MODU. Bunded areas will contain hydrocarbons reducing the potential for a spill escaping to marine waters. Where applicable open deck drainage will be closed to prevent hydrocarbon draining into the marine environment.
	Shipboard Oil Pollution Emergency Plan	✗	✓ 1	MARPOL requirement for applicable vessels. In the event a vessel hydrocarbon storage tank is ruptured, applicable strategies for reducing the volume of hydrocarbon releases will be contained within the vessel SOPEP. This may include securing cargo via transfer to another storage area on-board the vessel, transfer to another vessel, or through pumping in water to affected tank to create a water cushion (tank water bottom). Trimming the vessel may also be used to avoid further damage to intact tanks. These actions will aim to minimise the volume of fuel spilled.
	Surface well kill	✓ 1	✗	Considered during relief well planning but may not be possible depending upon technical and safety constraints. Surface well kill is only considered when the estimated leak rate is small enough not to generate an explosive gas cloud and access to the MODU is still preserved. This methodology would not be considered should safe access to the MODU or ability to operate a vessel alongside the MODU not be achievable.
	Capping stack	✓ 1	✗	Installation of a capping stack is feasible and Santos has access to two (Aberdeen and Singapore). SFRT will be deployed as the SFRT includes equipment that gives the ability to clear the area around the wellhead, to enable intervention and prepare for relief well drilling. This also includes the subsea dispersant kit, which will be utilised for subsea chemical dispersant application; see 'Subsea Chemical Dispersant' below for its details.
	Relief well drilling	✓ 1	✗	Relevant to LOWC. Relief well drilling is the primary method for killing the well if access to the MODU is not preserved. To be conducted as per the Source Control Emergency Response Plan (DR-00-OZ-20001) and well-specific Source Control Plan (document numbers to be confirmed).
In-Situ Burning	Controlled burning of oil spill	✗	✗	Not applicable to condensate wells due to safety hazards. Not applicable to diesel spills due to inability to contain marine diesel making it very difficult to maintain necessary slick thickness for ignition and sustained burning.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Monitor and Evaluate Plan (Operational Monitoring)	Vessel surveillance	✓ 1	✓ 1	Provides real-time information on spill trajectory and behaviour (e.g., weathering). Informs implementation of other response strategies. Vessel personnel may not be trained observers. Vessel observers on leaking vessel may not have capacity to observe oil during emergency response procedure implementation. Constrained to daylight. Limited to visual range from the vessel. Limited capacity to evaluate possible interactions with sensitive receptors.
	Aerial surveillance	✓ 1	✓ 1	Provides real-time information on spill trajectory and behaviour (e.g., weathering). May identify environmental sensitivities impacted or at risk of impact (e.g., seabird aggregations, other users such as fishers). Informs implementation of other response strategies.
	Tracking buoys	✓ 1	✓ 1	Can be implemented rapidly. Can provide indication of near-surface entrained/dissolved hydrocarbons (most other monitor and evaluate techniques rely on the hydrocarbon being on the surface or shoreline).
	Trajectory Modelling	✓ 1	✓ 1	Can be implemented rapidly. Predictive - provides estimate of where the oil may go, which can be used to prepare and implement other responses. No additional field personnel required. Not constrained by weather conditions. Can predict floating, entrained, dissolved and stranded hydrocarbon fractions. May not be accurate. Requires in-field calibration.
	Satellite Imagery	✓ 1	✓ 1	Can work under large range of weather conditions (e.g., night time, cloud cover, etc). Mobilisation likely to be more than 24 hours. Requires processing. May return false-positives.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
	Operational Water Quality Monitoring	✓ 1	✓ 1	Fluorometry surveys are used to determine the location and distribution of the entrained oil and dissolved aromatic hydrocarbon components of a continuous subsea spill and validate the spill fate modelling predictions.
	Shoreline and Coastal Habitat Assessment	✓ 1	✓ 1	Provides information on shoreline oiling (state of the oil, extent of pollution, etc). Can provide information on amenability of shoreline response options (e.g., clean up, protect and deflect). Provides information on status of impacts to sensitive receptors. Considerable health & safety considerations. Requires trained observers. Constrained to daylight. Delayed response time.
Chemical dispersion	Vessel Application	✓ 1	✗	*Theo-3* Surface chemical dispersant is considered a viable option for reduction in shoreline loading on the basis of spill fate modelling conducted with addition of dispersant scenarios (refer **Section 6.5.3**) The decision for application of this response will be subject to an operational NEBA. Applicability given dispersant addition is predicted to increase the concentration of entrained oil near sensitive receptors in some environmental conditions. *Marine Diesel* Marine diesel is not considered a persistent hydrocarbon and has high natural dispersion rates in the marine environment. Chemical dispersant application is not recommended as a beneficial option for diesel as it has a low additional benefit of increasing the dispersal rate of the spill while introducing the potential for more chemicals into the marine environment.
	Aerial Application	✓ 1	✗	
	Subsea dispersant injection	✓ 2	✗	
Offshore Containment and Recovery	Use of offshore booms/skimmers or other collection techniques deployed from vessel/s to contain and collect oil	✓ 1	✗	*Theo-3* The oil is highly weathered, of high viscosity and it is not easily entrained. Therefore, removal of floating oil is a key activity (refer **Section 6.5.4**). The decision for application of this response will be subject to an operational NEBA. *Marine Diesel* Not suitable for marine diesel given its rapid weathering nature. Marine diesel spreads quickly to a thin film, making recovery via skimmers difficult and ineffective.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Mechanical Dispersion	Vessel prop-washing	✗	✓ 2	Safety is a key factor and slicks with potential for high volatile organic compound (VOC) emission are not suitable. Mechanical dispersion may be applicable for the localised entrainment of surface oil but is not considered to have a significant effect on removing oil from the surface. Mechanical dispersion will entrain surface oil into the top layer of the water column. The aim of mechanical dispersion is to reduce the concentration of oil floating at the surface which could potentially contact receptors at the sea surface (e.g., sea birds) or shoreline receptors (e.g., mangroves). Once dispersed in the water column the smaller droplet sizes enhance the biodegradation process. Marine diesel is a light oil that can be easily dispersed in the water column by running vessels through the plume and using the turbulence developed by the propellers to break up the slick. Mechanical dispersion may be considered for targeted small breakaway patches of crude but may have limited effectiveness. The potential disadvantage of mechanical dispersion is that it could temporarily increase the concentration of entrained and dissolved oil in the vicinity of submerged shallow water receptors (e.g., corals, seagrass ad macroalgae). This is most likely in shallow water of a few metres deep. The suitability of mechanical dispersion as a response measure would consider the prevailing environmental conditions (it mimics the action of wave induced entrained so is most beneficial in calm conditions) and the type, proximity and depth (as applicable) of sensitivities in the area. Mechanical dispersion will be considered for petroleum activity sourced spills at the discretion of the OSC/IMT or by the relevant Control Agency. It is unlikely that vessels would be specifically allocated for mechanical dispersion but vessels undertaking primary strategies may be used opportunistically.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Protection and Deflection	Booming in nearshore waters and at shorelines	✓ 1	✓ 2	Considered if operational monitoring shows or predicts contact with sensitive shorelines. *Theo-3* Modelling shows high probability of contact, above impact and response thresholds for all LOWC scenarios. The effectiveness of this response will be dependent on local bathymetry, sea state, currents, tidal variations and wind conditions at the time of implementation. It is typically more effective in areas with low to moderate tidal ranges on low energy coastline types such as sandy beaches. Moderate to high tidal ranges generally include stronger currents and larger/longer intertidal areas that make it less effective and more difficult to keep booms in place. Protection and deflection is feasible in locations where access to the coastline allows vehicles and vessels to undertake operations. Activities would focus on areas of high protection value in low energy environments based upon real-time operational surveillance, provided the environmental and metocean conditions are favourable for an effective implementation. Consequently, this strategy may not be applicable across all areas or receptors identified as priority for protection. *Marine Diesel* Modelling shows low probability of contact with shorelines. Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats. Given the relatively small volumes predicted to come ashore, and the high rates of natural biodegradation of marine diesel, it would be better to focus on high priority areas for protection. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority protection areas are at risk of impact from marine diesel.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Shoreline clean-up	Activities include physical removal, surf washing, flushing, bioremediation, natural dispersion	✓ 1	✓ 2	Considered if operational monitoring shows or predicts contact with sensitive shorelines. *Theo-3* Shoreline clean-up has the ability to reduce stranded oil on shorelines and/or reduce remobilisation of oil. However, this response has potential to cause more impacts than benefits, especially if oiling is light. Shoreline assessments as part of operational monitoring provide site-specific guidance on the applicability and likely benefits of different clean-up techniques. Intrusive activities such as physical removal of waste using manual labour or mechanical aids requires careful site-specific planning to reduce secondary impacts of habitat disturbance, erosion and spreading oil beyond shorelines. Secondary impacts can be minimised through the use of trained personnel to lead operations. Logistically, clean-up operations will require site access, decontamination, waste storage, personal protective equipment, catering and transport services to support personnel working on shorelines. Flushing may be considered if the oil enters high priority/slow recovery habitats such as mangroves. Natural dispersion will occur as the hydrocarbon is remobilised from rock shelves and hard substrates, while residual hydrocarbons will biodegrade. *Marine Diesel* Modelling shows less than 20% probability of shoreline accumulation at more than 10 g/m^2. Shoreline clean-up activities can result in physical disturbance to shoreline habitats. Given the relatively small volumes predicted to come ashore, and the high rates of natural biodegradation of marine diesel, it would be better to focus on high priority areas for clean-up. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where protection priority areas are at risk of impacts from marine diesel.
Oiled wildlife response	Activities include hazing, pre-emptive capture, oiled wildlife capture, cleaning and rehabilitation	✓ 1	✓ 1	Can be used to deter and protect wildlife from contact with oil. Mainly applicable for marine and coastal fauna (e.g., birds) where oil is present at the sea surface or accumulated at coastlines. Surveillance can be carried out as a part of the fauna specific operational monitoring. Wildlife may become desensitised to hazing method. Hazing may impact upon animals (e.g., stress, disturb important behaviours such as nesting or foraging). Permitting requirements for hazing and pre-emptive capture.

OSR Strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy		Considerations
		Theo-3	MDO	
Scientific Monitoring	The monitoring of environmental receptors to determine the level of impact and recovery form the oil spill and associated response activities	✓ 1	✓ 1	Monitoring activities include: water and sediment quality biota of shorelines (sandy beaches, rocky shores and intertidal mudflats) mangrove monitoring benthic habitat monitoring (seagrass, algae, corals, non-coral benthic filter feeders) seabirds and shorebirds marine megafauna (incl. whale sharks and mammals) marine reptiles (incl. turtles) seafood quality fish, fisheries and aquaculture The type and extent of scientific monitoring will depend upon the nature and scale of oil contact to sensitive receptor locations as determined through operational monitoring. Pre-defined initiation criteria exist for scientific monitoring plans associated with marine and coastal sensitivities.

6.7 Net environmental benefit

The IMT uses a NEBA, also referred to as a spill impact mitigation assessment (SIMA), to inform the incident action planning process (**Section 8**), so the most effective response strategies with the least detrimental environmental impacts can be identified, documented and executed.

The Environmental Team Lead will use the information in **Section 6.4.3** to identify and prioritise initial response priorities and apply the NEBA to identify which response strategies are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume and priorities for protection.

As a component of the incident action planning process, NEBA is conducted by the Control Agency with responsibility for the spill response activity. Where there are different activities controlled by different IMTs, as in a cross-jurisdictional response between Santos and DoT, consultation will be required during the NEBA process such that there is consistency in the sensitivities prioritised for response across the Control agencies.

A strategic NEBA has been developed for all response strategies identified as applicable to credible spills identified in this OPEP, with the benefit or potential impact to each sensitivity identified (**Table 6-13** and **Table 6-14**). While not all spill response activities included in the strategic NEBA would be under the control of Santos during a spill incident, they have been included to assist the planning conducted by DoT.

In the event of a spill, NEBA is applied with supporting information collected as part of the Operational Monitoring Plan (**Section 10**) to achieve the following:

+ identify sensitivities within the area potentially affected by a spill at that time of the year (noting that the sensitivity of some key receptors, such as birdlife and turtles, varies seasonally);
+ assist in prioritising and allocating resources to sensitivities with a higher protection and response priority (**Section 6.4.3**);
+ assist in determining appropriate response strategies with support of real time metocean conditions, oil spill tracking and fate modelling;
+ when a spill occurs, NEBA is applied to the current situation, or operationalised. Operational NEBA Templates are filed within the Environment Team Leader folder on the Santos ER Intranet site. To complete the Operational NEBA:
  - all ecological and socioeconomic sensitivities identified within the spill trajectory area are recorded;
  - potential effects of response strategies on each sensitivity are assessed in terms of their benefit or otherwise to the socio economic sensitivities; and
  - all persons involved and data inputs have been considered for the analysis.

The Operational NEBA Form documents the decisions behind the recommendation to the Incident Commander on which resources at risk to prioritise, and the positives and negatives of response strategies to deploy. The Operational NEBA provides guidance to the IAPs and is revisited each Operational Period.

Table 6-13: Strategic NEBA matrix – Theo- 3 (Van Gogh) crude

Hot Spot/Key Environmental Values	No Controls	Source Control	Dispersant (Subsea)	Dispersant (Surface)	Monitor and Evaluate	Mechanical dispersion	Containment and Recovery	Shoreline Protection	Shoreline Cleanup	Oiled Wildlife Response	Scientific Monitoring
Notes: These strategies are implemented with control measures outlined in **Section 6.7.3** of the EP Further detail on these receptors, including key temporal windows of sensitivity is provided within **Section 3** of the EP											
Ningaloo Coast North											
Birds											
Mangroves										N/A	
Tidal creeks										N/A	
Turtles (nesting)											
Turtle foraging								N/A	N/A		
Coral								N/A	N/A	N/A	
Tourist beaches										N/A	
Whales								N/A	N/A	N/A	
Ningaloo Coast South											
Turtles (nesting)										N/A	
Tourist beaches										N/A	
Muiron Islands											
Mangroves										N/A	
Turtles (nesting)											
Birds											
Exmouth Gulf Coast											
Whales								N/A	N/A	N/A	
Turtles (nesting)											
Mangroves										N/A	
Tidal creeks										N/A	

Hot Spot/Key Environmental Values	No Controls	Source Control	Dispersant (Subsea)	Dispersant (Surface)	Monitor and Evaluate	Mechanical dispersion	Containment and Recovery	Shoreline Protection	Shoreline Cleanup	Oiled Wildlife Response	Scientific Monitoring
Birds											
Tourist beaches										N/A	
Dugongs								N/A	N/A	N/A	
Outer Shark Bay Coast											
Cultural/heritage sites										N/A	
Tourist beaches										N/A	
Carnarvon Inner Shark Bay											
Mangroves										N/A	
Seagrass meadows								N/A	N/A	N/A	
Cultural/heritage sites										N/A	
Turtles (nesting)											
Dugongs								N/A	N/A		
Eighty Mile Beach											
Ramsar wetland											
Turtle nesting – hawksbill, loggerhead and green											
Mangroves										N/A	
Migratory shorebirds – foraging habitat											
Tourism – camping and fishing Aboriginal heritage sites											

Hot Spot/Key Environmental Values	No Controls	Source Control	Dispersant (Subsea)	Dispersant (Surface)	Monitor and Evaluate	Mechanical dispersion	Containment and Recovery	Shoreline Protection	Shoreline Cleanup	Oiled Wildlife Response	Scientific Monitoring
		Beneficial impact									
		Possible beneficial impact dependent upon the situation (e.g., timeframes and metocean conditions to dilute entrained oil)									
		Negative impact									
N/A		Not applicable for the environmental value									

Table 6-14: Strategic NEBA matrix table - Marine diesel oil spills

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Chemical Dispersants	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Ningaloo Coast										
Turtle nesting – loggerhead, green				N/A		N/A				
Mangroves – Mangrove Bay and Yardie Creek				N/A		N/A			N/A	
Coral and other subsea benthic primary producers - largest fringing reef in Australia, lagoonal, intertidal and subtidal corals, Seagrass and macroalgae bed				N/A		N/A			N/A	
Whale sharks and manta rays				N/A		N/A				
Tourism - significant fishing/ charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)				N/A		N/A				

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Chemical Dispersants	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Seabird nesting - incl. breeding areas at Mangrove Bay, Mangrove Point, Point Maud, Mildura wreck and Fraser Island				N/A		N/A				
Humpback/ Pygmy blue whale migration				N/A		N/A				

Legend	
	Beneficial impact.
	Possible beneficial impact depending on the situation (e.g., time frames and metocean conditions to dilute entrained oil).
	Negative impact.
N/A	Not applicable for the environmental value or not applicable for the hydrocarbon type.

6.8 Response resource planning 'needs' for Priority for Protection areas

For response planning and preparation purposes, the total worst-case resource needs have been estimated by considering spill fate modelling results. Specifically, the worst-case modelled run (deterministic run) overall for oil loading onto shorelines. This run (SC1 Transition 050) has been defined and detailed in **Sections 6.4.2** and **6.4.3**. As well as producing an overall worst-case volume of oil reaching and accumulating on all shorelines, this run provides worst case loadings at the identified Priority for Protection areas.

A single run is used, as opposed to individual area-specific worst-case runs, so the resource needs are not over-estimated, as would occur through multiple counting on multiple runs.

At the beginning of a Level 2/3 incident, a procurement plan would be initiated. While resources are listed against identified Priority for Protection areas, these resources are to be distributed on an incident-needs basis to wherever they are required. Timeframes for deployment are based on worst-case modelling results used for planning purposes; actual deployment timeframes in the event of a spill will be dictated by information from the Monitor and Evaluate Plan (**Section 10**).

Table 6-15: Response Planning Needs for Priority for Protection areas

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
Oil Spill Management	Crisis Management Team Room and Incident Command Centre Facilities. Communications equipment. Emergency Response Plans and associated documentation to facilitate and support a response.	-	Sufficient personnel to staff the Incident Management and Incident Command available.	Day 1
Source Control				
Subsea first response toolkit (SFRT)	Subsea first response toolkit (SFRT) Up to 71 m^3 of chemical dispersants per day from day 8 to day 77 (refer Dispersant Supply schedule in **Section 12.5**)	1 x Dispersant vessel 2 x ROV vessels	As per the *Source Control Planning and Response Guideline (DR-00-OZ-20001)*	Day 8
Capping Stack	Capping Stack	1 x Heavy Lift Vessel (HLV) 2 x ROV vessels	As per the *Source Control Planning and Response Guideline (DR-00-OZ-20001)*	Day 22
Relief well	Drilling equipment	1 x Mobile Offshore Drilling Unit (MODU) 2 x support vessels	As per the *Source Control Planning and Response Guideline (DR-00-OZ-20001)*	Day 24
Monitor & Evaluate				
Aerial Observation	-	Helicopters or fixed-wing aircraft capable of conducting 2 x fly-overs per day	Pilots and ground crew to support 2 x fly overs per day Aerial Observers to accompany 2 x fly overs per day	Day 1 Day 2
Vessel surveillance	-	Vessels of opportunity (simultaneous operations) for offshore monitoring	Vessel crew	Day 1
	-	2 x 5/6 metre runabout vessel for shoreline monitoring (Exmouth Gulf Coast)	2 x marine crew 2 x Oil Spill Crew per vessel	Day 26
	-	2 x 5/6 metre runabout vessel for shoreline monitoring (Carnarvon-Inner Shark Bay)	2 x marine crew 2 x Oil Spill Crew per vessel.	Day 43

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	-	<u>Totals:</u> 4 x 5/6 metre runabout vessel for shoreline monitoring Vessels of opportunity (simultaneous operations) for offshore monitoring	<u>Totals:</u> 4 x marine crew 4 x Oil Spill Crew per vessel Vessel Crew (Vessels of opportunity)	-
Spill Trajectory modelling	RPS Group computer hardware system	-	RPS Group APASA modelling personnel	Day 1
Satellite monitoring	Opportunistic availability of images from various suppliers	-	-	As per availability
Tracker Buoys	12 x Tracker Buoys owned and available for use by Santos. Releasing 4 TBs every 24 hrs to be recycled within the plume on demand	Vessels as needed	Vessel crew as needed	Day 1
Unmanned Aerial Vehicles (UAVs) (Drones)	1 x drones capable of 1km flight range c/w cameras (Muiron Islands)	-	1 x drone operators	Day 25
	1 x drones capable of 1km flight range c/w cameras (Outer Shark Bay Coast)	-	1 x drone operators	Day 41
	1 x drones capable of 1km flight range c/w cameras (Carnarvon – Inner Shark Bay)	-	1 x drone operators	Day 43
	<u>Totals:</u> 3 x drones capable of 1km flight range c/w cameras	-	<u>Totals:</u> 3 x drone operators	-
Entrained oil monitoring	2 x Fluorometers via subsea gliders (Blue Ocean Monitoring) (Ningaloo Coast North)	1 x Deployment vessels	1 x deployment and operational personnel for monitoring and 1 x personnel for data downloading (Blue Ocean Monitoring). 2 x Vessel crew to deploy	Day 5

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	1 x Fluorometers via subsea gliders (Blue Ocean Monitoring) (Muiron Islands)	1 x Deployment vessels (reused from above)	1 x deployment and operational personnel for monitoring and 1 x personnel for data downloading (Blue Ocean Monitoring). 1 x Vessel crew to deploy (reused from above)	Day 24
	2 x Fluorometers via subsea gliders (Blue Ocean Monitoring) (Ningaloo Coast South)	1 x Deployment vessels (reused from above)	1 x deployment and operational personnel for monitoring and 1 x personnel for data downloading (Blue Ocean Monitoring). 1 x Vessel crew to deploy (reused from above)	Day 25
	1 x Fluorometer - vessel tow-behind (CSIRO) (Exmouth Gulf Coast)	1 x Deployment vessel	2 x deployment and operational personnel for monitoring and downloading per fluorometer (CSIRO). 1 x Vessel crew to deploy	Day 30
	1 x Fluorometer vessel tow-behind (OSRL) (Shark Bay Coast & Carnarvon-Inner Shark Bay) –	1 x Deployment vessel	2 x deployment and operational personnel for monitoring and downloading per fluorometer (OSRL). 1 x Vessel crew to deploy	Day 40
	Totals: 7 x Fluorometers	Totals: 3 x Deployment vessels	Totals: 6 x deployment and operational personnel for monitoring and downloading per fluorometer 3 x Vessel crew to deploy	-
Chemical Dispersants				

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
Aerial dispersant	Fuel and dispersant pump/transfer systems (Santos Exmouth) 15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 11**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes. 1 x Air Attack Observation Aircraft 1 x Search & Rescue (SAR) Vessel	2 x Pilots 1 x Air Attack Supervisor 1 x Aviation Coordinator 1 x Ground crew 1 x SAR Crew	Day 2
	15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes.	2 x Pilots	Day 3
	15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes.	2 x Pilots	Day 4
	Fuel and dispersant pump/transfer systems 15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes. 1 x Air Attack Observation Aircraft 1 x Search & Rescue (SAR) Vessel	2 x Pilots 1 x Air Attack Supervisor 1 x Aviation Coordinator 1 x Ground crew 1 x SAR Crew	Day 5
	15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes.	2 x Pilots	Day 6
	15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes.	2 x Pilots	Day 7
	Fuel and dispersant pump/transfer systems 15m^3 of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes. 1 x Air Attack Observation Aircraft 1 x Search & Rescue (SAR) Vessel	2 x Pilots 1 x Air Attack Supervisor 1 x Aviation Coordinator 1 x Ground crew 1 x SAR Crew	Day 8

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	$15m^3$ of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 12.5**) from day 2 to day 77.	2 x Fixed Wing dispersant application planes.	2 x Pilots	Day 9
	Can deposit up to $26m^3$ per day based on 2 x runs per day ($13m^3$ per run)	1 x OSRL Hercules Dispersant Aircraft	1 x Pilot	Day 21
	Totals 3 x Fuel and dispersant transfer systems $15m^3$ of dispersant per aircraft per day (refer Dispersant Supply schedule in **Section 12.5**)	Totals 16 x Fixed Wing dispersant application planes. 3 x Air Attack Observation Aircraft 1 x OSRL Hercules Dispersant Aircraft 3 x Search & Rescue (SAR) Vessels	Totals 19 x Pilots 3 x Air Attack Supervisors 3 x Aviation Coordinators 3 x Ground crew 3 x SAR crew	
Vessel dispersant	2 x Dispersant spray systems (Santos Exmouth) $10m^3$ of dispersant per vessel per day (refer Dispersant Supply schedule in **Section 12.5**) from day 1 to day 77.	2 x vessels	2 x Vessel crew (pre-trained Go Marine, JWM, EF&LS) 2 x Team Leader (pre-trained Go Marine, JWM, EF&LS)	Day 1
	3 x Dispersant spray systems (Santos and AMSA Dampier) $10m^3$ of dispersant per vessel per day (refer Dispersant Supply schedule in **Section 12.5**) from day 1 to day 77.	3 x vessels	3 x Vessel crew 3 x Team Leader 5 x OSRT members	Day 3
	Totals: 5 x Dispersant spray systems $10m^3$ of dispersant per vessel per day (refer Dispersant Supply schedule in **Section 12.5**) from day 1 to day 77.	Totals: 5 x vessels	Totals: 5 x Vessel crew 5 x Team Leader 5 x OSRT members	
Offshore Containment and Recovery (C&R)				
Offshore C&R	Ningaloo Coast North			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	1 x C&R Set (Santos Exmouth)	2 x vessels	2 x vessel crew, 1 x OSRT (6 pax/op) (Santos Exmouth)	Day 1
	1 x C&R Set (i.e. Boom, skimmer, pumping equipment) (Santos VI)	2 x vessels	2 x vessel crew, 1 x OSRT (6 pax/op) (Santos VI)	Day 2
	1 x C&R Set (Santos Dampier)	2 x vessels	2 x vessel crew, 1 x OSRT (6 pax/op) (Santos Dampier)	Day 3
	1 x C&R Set (AMSA Dampier)	2 x vessels	2 x vessel crew, 2 x OSRT (6 pax/op) (Santos vessels, AMOSC OSRT)	Day 3
	1 x C&R Set (AMOSC Fremantle)	2 x vessels	2 x vessel crew, 2 x OSRT (6 pax/op) (Santos vessels, AMOSC OSRT)	Day 5
	1 x C&R Set (AMOSC Fremantle)	2 x vessels	2 x vessel crew, 2 x OSRT (6 pax/op) (Santos vessels, AMOSC OSRT)	Day 5
	1 x Waste Transfer Equipment (Santos Dampier)	1 x vessel	1 x vessel crew	Day 6
	1 x C&R Set (AMOSC Geelong)	2 x vessels	2 x vessel crew, 1 x OSRT (6 pax/op) (Santos vessels, AMOSC OSRT)	Day 7
	1 x C&R Set (AMOSC Geelong)	2 x vessels	2 x vessel crew, 1 x OSRT (6 pax/op) (Santos vessels, AMSA NRT OSRT)	Day 7
	2 x C&R Sets (AMSA Dampier)	4 x vessels	4 x vessel crew, 1 x OSRT (6 pax/op) (Santos vessels, AMSA NRT OSRT)	Day 10
	1 x C&R Set (OSRL Singapore)	2 x vessels	2 x vessel crew, 2 x OSRT (6 pax/op) Santos vessels, OSRL & Workforce Hire OSRT)	Day 12
	1 x Waste Transfer Equipment (Santos Dampier)	1 x vessel	1 x vessel crew	Day 13

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	1 x C&R Set (OSRL Singapore)	2 x vessels	2 x vessel crew, 2 x OSRT (6 pax/op) Santos vessels, OSRL & Workforce Hire OSRT)	Day 14
	1 x Waste Transfer Equipment (Santos Dampier)	1 x vessel	1 x vessel crew	Day 20
	Totals: 12 x C&R Sets 3 x Waste Transfer Equipment Sets	Totals: 27 x vessels	Totals: 27 x vessel crews 16 x OSRT	
	Muiron Islands			
	2 x C&R Sets (relocated from pool above)	4 x vessels (relocated from pool above)	4 x vessel crew, 2 x OSRT (relocated from pool above)	Day 24
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above)	1 x vessel crew (relocated from pool above)	Day 24
	Exmouth Gulf			
	2 x C&R Sets (relocated from pool above)	4 x vessels (relocated from pool above)	4 x vessel crew, 2 x OSRT (relocated from pool above)	Day 31
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above)	1 x vessel crew (relocated from pool above)	Day 31
	Ningaloo Coast South			
	2 x C&R Sets (relocated from pool above)	4 x vessels (relocated from pool above)	2 x vessel crew,1 x OSRT (relocated from pool above)	Day 25
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above)	1 x vessel crew (relocated from pool above)	Day 25
	4 x C&R Sets (relocated from pool above)	8 vessels (relocated from pool above)	8 x vessel crew,4 x OSRT (relocated from pool above)	Day 37

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above)	1 x vessel crew (relocated from pool above)	Day 37
	Carnarvon – Inner Shark Bay			
	2 x C&R Set (relocated from pool above)	4 x vessels (relocated from pool above or sourced from Carnarvon/Denham)	2 x vessel crew, 1 x OSRT (relocated from pool above)	Day 43
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above or sourced from Carnarvon/Denham)	1 x vessel crew (relocated from pool above)	Day 43
	Eighty Mile Beach			
	2 x C&R Set (relocated from pool above)	4 x vessels (relocated from pool above or sourced from Carnarvon/Denham)	2 x vessel crew,1 x OSRT (relocated from pool above)	Day 62
	1 x Waste Transfer Equipment (relocated from pool above)	1 x vessel (relocated from pool above or sourced from Carnarvon/Denham)	1 x vessel crew (relocated from pool above)	Day 62
Shoreline Protection, Deflection and Collection				
Shoreline Protection, Deflection and Collection	Ningaloo Coast North			
	2 x 500 m shoreline boom (AMOSC Exmouth) 4 x anchor kits 2 x tow bridles 2 x accessory kits 2 x protection nets 500 x sandbags 5 x shovels	1 x boom tow vessels (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 2

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	2 x 500 m shoreline boom (AMOSC Fremantle) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets 500 x sandbags 5 x shovels	1 x boom tow vessels (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 4
	2 x 500 m shoreline boom (AMOSC Fremantle) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets	1 x boom tow vessels (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 6
	2 x 500 m shoreline boom (AMOSC Geelong) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets	1 x boom tow vessels (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 8
	2 x 500 m shoreline boom (AMOSC Geelong) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets	1 x boom tow vessels (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 10
	Muiron Islands			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	2 x 500 metres shoreline boom (AMOSC Geelong) 4 x anchor kits 1 x tow bridles 2x accessory kits 2 x protection nets	1 x boom tow vessel (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 24
	Exmouth Gulf Coast			
	4 x 500 m shoreline boom (AMSA Dampier) 8 x anchor kits 2 x tow bridles 4 x accessory kits 4 x protection nets	2 x boom tow vessel (4-6 m runabout)	2 x vessel crew, 3 x OSRT (6 pax/op)	Day 24
	Ningaloo Coast South			
	2 x 500 m shoreline boom (AMSA Dampier) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets	1 x boom tow vessels (4-6 m runabouts)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 25
	2 x 500 m shoreline boom (AMSA Fremantle) 4 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets	1 x boom tow vessels (4-6 m runabouts)	1 x vessel crew, 3 x OSRT (6 pax/op)	Day 27
	Carnarvon – Inner Shark Bay			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	2 x 500 m shoreline boom (AMSA Fremantle) 6 x anchor kits 1 x tow bridles 2 x accessory kits 2 x protection nets 500 x sandbags 5 x shovels (oil loading windows allow for some of this equipment to be relocated from Exmouth Gulf Coast and Muiron Islands)	1 x boom tow vessel (4-6 m runabout)	1 x vessel crew, 3 x OSRT (6 pax/op) (OSRT can be relocated from Exmouth Gulf Coast and Muiron Islands)	Day 42
	Eighty Mile Beach			
	10 x 500 m shoreline boom (AMOSC - Geelong, Fremantle, Exmouth), 10 protection nets, 1,000 sandbags.	5 vessels with anchors, bridles, accessories,	9 x vessel crew 27 x OSRT (6 pax/op)	Day 62
	<u>Totals:</u> 9,000 m shoreline boom 36 x anchor kits 9 x tow bridles 18 x accessory kits 18 x protection nets 2,000 x sandbags 20 x shovels	<u>Totals:</u> 10 x boom tow vessel (4-6 m runabouts)	<u>Totals:</u> 9 x vessel crew 27 x OSRT (6 pax/op)	-
Shoreline Clean-up	Ningaloo Coast North			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	2 x Decontamination Systems 2 x Staging area Infrastructure (Tents, Laydown) 4 x ATVs plus trailer 4 x bulldozer/scraper/front end loader 4 x Forklifts Clean up equipment kits (**Appendix G**)	-	600 x clean-up personnel (up to 400 rostered on at any one time – refer Table 15-3) 18 x OSRT Members onsite (AMOSC/NRT/SRT) 4 x Welfare Personnel onsite 2 x Medics onsite	Day 5 –136 (refer Table 15-3)
	Ningaloo Coast South			
	2 x Decontamination Systems 2 x Staging area Infrastructure (Tents, Laydown) 4 x ATVs plus trailer 4 x bulldozer/scraper/front end loader 4 x Forklifts Clean up equipment kits (**Appendix G**)	-	600 x clean-up personnel (up to 400 rostered on at any one time – refer **Table 15-4**) 18 x OSRT Members onsite (AMOSC/NRT/SRT) 4 x Welfare Personnel onsite 2 x Medics onsite	Day 24 –136 (refer **Table 15-4**)
	Muiron Islands			
	1 x Decontamination System 1 x Staging area Infrastructure (Tents, Laydown) 1 x ATVs plus trailer Clean up equipment kits (**Appendix G**)	1 x vessel/barge (personnel/equipment/waste transfers)	1 x vessel crew 45 x clean-up personnel (up to 30 rostered on at any one time – refer **Table 15-5**) 2 x OSRT Members onsite (AMOSC/NRT/SRT) 1 x Welfare Personnel onsite 1 x Medics onsite	Day 23 – 95 (refer **Table 15-5**)
	Exmouth Gulf Coast			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	1 x Decontamination Systems 1 x Staging area Infrastructure (Tents, Laydown) 1 x ATVs plus trailer 1 x bulldozer/scraper/front end loader 1 x Forklifts Clean up equipment kits (**Appendix G**)	1 x vessel/barge (personnel/equipment/waste transfers)	1 x vessel crew 75 x clean-up personnel (up to 50 rostered on at any one time – refer **Table 15-6**) 4 x OSRT Members onsite (AMOSC/NRT/SRT) 1 x Welfare Personnel onsite 1 x Medics onsite	Day 24 – 72 (refer **Table 15-6)**
	Outer Shark Bay Coast			
	1 x Decontamination Systems 1 x Staging area Infrastructure (Tents, Laydown) 1 x ATVs plus trailer Clean up equipment kits (**Appendix G**)	1 x vessel/barge (personnel/equipment/waste transfers)	1 x vessel crew 45 x clean-up personnel (up to 30 rostered on at any one time – refer **Table 15-7**) 2 x OSRT Members onsite (AMOSC/NRT/SRT) 1 x Welfare Personnel onsite 1 x Medics onsite	Day 38 – 178 (refer **Table 15-7)**
	Carnarvon - Inner Shark Bay			
	1 x Decontamination Systems 1 x Staging area Infrastructure (Tents, Laydown) 1 x ATVs plus trailer Clean up equipment kits (**Appendix G**)	1 x vessel/barge (personnel/equipment/waste transfers)	1 x vessel crew 75 x clean up personnel (up to 50 rostered on at any one time – refer **Table 15-8**) 4 x OSRT Members (AMOSC/NRT/SRT) 1 x Welfare Personnel 1 x Medic	Day 42 – 102 (refer **Table 15-8)**
	Eighty Mile Beach			

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
	2 x Decontamination Systems, 2 x Staging area Infrastructure (Tents, Laydown), 4 x ATVs plus trailer, 4 x bulldozer/ scraper/ front end loader, 4 x Forklifts, 600 x clean-up	1 x vessel/barge (personnel/equipment/waste transfers)	personnel (400 rostered on), 18 x OSRT members, 4 x welfare personnel, 2 x Medics	Day 62 – 102 (refer **Table 15-8)**
Waste Management	6 x 15 Tonne Skip Lift Trucks 4 x 28 m³ Front Lift Trucks 4 x 18 m³ Side Loading Trucks 2 x 70 Tonne Hook Lift Trucks 8 x 15 pallet space Flat Bed Trucks 100 x 240 litres MGB's 2 x 8 Pack MGB Offshore Lifting Cradle 6 x 1.1 m³ Lidded Bins 50 x 3m³ Front Lift Bins 25 x 4.5m³ Front Lift Bins 100 x 3m³ Offshore Rated Front Load Bins 45 x 7m³ Offshore Rated Bins 60 x 6-9 m³ Marrell Skip Bins 12 x 15-30 m³ Hook Lift Bins 4 x 4 tonne Forklift (above equipment supplied through North West Alliance contract)	-	Licenced Waste Transport Drivers (North West Alliance) 4 x Waste Staging Area Managers (Santos Logistics Supervisors or Workforce Labour Hire) 4 x Waste Management Supervisors (North West Alliance)	Progressively from day 5 (as per shoreline clean-up schedules)
Oiled Wildlife Response	As per WA Oiled Wildlife Response Plan & Pilbara Operational Oiled Wildlife Plan (dependent on location of oiled wildlife)	-	1 x OWR responders – Level 4 (AMOSC) 1 x OWR responders – Level 2 (AMOSC) 3 x OWR responders – Level 1 (AMOSC)	Day 2

Response Strategy	Equipment	Vessels/aircraft	Personnel	Deployment post-spill occurring schedule
			1 x OWR responders – Level 4 (AMOSC Contacts) 2 x OWR responders – Level 3 (AMOSC Contacts) 5 x OWR responders – Level 2 (AMOSC) 10 x OWR responders – Level 1 (DBCA registered volunteers) 1 x OWR Tech (vets) (as per WAOWRP) 1 x OWR Other personnel (Species Specific Specialists)	Day 6
			1 x OWR responders – Level 4 (AMOSC Contacts) 2 x OWR responders – Level 3 (AMOSC Contacts) 9 x OWR responders – Level 2 (AMOSC Contacts) 20 x OWR responders – Level 1 (Workforce Labour Hire) 1 x OWR Tech (vets) (as per WAOWRP) 1 x OWR Other personnel (Species Specific Specialists)	Day 10
			Contingency 200 x OWR Responders – Level 1. To cover for an OWR that goes beyond Level 6 (Workforce Labour Hire)	Day 21

6.9 Oil spill response as low as reasonably practicable assessment

For each response strategy included within this OPEP an environmental performance outcome has been determined and key control measures and performance standards have been identified such that the response can meet the required performance outcome. For each response strategy, an ALARP assessment has been conducted to demonstrate that the control measures mitigate the risk of an oil spill to ALARP.

Appendix H details the ALARP assessment framework. The results of the ALARP assessment conducted to inform the control measures and performance standards contained within this OPEP are presented below in **Table 6-16**.

Table 6-16: As-Low-As-Reasonably-Practicable assessment of the level of resourcing available for spill response strategies

Strategy	Proposed worst-case resourcing requirements (refer Table 6-15)	Justification	Environmental benefit of additional resources	Cost of additional resources	ALARP assessment
Aerial surveillance	Two passes per day of spill area by observation aircraft provided from Day 1. Trained Aerial Observers supplied from Day 2.	This will provide for two passes of spill area per day for worst case spill event. This based on aircraft deploying from Karratha, Exmouth and Carnarvon. The numbers of aircraft required to achieve this overpass frequency will depend on aircraft type and flight time. In any event Santos has access to enough aircraft to achieve the overpass frequency regardless of aircraft endurance.	The two passes per day philosophy allows coverage of oil movement at predicted current speeds up to 1.5 km/h. For example, two passes separated by 6 hours would result only in a 9 km movement of oil before the second pass relocated the oil front. Therefore, there is considered no environmental benefit for resourcing an overpass frequency of greater than two passes per day. There may be a need for additional resources if and when this is determined through the IMT based on the amount of available information and potential data gaps.	No additional costs as current arrangements will provide the overpass frequency required. In the event additional passes are required due to data gaps, the cost of the additional flights will be added to the cost of the response.	There is no value in increasing dedicated overpasses and therefore the arrangements are considered ALARP. However, opportunistic aerial surveillance can be provided through the shared use of aircraft deployed for other purposes. The response is considered ALARP.
Vessel surveillance	Vessel of opportunity.	At least three vessels will be immediately available from Santos MODU and FPSO support duties. In addition, other operators in the vicinity (e.g., MODU and FPSO operations) will have	Dedicated additional resources are not required given need is met through vessel sharing and surveillance will also be conducted through a number of complementary strategies	No additional costs as vessel of opportunity are considered to provide the required function. In the event that additional vessels are required due to data gaps	There is no benefit in having additional dedicated surveillance vessels given surveillance can be performed from any vessel and these duties will be shared among spill response

		supply vessels available for immediate surveillance and therefore it is considered vessel availability will not hamper initial surveillance efforts. Vessels for ongoing surveillance will be shared from other operations (e.g., C&R operations) to perform opportunistic surveillance as the response progresses. This strategy is not designed to perform 'whole of spill' coverage which is provided by aerial surveillance (i.e., it is a secondary strategy).	(aerial surveillance, tracker buoys). There may be a need for additional resources if and when this is determined through the IMT based on the amount of available information and potential data gaps. This capability would be stood up through vessels of opportunity.	the cost of the additional vessels will be added to the cost of the response.	vessels. The response is considered ALARP.
Tracker buoys	Up to 14 buoys immediately available to be deployed at a staggered rate determined by the need to track oil heading towards sensitive receptors. Vessel(s) of opportunity for buoy deployment.	Tracker buoys are an additional strategy to aerial surveillance to provide real time verification data (particularly beneficial at night and in conditions limiting aerial surveillance). Fourteen buoys is sufficient to enable timely retrieval and redeployment. Vessels for buoy deployment will be vessels of opportunity (i.e., a shared task with other strategies).	Additional buoys are available through secondary suppliers (e.g., AMOSC, OSRL and AMSA – greater than 20 buoys available) if required. These can be registered on the Santos Energy/Joubeh satellite tracking system within hours. This may beneficial if oil is heading in a large number of multiple directions. Dedicated vessels are not required given need is met through vessel sharing. No benefit in increasing vessel numbers – tracking buoys, not	Santos has 14 buoys. No additional buoys are required to be purchased by Santos given secondary availability through AMSA, AMOSC, OSRL within days. There is no additional upfront cost for accessing these secondary buoys.	The number of buoys immediately available and the availability of secondary buoys within days is sufficient to cover tracking of oil fronts especially given the spread of oil will be limited within the initial days of the spill. Therefore, no additional requirements and the response is considered ALARP.

			vessels, are the limiting resource for this strategy.		
Fluorometry	Fluorometers (either towed or contained within subsea gliders) to be deployed as per below: **Ningaloo Nth** – two subsea gliders with fluorometers. **Ningaloo Sth** – two subsea gliders with fluorometers. **Muiron Islands** – one subsea glider with fluorometer. **Exmouth Gulf** – one towed fluorometer. **Shark Bay** – one towed fluorometer. **Eighty Mile Beach**– one towed fluorometer. Glider deployment personnel. Dedicated vessels for towed fluorometers. Vessels of opportunity (vessel sharing) for subsea glider deployment.	Subsea gliders and towed fluorometers can cover approximately 1 km/hr. One fluorometer could cover 24 km/day. Spill-affected coastline lengths under worst case spill are: **Ningaloo Nth** (230 km) **Ningaloo Sth** (150 km) **Muiron Islands** (8 km) **Exmouth Gulf** (16 km) **Inner Shark Bay** (30 km) **Eighty Mile Beach** While oil may hit these lengths of coastline over the duration of the worst case spill (77 days), oil will not affect these lengths of coastline immediately, rather over a period of days to weeks. Furthermore, the deployment philosophy is that fluorometer surveys will not 'blindly' patrol the entire coastline. Deployments will be targeted to ground truth spill modelling predictions. That is, the predicted front(s) of entrained oil will be	The purpose of fluorometry is to: 1) inform dispersant controls (i.e., inform the location and concentration of entrained oil plumes relative to sensitive receptors); 2) inform the locations of scientific monitoring programs (e.g., water quality monitoring). Additional fluorometers may limit missed data opportunities (i.e., sites that are affected by entrained oil may not be detected in a timely manner). Fluorometry will, however, target those sites that have the greatest potential for environmental impact (i.e., the most sensitive areas with the highest predicted concentration of entrained oil). These high-priority sites will be the ones targeted for scientific monitoring and will also be those sites which will inform NEBA of dispersant use. Any additional fluorometers would be applied to lower sensitive areas and once the fluorometers deployed at high priority sites have confirmed	Santos can access five subsea gliders with fluorometers through Blue Ocean Monitoring and two towed fluorometers through CSIRO/OSRL. This is considered sufficient for upfront planning. Additional tow behind fluorometers can be sourced from CSIRO and OSRL if apparent there are data gaps that cannot be filled by existing arrangements. This would not be an upfront cost but the need and costs would be assessed after a spill event.	The existing arrangements are considered sufficient to provide targeted fluorometry to priority sites within oil arrival timeframes for a worst-case spill. Additional fluorometers can be arranged and deployed should the need arise this is not considered time critical and the additional benefit is considered low. The response is considered ALARP.

		traversed by gliders to verify entrained oil presence.	presence of entrained oil these units can be moved to areas of secondary priority. Therefore, it is considered there is little additional environmental benefit in having more fluorometers.		
UAVs	One UAV and licenced UAV operator for each of the following areas: **Muiron Islands** **Shark Bay Outer Coast** **Carnarvon-Inner Shark Bay** **Eighty Mile Beach**	UAVs are required only for coastlines where shoreline access and/or aircraft/vessel observation is difficult (e.g., dense mangrove habitat). Worst case modelling indicates UAVs may be beneficial for Muiron Islands, Outer Shark Bay Coast and Carnarvon-Inner Shark Bay. It is a secondary surveillance strategy used by shoreline clean-up teams supporting clean-up operations. It is considered that accessibility will not be an issue for contacted areas of Exmouth Gulf (upper western shoreline) and Ningaloo Coastline (including mangrove areas).	The resourcing provides one UAV capability per clean-up team in these areas. Adding additional UAVs will not provide additional benefit (except for redundancy). The UAVs are considered a secondary aid in locating oil in difficult shorelines.	The UAVs used will be small short-range UAVs and licenced operators which are readily available. Hire costs per day (UAV, operator and supporting equipment) on a scale of thousands of dollars. This would not be an upfront cost but the need and costs of additional UAVs would be assessed and borne after a spill event.	Additional UAVs can be sourced as needed after a spill event given their high availability. The number outlined in the OPEP is for pre-deployment planning purposes only. Given the use of UAVs is a secondary strategy and not critical to reducing environmental impact the existing arrangements are considered ALARP.
Surface dispersant application	16 Fixed Wing dispersant application planes. Two Air Attack Observation Aircraft.	The schedule for deployment of vessels and aircraft for chemical dispersant application is provided in Table 10-1 of the OPEP	<u>Dispersant</u> Under existing arrangements there is no benefit in increasing the availability of dispersants since the need can be met	In order to make-up the shortfall in aircraft a large number of dedicated dispersant application aircraft (up to 30) would	The cost of hiring dedicated dispersant aircrafts or vessels is disproportionately high compared to the level of risk reduction. Each

	One OSRL Hercules Dispersant Aircraft. One OSRL 727 Aircraft. Two Search & Rescue (SAR) Vessels. Supporting personnel. Five dispersant application vessels. Approximately 10,000 m³ chemical dispersant.	(Dispersant Needs and Supply). This schedule also shows how much chemical dispersant is required and where it will be sourced from in the event of a worst-case spill. The table also outlines the assumptions used to determine dispersant supply and application needs including vessel/aircraft application and encounter rates and dispersant:oil application ratios. This schedule demonstrates that the deployment of dispersant application planes and vessels from Day 2 and the ramping up of aircraft deployments over the following days will allow the required dispersant application rate for treating all surface oil (from a worst case sea surface blowout) to be met by around Day 13 onwards.	through existing stockpile arrangements and dispersant manufacturing by required timeframes. If the shortfall in aircraft and/or vessels was accounted for, additional dispersant would be required and will have environmental benefit. Aircraft Under existing arrangement there would be a shortfall in aerial dispersant application between Day 1 and Day 12 for a worst-case surface release. In order to meet this application shortfall (and assuming no additional vessels are used) 20 to 30 additional aircraft would need to be deployed each day over initial three days, 10 to 20 additional aircraft each day from Day 4 to Day 7 and one to ten additional aircraft per day from Day 8 to Day 12. If these additional aircraft were deployed all surface oil could theoretically be treated from surface dispersant application. Vessels The application rate for vessels is 10 m³ compared to 15 m³ for aircraft. The equivalent	need to be on standby and ready for deployment. The cost of aircraft would be in the order $800,000 p.a. One aircraft would provide for 15 m³ per day of dispersant. A shortfall of up to 30 aircraft would require up to $24 million p.a. to meet the need. For vessels, up to 45 additional vessels would be required over the first 12 days at a cost of $15,000 per day per vessel over the duration of the drilling campaign, with a total cost of up to $675,000 per day or up to $40 million for a 60-day drilling campaign. Spray systems would be an additional cost at approx. $30,000 each and a total cost of approx. $1.3 million in addition to the vessels costs. If the shortfall in aircraft and/or vessels was accounted for, additional dispersant would be required (approx. 1,000	aircraft or vessel would provide an average incremental benefit of up to approximately 1% (3,000 to 4,500 m³) extra treated oil over the initial 12 days of the response. With a dispersant efficacy of approximately 50%, up to approximately 2,000 m³ of oil would be 'removed' (dispersed) for each additional aircraft or vessel. For a single vessel on stand-by for a 60 day drilling campaign with a purchased spray system the cost would be over $1 million. For a single dedicated plane, the annual costs would be around $1 million. Assuming a vessel/aircraft cost of $1 million and a 'removal' of floating oil of approximately 2,000 m³ for the 12-day shortfall, the additional upfront cost of oil dispersed translates to $500/m³. The cost of setting up vessels and aircraft is an upfront guaranteed cost which needs to be compared to the

			shortfall in capacity for vessels (assuming no additional aircraft) is 30 to 45 vessels over the first three days, 15 to 30 vessels from Day 4 to Day 7 and two to 20 vessels from Day 8 to Day 12. This additional capability made up from vessel or aircraft would treat 17% of spilt oil otherwise untreated (assuming a 1:25 application ratio) with a dispersant efficacy likely around 50% (within 12 hours from release).	t). The dispersant required would cost around $8,000 a tonne to purchase. A shortfall of 1,000 t would represent a cost of $8 million + storage (approx. $8.5 million in total).	risk of an oil spill event which has a Rare likelihood. On this basis the cost of an additional vessel or plane to be on standby to apply dispersant within the first 12 days is considered disproportionally high compared to the incremental environmental benefit (percentage of additional oil treated). In the event of an oil spill the cost to remove 1 m³ of crude using manual or mechanical means is likely to be more than $10,000 (Etkin, 2000). While this is considerably higher than the upfront cost of having immediate capability to disperse all oil ($500/m^3 - based only on cost of having a vessel/aircraft on standby), the likelihood of a spill event is rare and the incremental risk reduction of dedicated aircraft/vessels is considered to be very low. The response is considered ALARP.
Offshore containment and recovery	24 C&R vessels, 12 C&R sets (boom and skimmer), three waste transfer vessels, three	This strategy will mobilise all C&R sets (booms and skimmers) available to Santos	For the worst-case spill event the resources provided for cannot remove all oil from the	To supply additional containment and recovery operations	Assuming a 50-day operating time with the best operational conditions

	sets waste transfer equipment.	either owned by Santos (three sets) or through arrangements with AMOSC, AMSA and OSRL. Worst case spill modelling indicates that these sets would initially be deployed from Exmouth for responding to oil off the northern Ningaloo Coast. Modelling then indicates these sets can then be moved to other Priority for Protection areas as the spatial extent of the spill increases. Offshore containment and recovery is not specifically proposed or prepared for along most of the outer Shark Bay coastline due to the limited sensitivity of the shoreline (steep rocky shorelines of Dirk Hartog/ Bernier/Dorre islands western shores and south of Steep Point) although Containment and Recovery operations are planned to target those passages entering into the more sensitive inner Shark Bay area and Turtle Bay/Cape Inscription on Dirk Hartog island.	water before shorelines are contacted. Under the most suitable weather conditions (low wave height) and assuming a recovery per operation of 30 m^3 per day 100s of C&R equipment sets, 100s of trained responders and 100s of vessels would be required from Day 7 to clean up all oil from water before landfall for the worst case spill event. Each additional C&R set + two vessels + trained responders mobilised would provide additional oil recovery of 30 m^3 per day per vessel assuming optimum weather conditions.	would require vessels to be set-up with equipment prior to the activity (stand-by vessels). The standby rate for two additional vessels (required per single operation) is approximately $50,000 per day. For a two-month drilling campaign, the additional cost would be approximately $3 million per two vessels in addition to the purchase of additional booms and skimmers and associated equipment at a cost of $1 million. A total cost of $4 million would provide at best and additional benefit of 30 m^3 per day.	providing for 30 m^3 per day a benefit of an additional 1,500 m^3 collected (less than 0.5% of total spill volume) would cost of $4 million. The $4 million is an upfront guaranteed cost while the 1,500 m^3 assumes the low probability of the worst-case spill occurring and having optimum weather conditions (calm seas) over the spill period to collect oil. This represents a cost of $3,000 per m^3 of oil. This compares to data from Etkin (2000) suggesting over three times this amount for shoreline clean-up for 1 m^3 of oil. The difference between the two strategies is that containment and recovery approach has a guaranteed cost regardless of a spill occurring vs shoreline clean-up costs which occur only on demand. The response is considered ALARP.

		All Australian based C&R (Santos, AMOSC, AMSA) recovery can be deployed by Day 7 – which covers response timeframe requirements based on the worst-case spill.			
Protection and deflection	**Ningaloo Nth** – ten 500 m shoreline boom (AMOSC – Geelong, Fremantle, Exmouth), five vessels with anchors, bridles, accessories, ten protection nets, 1,000 sandbags. **Muiron Islands** – two 500 m shoreline boom (AMOSC in Geelong), one vessel with anchors, bridles, accessories, two protection nets. **Exmouth Gulf Coast** – four 500 m shoreline boom (AMSA in Dampier), two vessels with anchors, bridles, accessories, four protection nets. **Ningaloo Sth** – four 500 m shoreline booms (AMSA in Dampier, Fremantle), two vessels with anchors, bridles, accessories, four protection nets. **Carnarvon-Inner Shark Bay** – two 500 m shoreline	The level of resources specified for each Priority for Protection areas is considered appropriate to protect those shoreline locations of highest priority (typically accessible mangroves areas or beach areas of high ecological value, such as turtle nesting beaches). However, the effectiveness of shoreline protection along the Ningaloo Coastline is limited due to longshore currents. Some areas (Yardie Creek mouth and Mangrove Bay) may be effectively protected; however, the booms will be more effective in collecting parcels of oil. The alternating direction of longshore currents indicates that the same boom set can collected oil from both directions	Protection and deflection booming has limited application for these Priority for Protection areas due to high velocity tidal currents. There is considered limited opportunity for additional resource deployment and additional environmental benefits.	Not applicable given there is limited environmental benefit of additional resources.	Given there is limited environmental benefit of additional resources the response preparedness is considered ALARP. However, additional lengths of shoreline boom is available through existing agreements (e.g., AMOSC, OSRL, NRT) if it becomes apparent that this is required, although not anticipated.

	booms (AMSA Fremantle), one vessel with anchors, bridles, accessories, two protection nets, 500 sandbags. **Eighty Mile Beach** (oil loading windows allow for some of this equipment to be relocated from Exmouth Gulf Coast and Muiron Islands).	rather than collecting oil from a single pass through. Shoreline protection is not considered for Outer Shark Bay coastline given the hazardous nature of this coast (steep cliffs, rocky shorelines and high wave energy). The shoreline boom, vessels and personnel stipulated for each Priority for Protection area can be provided within worst-case oil loading timeframes.			
Shoreline clean-up	**Ningaloo Coast Nth** Two Decontamination Systems, two Staging area Infrastructure (Tents, Laydown), four ATVs plus trailer, four bulldozer/ scraper/front end loaders, four Forklifts, 600 clean-up personnel (400 rostered on), 18 OSRT members, four welfare personnel, two Medics. **Ningaloo Coast Sth** Two Decontamination Systems, two Staging area Infrastructure (Tents, Laydown), four ATVs plus	The proposed shoreline clean-up operations are based on up to 200 clean-up personnel rostered on at any one staging area. This is considered the maximum number of personnel that can be managed to provide for an effective response which minimises additional impacts to the environment. This is also considered a maximum number that can be handled through camp amenities. The numbers of clean-up personnel (and mechanical equipment where applicable)	While oil is arriving (i.e., the source is not controlled) there is limited benefit from additional resources that might remove oil more quickly and any additional resources may be counterproductive in that additional impacts may outweigh benefits. After the source has been controlled and oil has finished arriving, there may be an additional benefit in having increased resources at particular locations dependent upon environmental sensitivity. For example, a turtle nesting beach during the nesting/ hatching season may benefit in	The cost of additional resources is not considered the limiting factor; the limiting factor is considered to be the availability of use. If required, additional personnel and machinery will be sourced and the additional cost borne by Santos.	The resources that have been planned for have been based on availability of use and based on existing knowledge are considered appropriate. If more resources are required during a response they will be provided for through existing arrangements. The response is considered ALARP.

	trailer, four bulldozer/ scraper/front end loaders, four forklifts, 600 clean-up personnel (400 rostered on), 18 OSRT members, four welfare personnel, two Medics. **Muiron Islands** One Decontamination System, one Staging area Infrastructure (Tents, Laydown), one ATV plus trailer, Clean up equipment kits, 45 clean-up personnel (30 rostered on), two OSRT members, one welfare person, one Medic, one vessel/barge, vessel crew. **Exmouth Gulf** One Decontamination System, one Staging area Infrastructure (Tents, Laydown), one ATV plus trailer, one bulldozer/ scraper/front end loader, one Forklift, Clean up equipment kits, 75 clean-up personnel (50 rostered on), four OSRT members, one welfare person, one Medic. **Outer Shark Bay** One Decontamination System, one Staging area	for each Priority for Protection area have been calculated such that the worst case modelled loading oil can be removed within a relatively short period (within a few weeks) after when last oil arrives at a location, notwithstanding that Phase 2 remediation will be monitored for months after Phase 1 manual pickup finishes. The equipment and personnel schedules for a worst-case shoreline loading at each of the Priority for Protection areas are detailed in Section 13.6 of the OPEP. The deployment of personnel involves a scaling up of capacity over time with rostered crews working 2 weeks on, 1 week off shift such that fatigue can be managed appropriately. The combination of machinery for mechanical removal of oil (bulldozers/scrapers/front end loaders) and personnel requirements have been considered for each Priority for Protection area based on	having additional resources deployed to clean the beach before nesting/ hatching events. In this situation additional resources can be obtained through existing recruitment agencies and/or resources redirected from existing operations. There may be benefit in deploying additional machinery in the event of greater opportunities for use given machinery has the capacity to remove far greater volumes of bulk oil in the right circumstances. Given the numerous factors and consideration in determining the best approach for shoreline clean-up, the benefit of additional resources will be determined for each operational period.		

	Infrastructure (Tents, Laydown), one ATV plus trailer, Clean-up equipment kits, 45 clean-up personnel (30 rostered on), two OSRT members, one welfare person, one Medic, one vessel/barge, vessel crew. **Carnarvon – Inner Shark Bay** One Decontamination System, one Staging area Infrastructure (Tents, Laydown), one ATV plus trailer, Clean-up equipment kits, 75 clean-up personnel (50 rostered on), four OSRT members, one welfare person, one Medic, one vessel/barge, vessel crew. **Eighty Mile Beach** One Decontamination System, one Staging area Infrastructure (Tents, Laydown), one ATV plus trailer, Clean-up equipment kits, 75 clean-up personnel (50 rostered on), four OSRT members, one welfare person, one Medic, one vessel/barge, vessel crew.	opportunities for use. Therefore, it is the opportunity for use rather than the availability of machinery and personnel which is considered the limiting factor.			
Waste management	Six 15-tonne skip lift trucks. Four 28 m^3 front lift trucks.	The resources planned for in terms of waste management (storage and transport) have	Additional resources will be obtained through existing arrangements with ToxFree if	Cost is not considered a limiting factor if	Resources are considered to match worst case modelled waste requirements.

	Four 18 m^3 side loading trucks. Two 70-tonne hook lift trucks. Eight 15-pallet space flatbed trucks. 100 x 240 L MGBs. Two 8-Pack MGB offshore lifting cradles. Six 1.1 m^3 lidded bins. 50 x 3 m^3 front lift bins. 25 x 4.5 m^3 front lift bins. 100 x 3 m^3 offshore rated front load bins. 45 x 7 m^3 offshore rated bins. 60 x 6-9 m^3 Marrell skip bins. 12 x 15-30 m^3 hook lift bins. Four 4-tonne forklifts. (above equipment supplied through ToxFree contract).	been matched to the waste generated from the combined Priority for Protection areas based on a worst-case hydrocarbon release (worst case shoreline loading volumes).	required. On the basis of shoreline waste collection volume calculations there is no apparent benefit in deploying additional resources.	additional resources are required.	Additional resources can be sourced through existing arrangements if during a response it becomes apparent that additional resources are required. The response is considered ALARP.
Oiled wildlife response	Oiled wildlife equipment requirements for up to a Level 6 response are provided within the WA Oiled Wildlife Response Plan (WAOWRP) and the Pilbara Operational Oiled Wildlife Response Plan (POOWRP).	The level of oiled wildlife response needed for each Priority for Protection area was considered to be within the threshold of the WAOWRP and POOWRP (up to a Level 6 response). The resources defined are consistent with the levels described in these plans.	It is considered by matching the total level of resources to need in the planning phases that no additional environmental benefit can be gained through the use of additional resources. However, in the event of a mass oiling of wildlife within the first few days of a spill event the total pool of	The cost of additional personnel is $1,500 per person per day as per existing arrangements through recruiting agencies. This is a guaranteed cost regardless of whether a spill occurs or not.	The additional cost of having personnel on standby ($9 million for 100 additional personnel) would provide an unknown benefit (species dependent) for the first few days of a response before ramp-up of existing resources can occur. Given the rare likelihood of a spill

	Three Level 4 OWR responders (AMOSC/AMOSC contacts). Four Level 3 OWR responders (AMOSC/AMOSC contacts). 15 Level 2 OWR responders (AMOSC/AMOSC contacts). One OWR Tech (vets) (as per WAOWRP). One OWR Other personnel (Species Specific Specialists). More than 200 Level 1 OWR responders (AMOSC/DPaW registered volunteers/ Workforce Labour Hire).	The timing of personnel deployment is consistent with a controlled ramp up of response (over a period of two days to three weeks) and initial deployments can be made within worst-case shoreline accumulation timeframes for each of the Priority for Protection areas.	resources will not be available unless sourced and placed on standby throughout the activity. That is, the defined resources are available through a ramp-up of response but not all immediately available. The benefit of the resources available over a quicker period will be variable based on the affected species (catchability and treatability) but it is known that an oiled wildlife response will not be 100% successful.	A near instantaneous mass oiling event could require up to 100 oiled wildlife responders on stand-by with a cost of approximately $150,000 per day over the duration of the drilling activity. For a two-month activity the upfront cost would be $9 million over the duration of the drilling period.	occurring and a mass oiled wildlife event occurring within the first few days this cost is seen as grossly disproportionate to environmental benefit. Therefore, the existing arrangements are considered ALARP.

7 External notifications and reporting procedures

For oil spill incidents, the OSC (of the MODU or Company Site Representative) will notify the Perth-based IMT for delegation of further notifications to relevant Regulatory Authorities and for further spill response assistance for Level 2/3 spills.

7.1 Regulatory notification and reporting

The Incident Commander (IC) is to delegate the following regulatory reporting requirements. Typical delegated parties will be the Safety Team Leader and the Environmental Team Leader.

Contact details for the Regulatory agencies outlined in **Table 7-1** are provided within the Incident Response Telephone Directory (SO-00-ZF-00025.020).

Table 7-1 outlines the external regulatory reporting requirements specifically for oil spill incidents outlined within this OPEP in Commonwealth and State jurisdictions, noting that regulatory reporting may apply to smaller Level 1 spills that can be responded to using onsite resources as well as larger Level 2/3 spills.

State water notifications to WA DoT will apply to spills in State waters or spills originating in Commonwealth waters and moving to State waters.

Table 7-1 outlines Santos oil spill reporting requirements associated with carrying out a Petroleum Activity in State and Commonwealth waters. There are also additional requirements for Vessel Masters to report oil spills from their vessels under relevant marine oil pollution legislation (e.g., MARPOL). This includes, where relevant, reporting oil spills to AMSA (Rescue Coordination Centre) and WA DoT (MEER unit).

The Incident Response Telephone Directory (SO-00-ZF-00025.02) contains a more detailed list and contact details for incident response support and is updated every 6 months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

7.2 Activation of external oil spill response organisations and support agencies

Table 7-2outlines notifications that should be made to supporting agencies to assist with spill response activities outlined within this plan. This list contains key oil spill response organisations that have pre-established roles in assisting Santos in an oil spill response. It is not an exhaustive list of all providers that Santos may use for assisting an oil spill response.

The Incident Response Telephone Directory (SO-00-ZF-00025.02) contains a more detailed list and contact details for incident response support and is updated every six months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

7.3 Environmental performance

Table 7-3 lists the Environmental Performance Standards and Measurement Criteria for external notifications and reporting.

Table 7-1: External notification and reporting requirements (commonwealth, state and international waters)

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
NOPSEMA Reporting Requirements for Commonwealth water spills					
NOPSEMA (Incident Notification Office)	Verbal notification within two hours Written report as soon as practicable, but no later than three days	*Petroleum and Greenhouse Gas Storage Act 2006* Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009 (as amended 2014)	A spill associated with VG Drilling activities in Commonwealth waters that has the potential to cause moderate to significant environmental damage[1]	Notification by IMT Environmental Team Leader (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
National Offshore Petroleum Titles Administrator and WA Department of Mines, Industry Regulation and Safety (DMIRS)	Written report to National Offshore Petroleum Titles Administrator and DMIRS within seven days of the initial report being submitted to NOPSEMA	Guidance Note (N-03000-GN0926) Notification and Reporting of Environmental Incidents	Spill in Commonwealth waters that is reportable to NOPSEMA	Notification by IMT Environmental Team Leader (or delegate)	Provide same written report as provided to NOPSEMA
DMIRS Reporting Requirements for State water spills					
WA DMIRS	Verbal phone call within two hours of incident being identified Follow up written notification within three days	Guidance Note on Environmental Non-compliance and Incident Reporting	A spill associated with drilling activities in State waters that has the potential to cause an environmental impact that is categorised as moderate or more	Notification by IMT Environmental Team Leader (or delegate)	Environmental and Reportable Incident/ Non-compliance Reporting Form http://www.dmp.wa.gov.au/Environment/Environment-reports-and-6133.aspx

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
			serious than moderate[1]		
DFAT Reporting Requirements for International waters spills					
Department for Foreign Affairs and Trade	Verbal notification within 24 hours of modelling suggesting trans-national migration of oil into Indonesian or Timor-Leste.	Not applicable	NOPSEMA, DISER and DFAT will form an inter-agency panel; the Australian Government Control Crisis Centre	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
AMSA and DoT spill reporting requirements					
AMSA Rescue Coordination Centre (RCC)[2]	Verbal notification within two hours of incident	Under the MoU between Santos and AMSA	Santos to notify AMSA of any marine pollution incident[1]	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
WA Department of Transport (WA DoT)[2] (MEER Duty Officer)	Verbal notification within two hours Follow up with Pollution Report (**Appendix I**) as soon as practicable after verbal notification If requested, submit Situation Report (**Appendix J**) within 24 hours of request	Emergency Management Regulations 2006 State Hazard Plan: Maritime Environmental Emergencies Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements	Santos to notify of actual or impending Marine Pollution Incidents (MOP) <u>that are in, or may impact, State waters</u> Emergency Management Regulations 2006 define MOP as an actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health	Notification by IMT Environmental Team Leader (or delegate) MEER Duty Officer contacted per Incident Telephone Directory	WA DoT POLREP (**Appendix I**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf WA DoT SITREP (**Appendix J**): https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
			of a person, property or the environment[1]		
Protected areas, fauna and fisheries reporting requirements					
Commonwealth Department of Agriculture, Water and the Environment (Director of monitoring and audit section)	Email notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	If Matters of National Environmental Significance (MNES) are considered at risk from a spill or response strategy, or where there is death or injury to a protected species	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
Department of Biodiversity Conservation and Attractions (Pilbara Regional Office)	Verbal notification within two hours	DBCA consultation	Santos to notify AMSA of any marine pollution incident[1] Notify if spill has the potential to impact or has impacted wildlife in State waters (to activate the Oiled Wildlife Adviser)	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
Department of Biodiversity Conservation and Attractions (State Duty Officer and Pilbara Regional Office)	Verbal notification within two hours	Western Australian Oiled Wildlife Response Plan	Notify if spill has the potential to impact or has impacted wildlife in State waters (to activate the Oiled Wildlife Adviser)	Notification by IMT Environmental Team Leader (or delegate)	Not applicable

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
Parks Australia (Director of National Parks)	Verbal notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	An oil spill which occurs within a marine park or are likely to impact on an Australian Marine Park	Notification by IMT Environmental Team Leader (or delegate)	Not applicable, but the following information should be provided: Titleholder's details Time and location of the incident (including name of marine park likely to be affected) Proposed response arrangements as per the OPEP Details of the relevant contact person in the IMT
Department of Primary Industry and Regional Development (DPIRD) Fisheries	Verbal phone call notification within 24 hours of incident	As per consultation with DPIRD Fisheries	Reporting of marine oil pollution[1]	Notification by IMT Environmental Team Leader (or delegate)	Not applicable
Australian Fisheries Management Authority	Verbal phone call notification within 24 hours of incident	For consistency with DPIRD Fisheries notification	Reporting of marine oil pollution[1]	Notification by IMT Environmental Team Leader (or delegate)	Not applicable

[1] *For clarity and consistency across Santos' regulatory reporting requirements, Santos will meet the requirement of reporting a marine oil pollution incident to AMSA by reporting oil spills assessed to have an environmental consequence of moderate or higher in accordance with Santos' environmental impact and risk assessment process outlined in* ***Section 5*** *of the Van Gogh Phase 2 Drilling and Completions EP (TV-00.RI-00003.02).*

[2] *Santos reporting requirements only listed. For oil spills from vessels, Vessel Masters also have obligations to report spills from their vessels to AMSA Rescue Coordination Centre (RCC) and, in State waters, WA DoT MEER.*

Santos

Table 7-2: List of spill response support notifications

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
AMOSC Duty Manager	As soon as possible but within two hours of incident having been identified	Verbal Service Contract	Santos is a Participating Company in AMOSC and can call upon AMOSC personnel and equipment (including oiled wildlife). Under the AMOSPlan, Santos can also call upon mutual aid from other trained industry company personnel and response equipment AMOSC's stockpiles of equipment include dispersant, containment, recovery, cleaning, absorbent, oiled wildlife and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome	Step 1. Obtain approval from Incident Commander to mobilise AMOSC. Step 2. Notify AMOSC that a spill has occurred. Put on standby as required – activate if spill response escalates in order to mobilise spill response resources consistent with the AMOSPlan. Step 3. E-mail confirmation and a telephone call to AMOSC will be required for mobilisation of response personnel and equipment, and callout authorities will be required to supply their credentials to AMOSC. A signed service contract must also be completed by a call out authority and returned to AMOSC prior to mobilisation.	IMT Environment Team Leader (or delegate) will notify AMOSC (upon approval from Incident Commander)
Babcock Helicopters	Within two hours of incident having been identified	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place	Phone call.	IMT Logistics Team Leader (or delegate)
Duty Officers/ Incident Commanders (Woodside, BHP, Chevron)	Within two hours of incident having been identified	Verbal	Mutual aid resources (through AMOSC mutual Aid Arrangement)	Phone call.	Incident Commander (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
Exmouth Freight & Logistics	Within two hours of incident having been identified	Verbal	Assistance with mobilising equipment and loading vessels	Phone call.	IMT Logistics Team Leader (or delegate)
North West Alliance – Waste	As required for offshore and shoreline clean-up activities	Verbal	Santos has contract arrangements in place with North West Alliance to take overall responsibility to transport and dispose of waste material generated through clean-up activities	Phone call to the Primary Contact Person. In the event the Primary Contact Person is not available, the Secondary Contact Person will be contacted.	IMT Logistics Team Leader (or delegate)
Astron	Scientific Monitoring Plan initiation criteria are met (**Section 17.7**)	Verbal and written	Astron has been contracted by Santos to provide Standby Services for Scientific Monitoring Plans (SMPs) 1 to 11. This includes provision of personnel and equipment. Astron annually reviews the SMPs for continual improvement	Step 1. Obtain approval from Incident Commander to activate Astron for Scientific Monitoring. Step 2. Verbally notify Astron followed by the submission of an Activation Form (Environment Team Leader Folder) via email. Step 3. Provide additional details as requested by the Astron Monitoring Coordinator on call-back. Step 4. Astron initiates Scientific Monitoring Activation and Response Process.	IMT Environment Team Leader (or delegate)
Intertek Geotech (WA) Environmental Services and Ecotoxicology	When characterisation of oil is activated (**Section 10.5**)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting	Phone call.	IMT Environment Team Leader (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
Oil Spill Response Limited, OSRL Duty Manager	Within two hours of incident having been identified	Verbal OSRL Mobilisation Authorisation Form	Santos has a Service Level Agreement with OSRL, which includes the provision of support functions, equipment and personnel to meet a wide range of scenarios At minimum OSRL will provide technical support to the IMT and place resources on standby Further details available on the OSRL webpage.	Step 1. Contact OSRL Duty Manager in Singapore and request assistance from OSRL. Step 2. Send notification to OSRL as soon as possible after verbal notification. Step 3. Upon completion of the OSRL incident notification form, OSRL will plan and place resources on standby.	Designated call-out authorities (including Incident Commanders)
RPS Group	As soon as possible but within two hours of incident having been identified	Verbal and written	Santos has an agreement in place with RPS Group to allow rapid marine hydrocarbon spill modelling capability to be activated at any time during activities, which will be undertaken for any spill greater than Level 1. AMOSC can also run modelling on behalf of Santos, if required, as part of contracting arrangements with RPS Group	Contact RPS Group Duty Officer.	IMT Environment Team Leader (or delegate)
Wild Well Control (WWC)	Within four hours of a loss of well control incident having been identified	Loss of well control only Verbal	Well intervention services. Under contract.	Step 1. Following Santos management confirmation of a LOWC, IMT Drilling Team Leader is to call the Wild Well Control 24 hour emergency hotline number to notify WWC of the incident. Step 2. As soon as practical after initial notification and once the scale of the subsea loss of containment is confirmed, an emergency mobilisation authorisation form (saved in ECM) must be filled out,	IMT Drilling Team Leader

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
				signed off by the authorised Santos Manger sent through to WWC. The form is located on the Santos Intranet Procedures Index under Emergency Procedures (http://ausintranet.enerylimited.com/dept_data/Procedure_data/index.htm). Email as directed by WWC point of contract provided by the emergency hotline attendant.	

Table 7-3: Environmental performance – external notification and reporting

Environmental Performance Outcome	Make notifications and reports within regulatory and defined timeframes.		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
External notifications and reporting plan	Response Preparedness		
	Incident Response Telephone Directory (SO-00-ZF-00025.02)	Incident Response Telephone Directory is revised every six months	Document revision history
	OPEP Communications Test	OPEP contact details for regulatory and service provider notifications are checked annually	Test records
	Response Implementation		
	External notifications and reporting tables	External notification and reporting undertaken as per **Table 7-1** and **Table 7-2**	Incident Log

8 Incident action planning

Santos incident response personnel use the incident action planning process to guide the incident response and to develop Incident Action Plans (IAPs). All stakeholders involved in the incident achieve unity of effort through application of the disciplined planning process.

The incident action planning process is built on the following phases:

7. Understand the situation;
8. Establish incident priorities, objectives and tasks;
9. Develop a plan (IAP);
10. Prepare and disseminate the plan; and
11. Execute, evaluate and revise the plan for the next operational period.

The Santos IMT will use the IAP process to determine and document the appropriate response priorities, objectives, strategies and tasks to guide the incident response which are reviewed and updated as more information becomes available.

The Santos IAP process is built on the phases described in **Figure 8-1.**

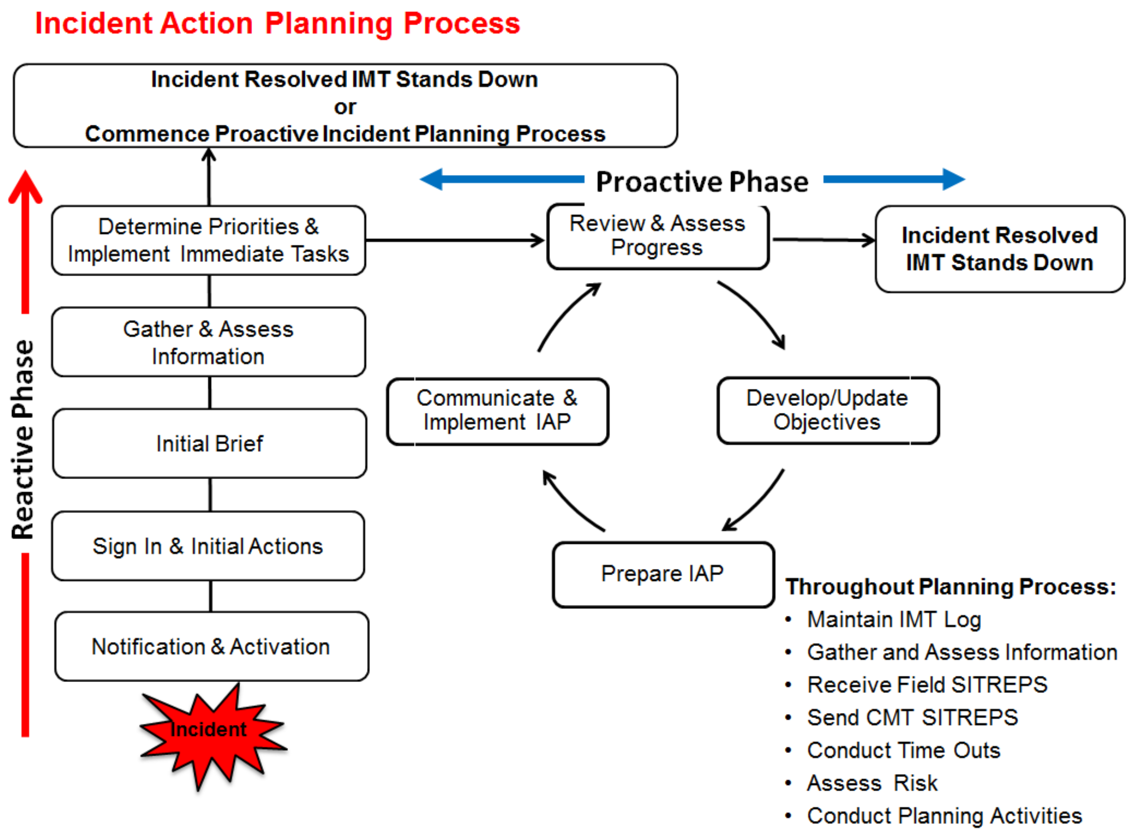

Figure 8-1: Incident Action Plan process

8.1.1 Reactive phase planning

The initial phase of the incident action planning process can be considered a reactive phase (indicatively lasting up to 48 hours) where information on the incident is being progressively established through reports coming in from the field. During this phase there is no formal Incident Action Plan to follow (given the incident has just begun and details are still being established) however the OPEP (this document) has been prepared to contain all first strike oil spill response actions required to be followed during this phase in lieu of a formal IAP.

First strike response actions are summarised in **Section 2** and provide links to relevant oil spill strategy sections within the OPEP which contain a more detailed list of implementation actions and considerations as well as statements of performance (performances standards) that must be followed to ensure the initial response meets regulatory requirements and environmental performance outcomes.

For each credible oil spill scenario covered by this OPEP the first strikes response actions, have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic net environmental benefit analysis (NEBA) also referred to as a spill impact mitigation assessment (SIMA). This pre-planning is included in **Section 6**. During the reactive phase the strategic NEBA is to be reviewed and, using the specific information gathered from the spill, operationalised into an operational NEBA (**Section 6.7**). This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the incident response.

8.1.2 Developing an Incident Action Plan

At the end of the reactive phase where the incident specifics have been determined, a more formal phase of spill response is entered whereby a documented IAP is developed to guide the incident response activities for the next operational period. An operational period is defined as the period scheduled for execution of actions specified in the IAP. The next operational period is nominally a daily period but for long running incidents may be extended further where the pace of the incident response has settled and the level of new information has decreased.

As IAPs and response strategies are implemented their performance is monitored. The performance measurement results are fed back into the IMT to provide the IMT with greater situational awareness to enable the effective formulation of following IAPs. Those response strategies that are effective are continued or increased, while those strategies that are ineffective are scaled back or ceased.

The performance against the objectives of the IAP must be documented in the Incident Log by the IMT. This provides the IMT with information required to assist in formulating the following IAP and provides evidence of Santos' response to the incident for regulatory and legal investigations that will follow the termination of the incident.

IAP performance is monitored through IMT communication with in-field response personnel both verbally and through logs/reports/photos sent throughout the response (e.g. surveillance personnel, team leaders, laboratory chemists, etc.) who report on the effectiveness of the response strategies.

IAP forms and processes are documented in the Incident Command and Management Manual (SO-00-ZF-00025) and in the 'Emergency Response' folder sets at L:\Resource\Emergency Response\Incident-Exercise Number-Name. Begin the response by copying and saving Incident-Exercise Number-Name folder set with a unique incident name and Id number on the lead folder; this is the Incident Log. Access subfolders to display all forms required to conduct incident action planning. Each functional position within the IMT and CMT has subfolders carrying forms and processes unique to the functional position.

8.2 Environmental performance

Table 8-1 lists the Environmental Performance Standards and Measurement Criteria for incident action planning.

Table 8-1: Environmental performance – incident action planning

Environmental Performance Outcome	Manage incident via a systematic		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Incident Action Planning	**Response Preparedness**		
	IMT Exercise and Training Plan	Incident Action Planning and NEBA is practiced by the IMT during exercises	Exercise records
	Response Implementation		
	Incident Action Plan	Incident Action Plan is completed for each operational period and approved by the Incident Commander	Incident Log Incident Action Plan/s
		Monitor effectiveness of response strategies being implemented and use information in the development of IAPs	Incident Log Incident Action Plan/s
	NEBA	An operational NEBA will be undertaken for each operational period of the incident	NEBA Incident Action Plan

9 Source control plan

The initial and highest priority response to an oil spill incident following the health and safety of onsite personnel is to prevent or limit further loss of hydrocarbons to the environment.

For major hydrocarbon release incidents during the Van Gogh Infill Phase 2 activities, the MODU Operator's Emergency Response Plan and the Santos-MODU Operator Emergency Response Bridging Plan outline the initial actions to be taken by onsite personnel to control the source of a hydrocarbon spill and limit the volume released to the environment.

For vessels with a SOPEP, the SOPEP will provide the relevant initial actions to control the source of the spill.

For the ongoing response to a LOWC incident, the Santos Offshore Source Control Planning and Response Guideline (DR-00-ZF-20001) is to be consulted as the overarching source of information for implementing a relief well response.

The sections below provide an outline of source control activities noting that the MODU Operator's Emergency Response Plan, Vessel SOPEP and Source Control Planning and Response Guideline (DR 00 ZF 20001), where applicable, will provide a higher level of detail for specific incidents.

9.1 Minor release

A minor (Level 1) release of up to 2.5 m^3 of marine diesel, base oil, hydraulic oil or lubricating oil is considered possible due to human error, hose failure, breach of containment, flare dropout etc.

Minor release from vessels/MODU				
Initiation criteria	Notification of spill.			
Jurisdictional Authority	Facility (MODU) spills including hydrocarbon transfers: NOPSEMA Support Vessel spills: AMSA			
Control Agency	Facility (MODU) spills including hydrocarbon transfers: Santos Support Vessel spills: AMSA NB: Santos will act as Control Agency for source control of all spills unless notified otherwise			
Objective	Implement source control to prevent further release of hydrocarbons to the marine environment.			
Applicable hydrocarbons	Crude Oil	Diesel	Hydraulic Oil	Lube Oil
	X	✔	✔	✔
Termination criterion	Release of hydrocarbon into the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons.			

In the event of a release of hydrocarbon onto the decks of a vessel or MODU, or a leak during bunkering activities, the relevant SOPEP will be implemented. Sorbent materials will be used from spill kits on-board the vessel or MODU to mop up the oil on deck. Soiled sorbent materials will be bagged and disposed to shore, and managed as per the Waste Management Plan.

A summary of measures to be taken to control a spill of this nature include:

+ pumping operations to cease immediately following the spill;
+ drainage networks closed as soon as practicable following the spill to prevent discharge to the ocean;
+ recover hose and identify leak;
+ make necessary repairs to hose/pipe; and
+ use spill kit resources (i.e. sorbent material) to clean-up spills.

9.2 Vessel collision

This source control plan covers scenarios in which a vessel collision, or collision with the MODU, may result in the release of all or part of a storage tank or fuel tank contents, releasing hydrocarbons to the marine environment. This could require a Level 2/3 response.

Vessel Collision and fuel tank rupture		
Initiation criteria	Notification of a vessel incident/spill.	
Jurisdictional Authority	Spill from MODU onsite (facility): NOPSEMA Spill from Support Vessel: AMSA	
Control Agency	Spill from MODU onsite (facility): Santos Spill from Support Vessel: AMSA NB: Santos Will act as Control Agency for source control of spills from vessel collision unless notified otherwise	
Objective	Implement source control to prevent further release of hydrocarbons to the marine environment.	
Applicable hydrocarbons	Crude Oil	Diesel
	X	✔
Termination criterion	Cargo is secured and release to the marine environment has ceased; or As directed by the relevant Control Agency.	

In a vessel impact situation there is a likelihood of personnel injury, which will take priority over responses to reduce the hydrocarbon volume released to the marine environment. In the event diesel is released from a vessel due to a ruptured fuel tank, the relevant vessel Shipboard Oil Pollution Emergency Plan (SOPEP) will be followed by the Vessel Master, as applicable. Notwithstanding source control action specified in the vessel's SOPEP or other relevant procedures, the following activities would be immediately evaluated for implementation:

+ reduce the head of cargo by dropping or pumping the tank contents into an empty or slack tank;
+ consider pumping water into the leaking tank to create a water cushion to prevent further cargo loss;
+ if the affected tank is not easily identified, reduce the level of the cargo in the tanks in the vicinity of the suspected area if stability of the vessel will not be compromised;
+ attempt repair and plugging of hole or rupture;
+ evaluate the transfer of cargo to other vessels; and
+ trimming or lightening the vessel to avoid further damage to intact tanks.

Through the implementation of these actions, the amount of hydrocarbons released to the marine environment may be reduced. However, there are several influencing factors that would result in delay or inability to implement controls, potentially resulting in a full discharge of a fuel tank compartment; such as a high sea state, a significantly large rupture, or injuries to personnel.

Maintenance of Response

With the volumes of fuel involved in vessel collision source control, the response can be maintained using onsite resources or offsite vessels in the case of fuel transfer for the required time period of up to several hours without additional planning.

9.3 Loss of well control

A worst case loss of well control during drilling and completions activities could result in a crude oil release of 319,723 m^3 at seabed or 350,566 m^3 at sea surface over a period of 77 days.

Loss of Well Control Plan		
Initiation criteria	Notification of incident/spill.	
Jurisdictional Authority	NOPSEMA	
Control Agency	Santos	
Objective	Implement source control to prevent further release of hydrocarbons to the marine environment.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	X
Termination criterion	The primary well is contained and killed to prevent any further release of hydrocarbon to the environment.	

9.3.1 Emergency shutdown procedure

For LOWC during MODU drilling and completions over a well, all available attempts will be made to control the well through the use of the blow-out preventer (BOP). The BOP is a SCE within the NOPSEMA-accepted Safety Case for the MODU undertaking the drilling and completions activities.

For the worst case LOWC and spill volumes covered under this OPEP, failure of the BOP (in the case of MODU drilling and completion blowouts) and SSSV (in the case of an uncontrolled well leak) have been assumed.

9.3.2 Well kill sequence of events

In the event that the well cannot be brought under control using onsite systems, offsite resources will be activated to kill the well. In preparation for all possibilities a Subsea First Response Toolkit (SFRT), Capping Stack and a Relief Well drilling will be planned and mobilised and will be called back if situational circumstances prevent installation.

The key guidance for mobilisation of a source control response to a loss of well control event across Santos facilities and drilling operations is the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) and is to be consulted for detail regarding mobilisation of personnel and equipment for well control operations.

Drilling of a relief well is the primary strategy to kill a leaking well. Preparations for relief well drilling will be pursued concurrently with SFRT/ Capping Stack mobilisation and planning preparation.

Key IMT actions for the drilling of a relief well are detailed below.

	No.	Action	By whom
Actions	1	Notify Santos Drilling and Completions Team to immediately begin preparations	Drilling Team Leader
	2	Source MODU through nearby drilling operations if available or procure from nearest operator through mutual aid agreement MOU.	Drilling Team Leader and Drilling & Completions Source Control Team
	3	Design Relief Well and have prepared in time to procure equipment and personnel prior to MODU arrival on location	Drilling & Completions Source Control Team

	4	Assess relief well equipment and personnel requirements. Procure and make ready		Drilling & Completions Source Control Team
	5	Deploy equipment and personnel to site to begin spud and drill (24 days from initial activations)		Logistics Team Leader
	6	Monitor progress of relief well drilling and communicate to IMT		Drilling Team Leader
Supporting documentation for IMT				
Document Title			**Reference No.**	**Note**
Campaign specific Source Control Plan (as applicable)			To be confirmed before drilling	
Memorandum of Understanding: Mutual Assistance (To facilitate the transfer of Drilling Units and Well-Site Services between operators in Australian and Timor Leste administered waters to overcome emergency conditions)			N/A	Maintained on Santos Intranet Procedures Page
Santos-WWC Contract for Well Intervention Services				Reviewed regularly
Maintenance of response			Santos has the resources available from existing operations on the NWS to maintain and operate a MODU for as long as the response is required. Staff will be rotated (including specialists from Perth and from Wild Well Control) and the MODU will be maintained with support vessels through existing contracts with vessel suppliers.	

A summary of the sequence of events that takes place once a blowout has occurred is illustrated in **Figure 9-1** and detailed further in **Sections 9.3.3** to **9.3.7.**

Figure 9-1: Sequence of events for well intervention

9.3.3 Initial response

+ Emergency Response Plan:
  - evacuation of personnel
  - activate IMT/Source Control Plan as per the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001)
  - manage the rig involved in the incident
+ Organizational structure set up:
  - develop the organizational command team and assign who is in charge
+ Mobilization of subsea intervention equipment & personnel commences (SFRT and capping stack):
  - contact Wild Well Control Inc. (WWCI) and AMOSC (Australian Marine Oil Spill Centre) to initiate the mobilization of subsea intervention equipment
  - equipment and services for relief well planning and drilling
+ Establish SIMOPS control and safety zones (for surface and subsea operations).
+ Safety case, safety case revision –regulatory approval process commenced.

9.3.4 Survey & Planning

+ Conduct ROV site survey. The purpose of the survey is to:
  - inspect well site
  - install acoustic positioning system
  - identify the layout, location and map the debris in the well site
  - determine the status of the surface and subsea infrastructure and the magnitude of the hydrocarbon release.

- determine wellhead & BOP damage, subsea structure integrity, wellhead inclination
  - determine source(s) of hydrocarbon release and geometry of release point(s)
  - provide continuous ROV video and data feed to support facilities (intervention vessels, command posts, etc.)
  - conduct air monitoring at surface.
+ Response plan formalized and necessary additional resources mobilized:
+ Based on the ROV survey, plans for debris clearance, BOP intervention and/or capping stack installation can be developed and the associated equipment can be mobilized.
+ BOP intervention with ROV (operation of the critical functions for each shear ram, one pipe ram, ram locks, and unlatching of the LMRP connector) is required if the rig is unable to function the BOP.
+ Liaise with logistics and obtain required purchase orders and contracts to secure:
  - aircrafts and vessels required for transport of equipment
  - monitoring equipment
  - all vessels including ROVs
+ Conduct engineering planning i.e. relief wells, intervention operations:
  - done in parallel to all the activities
+ Coordinate regulatory approval for:
  - airport – flight clearance paths
  - transport routes
  - ports of mobilisation
+ Generate SIMOPs plan:
  - ensure that all simultaneous activities in regards to the subsea and surface well containment operations are conducted in a in a safe and efficient manner.

9.3.5 Mobilization of Resources

+ Additional Personnel & Response Equipment begins to arrive in-country.

Santos is required to address:

- customs and importation issues related to equipment arrival with the support of Wild Well Control;
- the mobilization of support vessels and rig(s);
- drilling of the relief well;
- sea fastening approvals, labour and materials; and
- resources to deploy offshore (ROV, vessels, etc.).

WWCI personnel responsible for:

- ground transport from airport to quayside;
- assembling and testing the system at the quay side, then loading the response equipment for transport to well site;
- quayside facility and support (cranes, forklifts, power, etc.) for assembly and testing of system; and
- offshore system deployment and operations.

9.3.6 Interim response

- Conduct debris clearance, BOP intervention and/or preparation for capping stack installation for sea floor BOPs:
  - if debris is found in the area, then debris removal becomes the primary task to allow access for intervention and access to the wellbore and the installation of the capping stack.
  - an area of 50 ft. radius clearance around the well centre is required for capping stack installation.
  - in addition to the tubular members (i.e. riser, pipe, etc.) the Lower Marine Riser Package (LMRP) will need to be removed to gain access to the BOP upper interface.
  - subsea dispersant is to be considered if hydrocarbons and/or volatile organic compounds are detected near or at the intervention site.
  - BOP intervention with ROV (operation of the critical functions for each shear ram, one pipe ram, ram locks, and unlatching of the LMRP connector) is required if the rig is unable to function the BOP.

9.3.7 Cap, Contain and Kill Well

- Install Capping stack if situation allows:
  - when the debris has been cleared and if there is access to the source, the Capping Stack can be installed.
- Complete relief well drilling
- Kill and abandon well
- Timing dependent on well depth and complexity

9.3.8 Relief Well Planning and Operations

Relief well planning is conducted for any well operations that will intersect a formation that is capable of natural flow to the surface (including completion and intervention operations). The purpose of the planning phase is to demonstrate that an appropriate relief well could be drilled if required. This up-front planning also minimises the time required to initiate relief well operations should a blowout occur.

Should tertiary well control response mechanisms be activated, many strategies and teams will likely progress in parallel; however, a relief well/s may still be the ultimate method of completing a safe permanent abandonment operation for the problem well. Pursuing alternate capping or intervention methods should not take resources away from relief well operations.

Relief well planning is embedded into the Santos Drilling & Completions Management Process as an integral part of Source Control considerations**.** The following industry-accepted guidelines have been adopted to assist relief well planning requirements:

- SPE Worst Case Discharge (WCD) Guidance Note, 2010; this is used as part of the prospect screening review in Phase 2 (Evaluate) to generate a credible rate for oil spill modelling, as well as providing an input for the dynamic kill modelling, part of the Well Specific Source Control Plan (WDW Act 3.5).
- UKOG Relief Well Guidelines, Rev 2, 2012; this methodology is used to confirm a well complexity analysis and tailor required content for the Well Specific Source Control Plan (WDW Activity 3.5) to the appropriate level of detail.

A register of well specific Source Control plans is saved in the Santos document control system ECM.

Santos considers relief well drilling would be completed within 11 weeks (77 days). This period is used as a base case by Santos across its wells for informing worst vase spill duration and is based on indicative mobilisation event durations as per the schedule below.

Source Control: Loss of well control		
Trigger	Loss of well control	
Activation time	**Task**	**Duration (in days)**
	Event reported – begin mobilisation of rig for relief well drilling	1
	New rig suspends operations at current location whilst preparing for relief well and rig mobilisation	10
	Continue preparations for relief well and rig mobilisation	21
	Rig mobilisation to well offset location (dependent on current and prevailing weather)	2
	Spud and drill relief well	38
	Intersect wellbore and bottom kill well – source controlled	5
	Total	**77**

9.3.9 Subsurface Dispersant Application

Refer to **Section 12.2**.

9.4 Environmental performance

Table 9-1 indicates the environmental performance outcomes, controls and performance standards for the Source Control response strategy.

Table 9-1: Environmental performance – source control

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine/onshore environment.		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Response Preparedness			
Source control – relief well drilling	Source Control Planning and Response Guideline (DR-00-OZ-20001)	The Source Control Planning and Response Guideline (DR-00-OZ-20001) is in place and up to date during the activity	Source Control Planning and Response Guideline (DR-00-OZ-20001)
	MODU Capability Register	A MODU Capability Register is maintained during the activity	Rig Capability Register
	Arrangements for source control emergency response personnel	Arrangements for access to source control personnel are maintained during the activity	Contract/ Memorandums of Understanding for source control personnel

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine/onshore environment.		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Source control - vessel collision	Vessel Spill Response Plan (SOPEP/SMPEP)	Support vessels have a SOPEP or shipboard marine pollution emergency plan (SMPEP) that outlines steps taken to combat spills	Audit records. Inspection records
		Spill exercises on support vessels are conducted as per the vessels SOPEP or SMPEP	Spill exercise close out reports
Response Implementation			
Source control – relief well drilling	Drilling and Completions Source Control Team	Drilling and Completions Source Control Team mobilised within 24 hours of the well release	Incident Log
	Equipment/Services for Relief Well drilling	Equipment/Services for Relief Well drilling sourced within five days of the well release	Incident Log
	Well Control Specialists	Well control specialists mobilised within 72 hours of the well release	Incident Log
	Relief Well MODU	MODU for relief well drilling to be onsite by Day 34 from the start of a well release.	Incident Log
	Relief Well	Relief well completed within 77 days of well leak incident	Incident Log
	Source Control Planning and Response Guideline (DR-00-OZ-20001)	Relief well drilling implemented in accordance to the Source Control Planning and Response Guideline (DR-00-OZ-20001) during a well release	Incident Log
Source control - vessel collision	As per the vessel SOPEP	Actions to control spill associated with a vessel incident followed in accordance with SOPEP	Vessel logs

10 Monitor and evaluate plan

Understanding the behaviour and likely trajectory of an oil spill is critical to evaluate the appropriate response strategy. There are a number of methods that can be used to monitor and evaluate, including:

+ vessel surveillance;
+ aerial surveillance;
+ tracking buoys;
+ oil spill trajectory modelling;
+ satellite imagery
+ initial oil characterisation;
+ operational water quality monitoring; and
+ shoreline assessments.

10.1 Vessel surveillance

Direct observations from the MODU or vessels assess the location and visible extent of an oil spill, which assists with the verification of modelling predictions and trajectories and informs response strategies.

Vessel Surveillance		
Initiation criteria	Notification of a Level 2/3 spill - may be deployed in a Level-1 incident (to be determined by OSC)	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: Santos will act as Control Agency/Lead IMT for all offshore operational monitoring of the spill unless notified otherwise	
Objective	Monitor and evaluate spill in a timely and effective manner to inform response strategy and to gain situational awareness.	
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Vessel-based surveillance is undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, OR NEBA is no longer being achieved, OR Agreement is reached with Jurisdictional Authorities to terminate the response	

If the IMT or On-Scene Commander determines metocean conditions are conducive for vessel surveillance, they will initiate available (undamaged) support vessels and crew, or by vessels of opportunity that are working in the area.

A request for mobilisation is made by the Incident Commander or On-Scene Commander upon notification of the incident to allow for mobilisation within 90 minutes. Vessel surveillance observations will be used to confirm surface slick location and extent to inform and develop response strategies.

Reports are to be provided to the On-Scene Commander or Vessel Master (Level 1) or Incident Commander (Level 2 or 3) providing information on spill location, weather conditions, marine fauna sightings and visual appearance of the slick. This information is to be included in the Vessel Surveillance Observer Log (refer **Appendix K**) and emailed to the IMT following each recording.

The nearest support vessel to the release location is to be mobilised upon notification of an incident. IMT Logistics will leverage from existing contracts for additional vessels that are available for use, as well as identifying vessels of opportunity that are working in the impacted area.

Vessel-based surveillance is only effective in sea-state conditions sufficiently calm to maintain visual contact with the oil on the water (to be evaluated by the IMT or On-Scene Commander in consultation with the relevant Vessel Master).

Key actions for the IMT are provided below.

Monitor and Evaluate: Vessel Surveillance			
Trigger	Level 2 or 3 spills – may be deployed in a Level-1 incident (to be determined by On-Scene Commander)		
Activation time	Within 90 minutes for available onsite vessels		
Immediate Actions	**No.**	**Action**	**By whom**
	1	Notify Vessel Master of Support Vessels to commence surveillance	On-Scene Commander
	2	Identify all other vessels operating in the area and those under deployment for the incident response and request slick visual monitoring.	Logistics Team Leader
	3	Confirm surface slick location and extent, weather conditions, and marine fauna presence using forms in **Appendix K**	Vessel Observers
	4	Relay surveillance information (spill location, weather conditions, marine fauna sightings and visual appearance of the slick, (**Appendix K**) to the IMT	Vessel Master and/or On-Scene Commander
	Resources		**Location**
	Equipment		
	Support Vessel		Operational Area
	Source of Personnel		
	Support Vessel Crew		With vessel
Maintenance of response	This response will be maintained through Santos' existing contractual arrangements with vessel suppliers, which will ensure that sufficient surveillance can be maintained. The number of vessels required to undertake this surveillance are available to Santos and will be used on a continual basis until no longer required. Regular rotations of vessel crews and refuelling runs will be timed with other surveillance vessels to maintain the response.		

10.2 Aerial surveillance

Aerial Surveillance	
Initiation criteria	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills)

Aerial Surveillance		
	Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: Santos will act as Control Agency/Lead IMT for aerial monitoring of the spill unless notified otherwise	
Objectives	Monitor and evaluate spill in a timely and effective manner to inform response strategy and to gain situational awareness.	
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Aerial surveillance undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, OR As directed by the relevant Control Agency	

Aerial surveillance is used to:

+ record the presence of oil at surface and other environmental observations including weather conditions, marine fauna and sensitive receptors in the area; and
+ gain an understanding of the potentially impacted shoreline type and access points.

Santos maintains a trained pool of Aerial Observers managed through the Santos Oil Spill Coordinator and AMOSC. These comprise both field and office personnel, with field personnel potentially able to deploy faster. Aerial Observers can be mobilised to site on Day-2 of the spill response. Initial observations will be made by Pilots prior to Aerial Observers becoming available.

Helicopter and fixed wing aircraft have a maximum flight time ranging from three to five hours. Flying time to the operational area is up to 25 minutes from Exmouth and up to 1.5 hours from Karratha. An aviation base is to be established at an airport serviceable for the areas where the aircraft will be dispatched to (e.g. Exmouth Light Air Strip, Learmonth Airport, Karratha Airport, Canarvon Airport, etc).

Key actions for the IMT and Aerial Observers are outlined below.

Santos

Monitor and Evaluate: Aerial Surveillance			
Trigger	Notification of a Level 2 or 3 spill		
Activation time	Within 3 hours from notification		
Immediate Actions	**No.**	**Action**	**By whom**
	1	Source and mobilise initial aerial surveillance from closest location of available aircraft.	Logistics Team Leader
	2	Source available Santos Aerial Observers and deploy them to flight departure location	Logistics Team Leader
	3	Aerial Observers to commence surveillance	Operations Team Leader
	4	Develop flight plan (frequency and flight path) to meet IMT expectations	Operations Team Leader / Aviation Superintendent
	5	Determine the spill extent by completing Aerial Surveillance Log and Surface Slick Monitoring Template (**Appendix L**; **Appendix M**) using Bonn Agreement Oil Appearance Code (**Appendix N**). Calculate volume of oil Take photographic images of the slick	Aerial Observer
	6	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (**Appendix O**)	Aerial Observer
	7	Complete Aerial Surveillance Observer Log and Shoreline Observer Log (**Appendix M**; **Appendix P**) and relay all surveillance records: logs, forms, photographic images, video footage to the IMT	Aerial Observer
	8	Using photographic images sent by Aerial Observers, conduct assessment of oil volume and distribution to validate Observers calculations or to conduct estimate if not done previously.	Operations Team Leader
	Resources		**Location**
	Equipment		
	Helicopters		Existing Santos contracted providers (Exmouth/ Karratha)
	Source of Personnel		
	Santos Aerial Observers		VI, DC, Perth Office
Escalation and Ongoing Response Actions	**No.**	**Action**	**By whom**
	1	Develop and update flight schedule to maintain level of surveillance required to inform responses	Operations Team Leader / Aviation Superintendent
	2	Organise flights through available suppliers to achieve flight schedule	Logistics Team Leader
	3	Mobilise Aerial Observers to flight departure locations	Logistics Team Leader
	4	Communicate surveillance information to the IMT	Aerial Observer
	Resources		**Location**
	Equipment		
	Helicopters		TBD
	Source of Personnel		
	National Response Team, State Response Team, Santos, Other companies through AMOSPlan Mutual Aid		Perth, NWS various

Maintenance of response	Aerial surveillance will be maintained through continual procurement of additional aircraft as required from Perth, the Pilbara regions and interstate. Trained aerial observers will be rotated on a roster throughout the response.

10.3 Tracking buoys

Tracking Buoys		
Initiation criteria	Notification of a Level 2 or 3 spill. May be deployed for a Level 1 spill when deemed beneficial by the On-Scene Commander.	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: Santos will act as Control Agency/Lead IMT for tracking buoy monitoring of the spill unless notified otherwise	
Objective	Monitor and evaluate spill in a timely and effective manner to inform response strategy and to gain situational awareness.	
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Tracking buoy deployment will continue for 24 hours after the source is under control and a surface sheen is no longer observable, OR As directed by the relevant Control Agency	

Santos maintains a minimum of 12 spill tracking buoys across their North West Shelf operations available for deployment in the event of a spill. These are located on Santos facilities and contracted drilling MODUs. Each buoy acquires GPS data at 20 second intervals and transmits once every 30 minutes. Buoy availability and locations are tracked through a tracking website. The IMT are to access the website and select the closest and quickest tracker buoys for deployment.

A crewman is to deploy the tracking buoy from a support vessel once on location, as directed by the On-Scene Commander. In a Level 2/3 spill, deploy 4 x Tracker Buoys per 24 hours, and retrieve and redeploy on an as needs basis.

Key actions for IMT and field responders are outlined below.

Monitor and Evaluate: Satellite Tracking Buoys			
Trigger	Notification of a Level 2 or 3 spill – may be deployed in a Level-1 incident (to be determined by On-Scene Commander)		
Activation time	Mobilisation within 2 hours upon request from IMT or On-Scene Commander (deployment time subject to Vessel locations and weather conditions)		
Actions	**No.**	**Action**	**By whom**
	1	Organise vessel to release tracking buoys stored on MODU. Deploy at designated locations along the plume	On-scene Commander
	2	Mobilise additional tracking buoys if required from other Santos operations (Santos presently has 12 Tracker Buoys located on the NWS)	Logistics Team Leader
	3	Deploy tracking buoys	Vessel Master / On-Scene Commander

	4	Monitor movement of tracking buoys: Fastwave buoys (Ningaloo Vision, MODU, Varanus Island, Dampier) Metocean buoy tracking (2 Exmouth buoys only) Refer login details of tracking buoy monitoring website on Santos ER intranet site	Can be done by MODU On-Scene Commander and/or IMT Planning Team Leader/GIS
	5	Relay information to spill fate modelling supplier for calibration of trajectory modelling	Environmental Team Leader
	6	Assess the need for additional tracking buoys in the spill scenario, and identify/nominate preferred deployment locations. Additional tracking buoys are available through AMOSC (Geelong), AMSA (Karratha) and OSRL (Singapore).	Planning Team Leader
	7	Direct the deployment of the Tracker Buoys at IMT nominated locations, targeting an indicative 4 x tracker buoy releases per day with retrieval and recycle every 3 days, notwithstanding the actual deployment and retrieval schedule will depend upon the extent and direction of oil as conveyed through modelling and other surveillance measures.	Operations Team Leader
	Resources		**Location**
	Tracking buoys (12)		Various (2 x on Drilling Rig)
Maintenance of response	This response will be maintained through checks and repair/replacements of tracking buoys if malfunctions occur during deployment. The standard operating life of the buoys is approximately 180 to 365 days. Each buoy acquires GPS data at 20 second intervals and transmits every 30 minutes. Tracker Buoy operations are tested annually. Tracker Buoy batteries are replaced biannually. Satellite Tracking Website Subscription is renewed biannually. Vessels are always on contract.		

10.4 Oil trajectory modelling

Santos has engaged RPS Group to provide forecast modelling to assess the direction, speed, and potential impact locations of the oil spill. RPS Group use SIMAP and OILMAP modelling systems that comply with Australian Standards (*ASTM Standard F2067 "Standard Practice for Development and Use of Oil Spill Models"*).

Spill Fate Modelling		
Initiation criteria	Notification of a Level 2 or 3 spill.	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: Santos will act as Control Agency/Lead IMT for spill fate modelling unless notified otherwise	
Objective	Monitor and evaluate spill in a timely and effective manner to inform response strategy and to gain situational awareness.	
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Spill fate modelling will continue for 24 hours after the source is under control and a surface sheen is no longer observable, or until no longer beneficial to predict spill trajectory and concentrations, OR As directed by the relevant Control Agency	

The spill fate modelling service is to be initiated by the submission of the RPS Group trajectory modelling request form by the IMT. RPS Group is to provide at least daily updates to the IMT of trajectory model outputs to inform response planning. More frequent updates can be provided if weather conditions are highly variable or change suddenly. Operational surveillance data (aerial, vessel, tracker buoys) is to be provided to RPS Group to verify and adjust fate predictions of the spill and improve predictive accuracy.

Key Actions for the IMT are outlined below.

<table>
<tr><th colspan="4">Monitor and Evaluate: Oil Spill Fate Modelling</th></tr>
<tr><td>Trigger</td><td colspan="3">Notification of a Level 2 or 3 spill</td></tr>
<tr><td>Activation time</td><td colspan="3">Oil Spill Fate Modelling provider will be contacted immediately upon notification of a Level 2/3 spill.
As per contractual agreements with the modelling service provider, upon activation and when requested by Santos, RPS Group will provide trajectory models with the following minimum delay (or otherwise agreed with Santos on a case-by-case basis);
• Within 2 hours for OILMAP model for offshore and open ocean
• Within 4 hours for OILMAP operation for near-shore</td></tr>
<tr><td rowspan="7">Immediate Actions</td><td>No.</td><td>Action</td><td>By whom</td></tr>
<tr><td>1</td><td>Assess requirement for modelling to be undertaken using information from On-Scene Supervisor</td><td>Planning Team Leader</td></tr>
<tr><td>2</td><td>Initiate spill modelling by submission of a trajectory modelling request form to RPS Group. Request for 3 day forecast trajectory modelling.</td><td>Environment Team Leader</td></tr>
<tr><td>3</td><td>Operational surveillance data (aerial, vessel, tracker buoys) to be provided to RPS Group to verify and adjust fate predictions of the spill and improve predictive accuracy</td><td>Environmental Team Leader
IMT GIS</td></tr>
<tr><td>4</td><td>Login to the RPS data sharing website and maintain connection. Download modelling results and spatial data to Santos GIS</td><td>IMT GIS</td></tr>
<tr><td>5</td><td>Identify locations along the predicted oil trajectory that would be applicable to the different response strategies available. Assess strategies for applicability.</td><td>Operations Team Leader
Planning Team Leader</td></tr>
<tr><td>6</td><td>Identify location and sensitivities at risk based on the trajectory modelling and inform IMT. Conduct NEBA on proposed response strategies.</td><td>Environment Team Leader</td></tr>
<tr><td colspan="3">Resources</td><td>Location</td></tr>
<tr><td colspan="3">Spill fate modelling provider (RPS Group).</td><td>Perth</td></tr>
<tr><td colspan="2">Maintenance of response</td><td colspan="2">This response will be maintained through contracts with suppliers to maintain spill trajectory modelling services to Santos.</td></tr>
</table>

10.5 Satellite imagery

Satellite imagery is considered a supplementary source of information that can improve awareness but is not critical to the response.

<table>
<tr><th colspan="2">Satellite Imagery</th></tr>
<tr><td>Initiation criteria</td><td>Notification of a Level 2 or 3 spill.</td></tr>
<tr><td>Jurisdictional Authority</td><td>Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State)
Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)</td></tr>
<tr><td>Control Agency</td><td>Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills)
Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)
NB: Santos will act as Control Agency/Lead IMT for satellite monitoring of the spill unless notified otherwise</td></tr>
<tr><td>Objective</td><td>Gain greater situational awareness.</td></tr>
</table>

Satellite Imagery		
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Satellite monitoring will continue until no further benefit is achieved from continuing; or as advised by relevant Control Agency.	

Satellite imagery is considered a supplementary source of information that can improve awareness but is not critical to the response and usage is at the discretion of the IMT.

Suitable imagery may be available via satellite imagery suppliers. This can be done through existing AMOSC and OSRL contracts. The most appropriate images for purchase will be based on the extent and location of the oil spill. Synthetic aperture radar (SAR) and visible imagery may both be of value.

Notify AMOSC and OSRL Duty Officer to initiate request for available satellite imagery.

10.6 Initial oil characterisation

The characteristics of oil produced from the Van Gogh is well understood through assays, weathering/dispersant amenability analysis and ecotoxicity (refer **Section 6.2.1**), however for Level 2/3 spills where significant environmental impacts could occur, testing of the released oil is to be undertaken to validate this information.

Oil sample and analysis		
Initiation criteria	Notification of a Level 2/3 spill.	
Jurisdictional Authority	NOPSEMA (Commonwealth) or DoT (State)	
Control Agency	Santos (Commonwealth) or DoT (State Level 2/3 spills) NB: Santos will act as Control Agency/Lead IMT for operational sampling and characterisation of crude oil unless notified otherwise	
Objective	To guide and adapt the response strategies defined in this OPEP based on actual oil characteristics and behaviour.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	X
Termination criterion	Oil sample and analysis to terminate once enough data has been collected to profile the oil characteristics and dispersant amenability throughout weathering and to provide oil for toxicity testing, OR As directed by the relevant Control Agency	

10.6.1 Oil properties and dispersant amenability

Given diesel is a common fuel type with known properties and Theo-3 (Van Gogh) crude oil is a production hydrocarbon that has been previously assayed, the general physical and chemical characteristics of these hydrocarbons are known and have been presented in **Section 6.2** . Nevertheless, sampling and analysis of the released hydrocarbon will provide the most accurate information on the hydrocarbon properties at the time of release.

The composition and physical properties of the hydrocarbon will also evolve over time through weathering processes that change its composition and properties, such as the viscosity, density, water content and pour point. The rate of change of the hydrocarbon properties will affect the likely time-window of opportunities 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.

10.6.2 Oil sampling and laboratory analysis

Onsite dispersant testing

Using AMOSC dispersant shake test kits, samples of oil are to be tested by onsite vessels/crew for dispersant efficacy using the included dispersants by way of a simple shake test of efficacy. Photos of sample jars and observations are to be reported back to the IMT for evaluation. These tests are not a substitute for laboratory testing and test spraying but provide an early indication of efficacy on the oil and the relative effectiveness of the dispersants included within the test kits.

Laboratory analysis

Using onsite vessels of opportunity, oil samples (2L per sample) are to be taken daily where possible from fresh oil, and from the weathered oil locations and dispatched to a laboratory for analysis. Samples are to be collected for 14 days post release where oil is available for sampling.

Laboratory analysis of the chemical and physical properties of the recovered oil, including gas chromatography/ mass spectrometry (GC/ MS) for the purpose of fingerprinting the oil constituents, is to be undertaken. Fingerprinting of the released hydrocarbon potentially allows contamination to be traced back to the source where this is otherwise unclear or in dispute.

Ecotoxicology assessment of the oil is to be conducted at an ecotoxicology laboratory following the revised Australian and New Zealand Water Quality Guidelines. The quantity of oil required for analysis will be confirmed by the laboratory but is expected to be in the order of 6-10 L of oil. Testing results will provide the concentrations at which toxicity endpoints consistent with revised Australian and New Zealand Water Quality Guidelines are met for each test. Overall species protection concentrations, including 90%, 95% and 99% species protection trigger levels are then to be generated using a species sensitivity distribution (SSD) fitted to the data (e.g. by using the Burrlioz software program).

10.7 Operational water quality monitoring

Operational water sampling and analysis

Operational sampling of oil and oil in water will be undertaken at discrete locations, providing visual observations, real time fluorometry/ dissolved oxygen readings and providing oil and water samples for laboratory analysis. This monitoring is particularly applicable to subsea releases where an understanding on the distribution of oil entrained and dissolved underwater is required.

This monitoring is complimentary to scientific water quality monitoring (SMP1) delivered through the Oil Spill Scientific Monitoring Plan in terms of methodology and required skillset and can be provided through Santos' Scientific Monitoring Provider (**Section 17.7**).

Key aspects of this monitoring program is provided below.

Operational water sampling and analysis	
Initiation criteria	Notification of a Level 2/3 spill.
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)

Operational water sampling and analysis		
	NB: Santos will act as Control Agency/Lead IMT for operational water quality sampling unless notified otherwise	
Objective	To provide ongoing information on the distribution, concentration, composition and behaviour of oil on and within the water column.	
Applicable hydrocarbons	Crude oil	Diesel
	✔	✔
Termination criterion	Operational water sampling and analysis will continue for 24 hours following control of the source provided oil is no longer detectable, OR As directed by the relevant Control Agency, OR Vessel surveillance will terminate if there are unacceptable safety risks associated with volatile hydrocarbons at the sea surface.	
Scope of Work	The work scope for operational water quality monitoring will be driven by the IMT, defining objectives for each operational period. The sampling will occur within the predicted or observed position of the spill on surface or the underwater plume. The positioning of water quality locations will be informed by other operational monitoring inputs (for example spill fate modelling, aerial surveillance).	
Activation	Activation is to follow that for mobilising water quality sampling personnel and equipment for the Water Quality Scientific Monitoring Plan (SMP1). Following activation, scientific monitoring provider to mobilise within 72 hours.	
Survey design	The operational water sampling activities will be conducted by experienced environmental scientists and managed through the IMT Incident Action Planning (IAP) process. The exact nature of the sampling activities will depend upon the objectives for each operational period, however the sampling design and methodology will consider the following points: + sampling locations will be moved with the slick and/or plume based on the observed or predicted location and movement of oil on water and subsea plumes. This will be informed by vessel/aerial surveillance, satellite tracking buoys and spill fate modelling + at each discrete location, sampling will be conducted along a depth profile which captures the three dimensional distribution of the oil. For a subsea release or where surface oil is present in shallow water (<5 m) this should involve a depth profile from the seabed to surface waters. Profiles should ensure that the full gradient of oil in water concentration can be determined + floating oil is to be collected using an oleophilic sampling device that selectively collects oil, or by carefully skimming with a narrow-neck flask to minimise mixing with the water immediately below the slick, which may contain soluble hydrocarbons or other components that would contaminate the floating oil sample + for samples at depth a Niskin bottle(s) or similar device that allows remote closing and discrete sampling at depth is to be used. Alternatively, water samples can be pumped from defined depths using a hose suspended vertically using a suitable pump for water sampling (e.g. a peristaltic pump) + in addition with collection of oil samples, observations and images of the oil at the sea surface are to be made at each sampling site, noting colour and physical properties of the slick + samples are to be collected in clean, fully labelled glass jars, filled to the top and refrigerated/ kept cool and in darkness during storage and transport. Handling, storage and documentation requirements to be confirmed with laboratory but holding time <7 days is expected requirement + oil and oil in water samples will be replicated at each site to allow intra-site variability to be assessed + concurrent with collection of water samples a conductivity-temperature-depth (CTD) meter shall be deployed at each site along the same depth profile from which water samples are collected. The CTD will require fluorometry and dissolved oxygen (DO) sensors as part of the sensor package to record the presence of oil (fluorometry) and the activity of hydrocarbon degrading bacteria (dissolved oxygen) + water samples also to be provided to an independent NATA-accredited laboratory in Perth for hydrocarbon suite analysis including polycyclic aromatic hydrocarbons (PAHs).	

Operational water sampling and analysis	
Analysis and reporting	+ all data collected on oil properties provided in spreadsheets (including GPS location, depth of sampling, timing, on water observations, in-situ readings and water sample label details) to IMT on an ongoing basis during spill response operations + daily field reports of results provided to the IMT + analytical analysis of oil properties following laboratory evaluation + final report detailing all data collected on oil properties throughout the monitoring program including relevant interpretation.

10.7.1 Continuous fluorometry surveys

Subsurface gliders with fluorometers built into the body of the glider, and vessel tow-behind fluorometers will be used to confirm the presence of entrained oil in the marine environment as predicted by spill fate modelling. The IMT are to use fluorometry survey data to track entrained oil and to inform response strategies.

Continuous fluorometry surveys		
Initiation criteria	Notification of a Level 2 or 3 spill.	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: Santos will act as Control Agency/Lead IMT for operational fluorometry unless notified otherwise.	
Objective	Monitor and evaluate entrained oil in a timely and effective manner to inform response strategy and to gain situational awareness.	
Applicable hydrocarbons	Oil	Diesel
	✔	✔
Termination criterion	Continuous fluorometry surveys will continue for 24 hours following control of the source provided oil is no longer detectable, OR As directed by the relevant Control Agency	

In addition to operational water sampling and sensor deployment at discrete locations, a continuous fluorometry survey(s) may be run across the expected slick/plume extent, as well as vertically through the water column. This allows a far greater area of coverage than discrete sampling, aiding in the mapping of entrained and dissolved oil movement.

Continuous fluorometry surveys are also used to evaluate the effectiveness of dispersant application by detecting changes in the distribution of oil before and after the application of dispersants whether that be on surface on subsea.

Sub surface gliders containing fluorometers built into the body of the glider may be used for this monitoring and would be preferential for monitoring a continuous subsea release (well leak scenario). This will allow continuous monitoring of entrained oil covering a large area and will provide near real-time three-dimensional data on the distribution of entrained oil to enable decision making within the IMT. Similarly, other sources of monitoring data (e.g. spill fate modelling) can be used in near real-time to inform the path of the sub surface glider. Sub surface gliders are particularly suited to subsea releases where oil may be distributed below surface layers.

Towed fluorometers towed behind vessels will be used as an alternative or complementary approach for a subsea release and would be preferred for surface spills and to monitor the effect of dispersant application at surface.

Fluorometry surveys			
Trigger	Notification of a Level 2 or 3 spill		
Activation time	Within 24 hours of request by IMT with mobilisation to site within 5 days.		
Immediate Actions	**No.**	**Action**	**By whom**
	1	Activate Monitoring Service Provider and engage to provide towed fluorometry services (personnel and equipment) as part of Operational Water Sampling and Analysis – refer Table 10 27 for actions.	Monitoring Service Provider Environment Team Leader
	2	Activate OSRL monitoring and determine availability of subsea gliders and towed fluorometry equipment.	Incident Commander Environment Team Leader
	3	Determined suitability of subsea gliders for monitoring	Environment Team Leader
	4	If gliders and pilot/s available and suitable for incident, engage provider to develop Monitoring Action Plan.	Environment Team Leader
	5	Source vessels and other logistics to support monitoring	Logistics Team Leader Operations Team Leader
	6	Conduct monitoring as per monitoring action plan with deployment area guided by other operational monitoring studies and dispersant application areas	Operations Team Leader Planning Team Leader Environment Team Leader
	Resources		**Location**
	Towed fluorometers Towed Fluorometers: 7 x Turner C3 fluorometers globally 4 in Southampton, 2 in Singapore and 1 in Fort Lauderdale <72 hours		OSRL
	Glider mounted fluorometers Subsea glider qty subject to availability from OSRL contractor - 1 engineer from OSRL contractor to deploy and operate the Glider. Gliders based in Perth. OSRL towed fluorometers out of Singapore, Southampton and Fort Lauderdale <72 hours dependent upon availability		OSRL
	Water quality monitoring personnel to operate towed fluorometers approx. 15 (based on capability reports) Perth based <72 hours		Monitoring Service Provider (currently Astron/BMT)
	Glider (remote) pilot/s and deployment crew Subsea glider: Qty subjected to availability from OSRL contractor - 1 engineer from OSRL contractor to deploy and operate the Glider. Perth based pilot and deployment crew <72 hours dependent upon availability		Third-party provider via OSRL
Maintenance of response	Provide daily data reports and spatial outputs IMT		
	Monitoring results to be incorporated into Common Operating Picture		

10.8 Shoreline and coastal habitat assessment

To assist in determining which response methods are most appropriate for shorelines, it is necessary to obtain information about shoreline character (topography, complexity, exposure etc.), degree and distribution of oiling, if present, presence of sensitive receptors (habitats, fauna etc.) and information on shoreline processes and access routes that could aid or hamper response efforts. This information can be collected from on-ground assessments.

DoT are the designated Control Agency for shoreline response for all marine spills identified in this OPEP and will direct resources provided through Santos for the purposes of on-ground shoreline assessments and shoreline response activities. Santos will provide additional information on shoreline character and oiling collected as part of aerial surveillance activities carried out under its control (refer **Section 10.2**).

The information below provides Santos guidance on shoreline assessments. In the event of a spill with the potential for shoreline contact, it is expected that survey objectives, methodology, deployment locations and resource allocation will be controlled by DoT, as the Control Agency (with Santos acting as a Supporting Agency).

DoT provides guidance on shoreline assessments within their 2015 Oil Spill Contingency Plan.

<table>
<tr><th colspan="3">Shoreline and Coastal Habitat Assessment</th></tr>
<tr><td>Initiation criteria</td><td colspan="2">Operational monitoring predicts or observes shoreline contact from surface oil; or
As directed by DoT</td></tr>
<tr><td>Jurisdictional Authority</td><td colspan="2">DoT</td></tr>
<tr><td>Control Agency</td><td colspan="2">Level 2 or 3 spills – may be deployed in a Level-1 incident (to be determined by OSC).</td></tr>
<tr><td>Objective</td><td colspan="2">To provide a rapid assessment of:
+ shoreline character and processes,
+ distribution of coastal habitat/ fauna,
+ level of oil contamination and oil characteristics (if oil present),
+ any constraints to responding to shoreline (e.g. access and safety constraints)
Based on this information appropriate response strategies, in particular, protection/deflection and shoreline-clean-up activities will be determined.</td></tr>
<tr><td rowspan="2">Applicable hydrocarbons</td><td>Oil</td><td>Diesel</td></tr>
<tr><td>✔</td><td>✔</td></tr>
<tr><td>Termination criterion</td><td colspan="2">As directed by the relevant Control Agency</td></tr>
<tr><td>Baseline</td><td colspan="2">Existing information on shoreline character, distribution of habitats/fauna and access/ safety constraints can be obtained from the following sources:
+ Santos GIS, including habitat/fauna distribution layers and aerial imagery
+ Oil Spill Response Atlas (OSRA) Web Map Application (WMA)
+ Pilbara Region Oiled Wildlife Response Plan</td></tr>
<tr><td>Survey design</td><td colspan="2">A shoreline assessment comprises the following tasks:
1. Assessment of shoreline character, habitats and fauna including:
+ shoreline structured biotic habitats
+ distribution of fauna
+ shoreline energy and processes (e.g. wave energy, tidal flows)
+ shoreline substrate (e.g. mud, sand, pebble, rock)
+ shoreline form (e.g. width, shape and gradient)</td></tr>
</table>

	+ access/ safety constraints 2. Assessment of shoreline oiling (if present): + surface distribution and cover + subsurface distribution + oil type, thickness, concentration and physical character + sampling of oil for laboratory analysis 3. Recommendations for response; + applicable strategies based on oil type and habitat + potential access, safety and environmental constraints + Likely resourcing (personnel and equipment) requirements Ground surveys undertaken on foot, by vehicles or by small vessel will occur at prioritised areas to provide a close-range assessment of shoreline physical characteristics, coastal habitats/fauna, scale and character of oiling and safety/ access constraints. Ground surveys are to be provided by trained shoreline clean-up specialists and other trained oil spill responders as per those required for managing shoreline clean-up operations. This includes the use of AMOSC Core Group personnel across industry and State and National Response Teams as provided for under WestPlan-MOP and NatPlan. The deployment of ground survey teams will be directed by DoT as the Hazard Management Agency (HMA) and Control Agency for coastal/ shoreline pollution in WA. The deployments will be informed by the observed and predicted contact of oil and from existing baseline information on shoreline character. Shoreline surveys will be undertaken within segments that are recorded and/or mapped that share common traits based on coast geomorphology, habitat type, fauna presence, level of oiling or access. Information on shoreline character and habitat/fauna distribution for each segment will be recorded through the use of the following techniques: + Still or video imagery collected with simultaneous GPS acquisition + Field notes together with simultaneous GPS acquisition + Mud maps outlining key natural features, oil distribution, imagery locations of quantitative data (transects, oil samples) + Transects (cross-shore, longshore) and vertical sediment profiles. + Samples of oil and/or oiled sediments. The following parameters are to be assessed: + Physical characteristics: rocky, sandy beach, flat, dune, other wetland + Major habitat types: mangrove, salt marsh, saltpan flats, fringing reef, rubble shore, seagrass verge + Coastal fauna and key habitats (e.g. nests) including quantification/ distribution of oiled fauna. + State of erosion and deposition: deposition, erosion, stable + Human modified coastline (access tracks, facilities etc) + Oil character, if present, including appearance, surface thickness, depth (into sediments), distribution, area and percentage cover.
Resources	Shoreline clean-up specialists and other trained oil spill responders from: + AMOSC Core Group + DoT State Response Team + AMSA National Response Team Santos GIS information (mapping and aerial imagery) Santos aerial surveillance reports Santos contracted vessels and vehicles as required for shoreline access.
Analysis and reporting	Shoreline survey reports are to be submitted to the Control Agency IMT at completion of assessments. All raw data collected will be included as appendices to the report and provided in a geospatial format for subsequent use in GIS mapping software.

10.9 Environmental performance

Table 10-1: Environmental performance – monitor and evaluate

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Response preparedness			
Monitor and Evaluate – vessel and aerial surveillance	Maintenance of Master Services Agreements (MSAs) with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	MSA with aircraft supplier	MSA in place with helicopter provider throughout activity	MSA with aircraft suppliers
	Santos trained Aerial Observers	Santos maintains a pool of trained aerial observers	Exercise Records Training Records
	AMOSC contract to facilitate mutual aid arrangements for access to Trained Aerial Observers	Maintenance of AMOSC contract to facilitate mutual aid arrangements for access to Trained Aerial Observers	AMOSC Participating Member Contract
	Access to certified UAV providers	Maintenance of contract for access to UAV providers	Maintenance of contract with service provider
	Aircraft charter companies for fauna observations	Maintain a list of aircraft charter companies that could potentially provide fauna observation services	List of providers
Response Implementation			
Monitor and Evaluate – vessel and aerial surveillance	Vessel surveillance	Minimum first strike resource requirements mobilised in accordance with **Section 10.1**.	Incident log
		Daily observation reports submitted to IMT until termination criteria is met	Incident log
	Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003)	Vessels comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 which includes controls for minimising the	Completed vessel statement of conformance

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		risk of collision with marine fauna	
		Aircraft comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 which includes controls for minimising interaction with marine fauna	Aircraft contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure
	Aerial surveillance	Minimum first strike resource requirements mobilised in accordance with **Section 10.2**	Incident log
		Following initiation two passes per day of spill area by observation aircraft provided	Incident log
		Trained Aerial Observers supplied from Day 2 of response	Incident log
		Flight schedules are maintained throughout response	Incident Action Plan
		Observers completed aerial surveillance observer log following completion of flight	Aerial Observer Logs
Response Preparedness			
Monitor and Evaluate – tracking buoys	Tracking buoys available	Maintenance of 12 tracker buoys throughout the activity	Computer tracking software Tracker buoy tests
Response Implementation			
Monitor and Evaluate – tracking buoys	Tracking buoy mobilisation	Minimum requirements mobilised in accordance with **Section 10.3**.	Incident log
Response Preparedness			

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Monitor and Evaluate – oil spill modelling	Maintenance of contract for emergency response modelling	Maintenance of contract for forecast spill trajectory modelling services throughout activity	Modelling services contract
Response Implementation			
Monitor and Evaluate – oil spill modelling	Oil spill modelling	Oil Spill Modelling provider will be contacted immediately (within two hours) upon notification of a Level 2 or 3 spill	Incident Log
		Modelling delivered to IMT within two hours of request to service provider	Incident Log
Response Preparedness			
Monitor and Evaluate – satellite imagery	Satellite imagery	Contract in place with third party provider to enable access and analysis of satellite imagery	Contract with service provider
Response Implementation			
Monitor and Evaluate – satellite imagery	Satellite imagery	Data incorporated into common operating picture and provided to spill modelling provider	Incident Log and Incident Action Plan
Response Preparedness			
Monitor and Evaluate – oil and oil in water monitoring	Maintenance of Monitoring Service Provider contract for water quality monitoring services	Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity	Contract with monitoring service provider
	Capability reports from Monitoring Service Provider	Obtain monthly capability reports from Monitoring Service Provider	Capability reports
	Entrained oil monitoring equipment and services	Maintenance of arrangements to enable access to fluorometry services throughout activity	Arrangement with provider of fluorometry equipment
	Water quality monitoring vessels	Maintenance of vessel specification for Water quality monitoring vessels	Vessel specification

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Oil and water quality monitoring equipment	Oil and water quality monitoring kits pre-positioned at Exmouth, Dampier and Varanus Island	Evidence of deployment to site
Response Implementation			
Monitor and Evaluate – oil and oil in water monitoring	Initial Oil Characterisation	Minimum requirements mobilised in accordance with **Section 10.6**	Incident Log
		Oil samples sent to laboratory for initial fingerprinting	Incident Log
		If applicable (not MDO), oil samples sent to laboratory for dispersant amenability	Incident Log
		Oil samples to be sent immediately for laboratory ecotoxicity testing of oil	Incident Log
		90, 95 and 99% Species protection triggers levels will be derived from ecotoxicity testing results (minimum five species' tests) within 24 hours of receiving all results	Incident Log
	Operational oil and oil in water monitoring	IMT activates monitoring service provider within four hours	Incident Log
		Operational water sampling and analysis surveys mobilised within 72 hours of approval	Incident Log
		Fluorometry surveys mobilised within five days of initiation	Incident Log
		Daily report including fluorometry results provided to IMT	Incident Log
Response Preparedness			
Monitor and Evaluate – shoreline assessments	AMOSC contract to facilitate mutual aid arrangements for access to Oil Spill Responders	Maintenance of AMOSC contract to facilitate mutual aid arrangements	AMOSC Participating Member Contract

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		for access to Oil Spill Responders	
Response Implementation			
Monitor and Evaluate – shoreline assessments	Shoreline assessment	Minimum shoreline assessment requirements mobilised as per **Section 10.8**	Incident Log
		Shoreline Assessment strategies will be implemented under the direction of DoT as the HMA	Incident Log
		Santos will make available AMOSC Core Group Responders for shoreline and coastal habitat assessment positions to the Control Agency	Incident Log
		Shoreline assessment reports provided to the IMT daily detailing the assessed areas to maximise effective utilisation of resources	Incident Log
	Use of shallow draft vessels for shoreline and nearshore operations	Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the designated Control Agency (i.e., DoT)	Vessel specification documentation contained in IAP.
	OSR Team Leader assessment/selection of vehicle appropriate to shoreline conditions	OSR Team Leader assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Conduct shoreline/ nearshore habitat/ bathymetry assessment	Unless directed otherwise by the designated Control Agency (i.e., DoT) a shoreline/nearshore habitat/bathymetry assessment is conducted prior to nearshore activities	IAP records assessment records
	Establish demarcation zones for vehicle and personnel movement	Unless directed otherwise by the designated Control Agency (i.e., DoT)	IAP demonstrates requirement is met

Environmental Performance Outcome	Implementation monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	demarcation zones are mapped out in sensitive habitat areas	
	Operational restriction of vehicle and personnel movement to limit erosion and compaction	Unless directed otherwise by the designated Control Agency (i.e., DoT) action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met

11 Mechanical dispersion plan

Table 10-2 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-2: Mechanical dispersion – environmental performance outcome, initiation criteria and termination criteria

Initiation criteria	Operational monitoring identifies thin oil patches at sea surface that are not naturally dissipating in sea surface and is posing risks to wildlife and shorelines by remaining on the surface	
Applicable hydrocarbons	**Crude Oil**	**MDO**
	X	✓
Termination criteria	There is no longer a noticeable reduction of surface oil resulting from the activity, or NEBA is no longer being achieved, Unacceptable safety risks associated with gas and VOCs at the sea surface, and Agreement is reached with Jurisdictional Authorities to terminate the response	

11.1 Overview

This response strategy assists with the natural dispersion process; creating mixing through physical agitation, which encourages the oil to break into smaller particle sizes that are more easily biodegraded. The two common activities associated with mechanical dispersion are:

1. manoeuvring a vessel through the slick, using propeller wash to create mixing in the water body; and
2. spraying water from the fire hose of a vessel and moving the vessel through the water body to create additional mixing and breakup of the slick.

11.2 Implementation guidance

Table 10-3 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 10-4** provides a list of resources that may be used to implement this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-3: Implementation guidance – mechanical dispersion

	Action	Consideration	Responsibility	Complete
Initial Actions	The Operational NEBA will confirm the suitability and environmental benefit of conducting mechanical dispersion at appropriate locations.	Water depth, sea state, possible impacts to sensitive shorelines and/or wildlife before spill naturally disperses. This activity is to be conducted during daylight hours only and once the safety plan has been developed.	Operations Team Leader Environment Team Lead Planning Team Leader	☐
	Safety team lead to develop a safety plan for the activity with respect to potential dangerous gasses and VOCs (including applicable controls).	-	Operations Team Leader Safety Team Leader	☐
	Notify vessel based responders to trial mechanical dispersion.	-	Operations Team Leader	☐
	Response personnel on vessels to evaluate the effectiveness of the use of mechanical dispersion operations to reduce the volume of oil on the water surface. Communicate the information to the IMT Operations Team Leader for inclusion in Operational NEBA.	-	Vessel Master/s Santos AMOSC Core Group Responders	☐

Table 10-4: Mechanical dispersion resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Vessels undertaking other activities	Santos contracted vessel providers	Varies – check through vessel contractors/ Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/ availability

11.3 Environmental performance

Table 10-5 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 10-5: Environmental performance – mechanical dispersion

Environmental Performance Outcome	To create mixing for oil and water to enhance natural dispersion		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Response implementation			
Mechanical Dispersion	Mechanical Dispersion Plan Safety Plan Operational NEBA	Mechanical dispersion is to be conducted during daylight only, once the safety plan has been developed and Operational NEBA confirms suitability and environmental benefit	Incident Log IAP

12 Chemical dispersant plan

Chemical Dispersants		
Initiation criteria	Notification of a Level 2/3 crude spill	
Jurisdictional Authority	NOPSEMA (Commonwealth) or DoT (State)	
Control Agency	Santos (Commonwealth) or DoT (State Level 2/3 spills) NB: Santos will act as Control Agency/Lead IMT for chemical dispersant application unless notified otherwise	
Objectives	+ To disperse the oil within the water column, reduce the volume of floating oil reaching shorelines and increase biodegradation of the oil. + To facilitate the application of a subsea capping stack as applicable (subsea dispersants).	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	x
Termination criterion	Application of chemical dispersants will cease when dispersant efficacy is no longer providing a net environmental benefit as assessed through the NEBA process, and Agreement is reached with Jurisdictional Authorities to terminate the response	

12.1 Surface application

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50 to 100 g/m² on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes BAOACs 1 to 3 (EMSA, 2010) (**Table 12-1**).

Table 12-1: Bonn Agreement oil agreement appearance codes

Code	Description	Layer Thickness	Code
1	Silvery sheen	0.04 to 0.30	40 to 300
2	Rainbow sheen	0.30 to 5.00	300 to 5,000
3	Metallic	5 to 50	5,000 to 50,000
4	Discontinuous true oil colour	50 to 200	50,000 to 200,000
5	Continuous true oil colour	More than 200	More than 200,000

Surface application of dispersants is applicable where there is a surface expression of oil, which may include subsea releases in addition to surface release.

Key IMT actions are detailed below.

Chemical Dispersion Plan – Surface application			
Activation time		Within 4 hours of loss of well control notification.	
Actions	**No.**	**Action**	**By whom**
	1	Mobilise vessel-based dispersant equipment from the Santos Supply Yard in Exmouth or Dampier (2 x systems at each location) to the designated deployment port. Mobilise 2 x vessels and vessel crew from contracted vessel	Logistics Team Leader

		providers to the designated deployment port. Preference for vessel providers who are trained with Santos equipment.	
	2	Mobilise FWADC aircraft, pilots and support personnel through AMOSC. Activate OSRL Hercules C-130 or B727 through OSRL.	Operations Team Leader Logistics Team Leader
	3	Mobilise National Plan and AMOSC dispersant stock to nominated deployment location (Exmouth, Dampier) *AMSA and AMOSC National dispersant stockpile inventories can be accessed via the Santos Emergency Response Website*	Logistics Team Leader
	4	Immediately dispatch vessels to conduct test sprays of dispersants on oil. Ensure vessels also equipped with dispersants shake test kits available at Exmouth, Dampier and Varanus island Arrange for oil and dispersant samples to be taken for ecotoxicology testing (**Section 10.5**.)	Operations Team Leader Planning Team Leader Environment Team Leader
	5	Assess dispersant amenability results from vessel and laboratory tests. If dispersant application is approved by the Incident Commander in consultation with DoT as the HMA for State waters, a test spray run via FWADC is to be conducted. Assess dispersant effectiveness and report to IMT. If deemed successful, prepare for ongoing operations.	Operations Team Leader Incident Commander
	6	Conduct NEBA using forecast modelling, surveillance data and dispersant efficacy results. If following NEBA ongoing dispersant application is approved by the Incident Commander in consultation with DoT as the HMA for State waters, define the operational area for vessel-based and aircraft application, ensuring operational area does not pass into within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) within 24 hours following application. Expected best results for dispersants is on fresh oil up to 12 hours from release.	Incident Commander Planning Team Leader Environmental Team Leader
	7	Conduct aerial and vessel dispersant operations, and reassess dispersant use utilising the Operational NEBA process for each operational period. Cease application if no net environmental benefit.	Operations Team Leader Planning Team Leader Environmental Team Leader
	8	Mobilise additional chemical dispersant stocks from AMSA, AMOSC & OSRL. *AMSA, AMOSC and OSRL dispersant stockpile inventories can be accessed via the Santos Emergency Response Website*	Logistics Team Leader

Resources	**Location**
Equipment	
Chemical dispersants: Australian dispersant stocks are available from through AMSA and AMOSC with international stockpiles available through OSRL global dispersant stockpile (GDS) and manufacturing.	Refer **Section 11**
FWADC aircraft and support equipment	As per the AMSA/AMOSC FWAD Contract (refer to the AMSA, AMOSC & Aerotech First Response, FWADC Joint SOP (**Appendix Q**) for instructions
OSRL Hercules C-130A aircraft with dispersant spray system (Singapore) or OSRL B727 aircraft with dispersant spray system (UK)	Senai Airport, Malaysia (Hercules C-130A) Doncaster Sheffield Airport, UK (B727) (refer **Appendix R** for mobilisation instruction)
Vessel-based Dispersant Equipment	Santos Dampier Yard Santos Exmouth Yard

	AMOSC Exmouth Stockpiles AMSA Dampier NatPlan Stockpile
Vessels for Vessel-Based Dispersant application	Santos contracted vessels providers (preference for those trained with dispersants systems)
Personnel	
Santos AMOSC Core Group Responders	Santos Operational sites
AMOSC Core Group Responders	Mobilised through AMOSC
Vessel Crew trained in Chemical Dispersant Equipment Operation	Santos contracted vessels providers (preference for those trained with dispersants systems)
FWADC personnel	AMSA-AMOSC FWAD Contract

Maintenance of Response

Santos Vessel-Based dispersant capability is inspected through annual exercises (as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan [SO-92-HG-10001]) and maintained as per the requirements defined in the SAP Maintenance System.

Aerial dispersant capability is maintained via AMSA-AMOSC FWAD Contract, with access maintained through the Santos/AMSA MOU. Refer to the AMSA, AMOSC & Aerotech First Response, FWADC Joint SOP (**Appendix Q**) for operational instructions.

Access to the OSRL Hercules C-130A (Singapore) or B727 (UK) for dispersant application is maintained through OSRL Associate Member Contract. Refer **Appendix R** for mobilisation instruction.

Chemical Dispersant supplies maintained by AMSA, AMOSC and OSRL. The Global Dispersant Stockpile is maintained by OSRL under contract conditions (**Appendix S**).

12.2 Subsurface application

Refer to the Source Control Planning and Response Guideline (DR-00-OZ-20001) for procedures defining process, equipment and personnel required for the execution of subsea chemical dispersant application.

An initial mixing ratio of 80:1, or up to 71m^3 per day, will be applied and will be adjusted to achieve the optimal mixing ratio according to observations of effectiveness at the time of injection. The initial mixing ratio of 80:1 mixing ratio is recommended through assessment of previous deployments and is to be adjusted based on visual observations.

Supply of dispersant is not required until the subsurface dispersant system can be deployed and installed. Dispersants are available through AMSA (~800 m^3), AMOSC (~700m^3) and OSRL (~5,000 m^3) as per the Dispersant Logistics Plan. Additional dispersants are available through manufacturers under the OSRL Global Dispersant Stockpile contract.

It is not guaranteed that the subsurface dispersant injection system can be successfully installed, which will be dependent on many factors related to the actual release location and site-specific circumstances. For contingency planning the dispersant will be supplied to prepare for a successful installation.

As with surface dispersant application, a Net Environmental Benefit Analysis (NEBA) will be conducted for subsurface dispersant application. That is, the NEBA will consider forecast spill modelling of chemically dispersed oil, results of chemically dispersed oil toxicity testing and operational oil and oil in water monitoring. However, the NEBA will also consider the progress of SFRT operations in supporting the source control plan. There is considerable environmental benefit in lessening the release duration or release rate of oil which may occur from source control operations (e.g. Capping Stack installation). This benefit may outweigh a short term increases in entrained or dissolved oil at sensitive receptors as a result of subsurface dispersant application.

12.3 Dispersant selection process

Chemical dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA) or assessed as acceptable using the Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) prior to application, are to be used. FINASOL OSR 52 has been pre- assessed as low risk using the Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) and are therefore designated as acceptable for use.

The Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure requires the dispersant to be risk assessed and deemed environmentally acceptable. The criteria used for environmental acceptability includes aquatic toxicity, biodegradation and bioaccumulation potential data.

Where sufficient data is available, the chemical is risk assessed using the Offshore Chemical Notification Scheme (OCNS) CHARM or non-CHARM models depending on the model's applicability criteria. Chemicals that meet the selection criteria belonging to CHARM Colour-band Gold or Silver, or non-CHARM groups D or E are considered environmentally acceptable. According to the OCNS CHARM model, GOLD ranked chemicals have a maximum Hazard Quotient (HQ) of <1 and Silver, HQ ≥1 and <30. According to the OCNS non-CHARM model guidelines, the worst case initial OCNS grouping would be group B based on aquatic toxicity data of LC50 or EC50 > 1 to 10 ppm. To obtain a final OCNS grouping of D, the chemical would need to be readily biodegradable (>60% biodegradation in 28 days) and non-bioaccumulative (Log Pow <3 or BCF ≤100 and molecular weight ≥ 700). The best case initial OCNS grouping would be group E based on aquatic toxicity data of LC50/EC50 > 1000 ppm. The best case final OCNS grouping would remain E with the chemical readily biodegradable and non-bioaccumulative.

Where insufficient ecotoxicity data is available to assign a pseudo OCNS CHARM or non-CHARM group ranking; however, there is sufficient ecotoxicity data available to determine the environmental hazard of the chemical, environmental acceptability is based on volume/concentration, ultimate fate and ecotoxicity data (aquatic toxicity, biodegradability and/or bioaccumulation data where applicable i.e. biodegradation and bioaccumulation potential are not applicable to inorganic substances).

During a response, chemical dispersant shall be tested on the released oil at a laboratory as part of the initial oil characterisation (refer **Section 10.5**) as well as through field testing using vessel-based spray systems/ dispersant shake test kits. Santos has already characterised the dispersant efficacy of Van Theo-3 (Van Gogh) as described in **Section 6.5.3**.

12.4 Equipment and personnel

The vessels for vessel-based dispersant systems will have trained and competent crew. A vessel-based dispersant exercise is conducted every year testing the vessel crew ability to assemble and operate Santos owned vessel-based dispersant equipment, as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).

A Santos Core Group Responder is to be dispatched to each vessel to oversee operations and will be rotated with AMOSC core responders if necessary.

The effectiveness of the vessel based chemical dispersion strategy is communicated to the IMT Operations Team Leader via the Team Leaders on-board the vessels with spray equipment. The IMT Operations Team

Leader is responsible for terminating application, in consultation with the Incident Commander, when chemical dispersants are no longer effective.

Notification and activation of the National Plan Fixed Wing Aerial Dispersant Contract (FWADC) is to be made through AMOSC. AMOSC will deploy appropriate aircraft to a designated airstrip close to the spill location (e.g. Learmonth or Onslow Airport), and arrange for all personnel required to manage and conduct FWADC operations. Santos initially is to supply observation aircraft (one per two attack planes) and aerial observers.

Refer to the AMOSC & Aerotech First Response Joint Standard Operating Procedures for FWADC (**Appendix Q**) to execute the FWADC.

Arrival time of the aircraft will depend on flight time and will include a four hour lead time for ‘wheels up’ from initial request. Aerial chemical dispersant application will be available for operation within 24 hours of initial AMOSC notification (daylight and weather condition dependent).

The effectiveness of the aerial based chemical dispersion strategy is communicated to the IMT Operations Team Leader via the Air-Attack Supervisors, who will advise the IMT Operations Team Leader if chemical dispersant application operations are to be terminated.

The Hercules and B727 dispersant aircraft are supplied by OSRL under contract arrangements and are activated through the OSRL Activation Authorisation Form completed and submitted to OSRL by the Incident Commander.

12.5 Dispersant supply plan

If it does not restrict supply, preference will be given to using AMSA approved dispersants first, as listed on the Oil Spill Control Agents (OSCA) Register, followed by transitional listed dispersants and other dispersants assessed and approved under the Santos Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001).

Access to the National Plan stockpiles of chemical dispersants is via AMOSC and AMSA. Access to international stockpiles is via OSRL. Santos has 2 x contracts with OSRL that allow access to Global Dispersant Stockpiles in excess of 5,000m^3.

Dispersant manufacturing commitment by the manufacturers of Dasic, Corexit and Finasol is included in the OSRL Global Dispersant Stockpile contract (The OSRL GDS Contract is accessible from the *Santos Intranet / Procedures Index / Emergency Response*).

It is the responsibility of Santos to arrange loading facilities and equipment to transfer the chemical dispersants onto vessels and/or aircraft.

12.6 Dispersant logistics plan

AMSA Dispersant Stocks Mobilisation and Logistics Plan

Under the MOU between AMSA and Santos, AMSA will provide all resources available through the National Plan in support of a Santos Offshore Oil & Gas spill response, which includes all logistical services to transport chemical dispersants from National Plan stockpiles to the designated deployment location. All stockpiles are deliverable to any other stockpile location in Australia within 48 hours. The required inventory of dispersant would be transported to designated deployment bases arriving in a staggered fashion over 1–2 days.

To support the AMSA chemical dispersants logistics plan, Santos can provide additional logistics support via the IMT Logistics Team Leader. The below timings include the movement of the AMSA stockpiles by road, in support of the effort by AMSA directly; this would be moved by Regal Transport’s hazardous cargo division.

Santos

Regal Transport has agreed to a maximum of 12 hours to mobilise, however it is anticipated this would be much reduced in a real time event. These deliveries would be directed to a holding area in Karratha or directly to the forward operational areas.

+ Fremantle to Dampier: 18 to 27 hours;
+ Port Hedland to Dampier: 5-10 hours;
+ Darwin to Dampier: 35 to 49 hours; and
+ Adelaide to Dampier: 50 to 60 hours.

The vehicles are tracked by GPS and feed reports to CH Robinson through their 'Control Tower' communication system/ process, in turn transportation status reports can be provided to Santos at intervals as requested.

AMOSC Dispersant Stocks Mobilisation and Logistics Plan

AMOSC has MOU's with third party logistics providers to move equipment and consumables around Australia by air and road. These parties will be activated by AMOSC following activation of the AMOSC Duty Officer to move chemical dispersants to wherever it was required by Santos. Given these are MOU's and not contracts, AMOSC cannot guarantee time frames, however would move stock as quickly as possible. As an example, the air charterer could have a C130 at Avalon airport in less than 24 hours. It would then be loaded from AMOSC's Geelong stockpile and dispatched, arriving in Karratha in less than 48 hours. Each flight will cost around $375K. The truck/ road freighter can usually get trucks to AMOSC warehouse Geelong quickly, so land transport to Karratha could be as little as 65–75 hours for a fraction of the cost. This is all 'best endeavours' not contracted outputs or guarantees.

To support the AMOSC dispersants logistics plan, Santos provides secondary options through its contracted Logistics Company, CH Robinson. CH Robinson has developed *OSRL Global Dispersant Stockpile Logistics Planning Guide* for Santos that outlines all logistics arrangement for bringing dispersants from global stockpiles into Australia.

CH Robinson has developed VGI Drilling - dispersant supply and logistics plan – July 2020. This documents are maintained within the Logistics IMT functional folder.

OSRL Dispersant Stocks Mobilisation and Logistics Plan

Santos has a contract with OSRL for the supply of up to 5,000m^3 of chemical dispersant. Authority to activate the supply contract is given to the Incident Commanders.

Refer to the OSRL Global Dispersant Stockpile Logistics Execution Plan in **Appendix S** for detailed procedure for supply of the GDS Dispersant Stockpile.

OSRL can provide logistics services to deploy their dispersant stockpiles to local port/ airport, which can also be supported by Santos' global freight forwarding company CH Robinson.

12.7 Environmental performance

Table 12-2 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 12-2: Environmental performance – surface dispersant application

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities		
Response Strategy	**Control Measures**	**Response Strategy**	**Measurement Criteria**
Chemical Dispersant Application	**Response Preparedness**		
	Arrangements to enable access to dispersants, equipment and personnel	Maintenance of access to dispersant, application equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			AMOSC SFRT Participant
			OTA Agreement with Oceaneering
			OSRL Associate Member Contract and Global Dispersant Supply Supplementary Agreement
	Arrangements in place to monitor availability of vessels capable of transporting SFRT	Vessel availability shall be monitored regularly via Santos' contracted vessel broker	Shipbroker reports
	Maintenance of MSAs with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Dispersant application vessels	Maintenance of vessel specification for dispersant application vessels	Vessel specification
	Nominated first-strike dispersant application vessel c/w trained crew, dispersant equipment and dispersants onboard (use of existing supply vessel servicing Exmouth floating production, storage and offloading vessels (FPSOs)	Complete feasibility review to determine if existing supply vessel can be equipped and used as nominated surface dispersant first strike response vessel (to be completed by end of 2020)	Correspondence records
	Response Implementation		
	Mobilisation of minimum resource requirements for initial response operations	Minimum requirements mobilised in accordance with **Section 12.6**	Incident log

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities		
Response Strategy	**Control Measures**	**Response Strategy**	**Measurement Criteria**
	Chemical Dispersant Application Plan	Only chemical dispersants that are listed as approved on the National Plan Oil Spill Control Agent (OSCA) list or are evaluated as acceptable as per the Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) are to be used	Incident Log
		Analysis of dispersant amenability provided to IMT within 24 hours of oil delivery to Laboratory	Incident Log
		If amenable to surface dispersants, and required oil volume can be collected, oil and dispersant samples to be sent immediately for laboratory ecotoxicity testing of oil and chemically dispersed oil	Incident Log
		If dispersant application is approved by the Incident Commander for aerial application, a test spray run via the National Plan Fixed Wing Aerial Dispersant Contract will be conducted to assess dispersant effectiveness	Incident Log IAP
		If dispersant application is approved by the Incident Commander for vessel application, a test spray will be conducted to assess dispersant effectiveness	Incident Log IAP
		If dispersant application is approved by the Incident Commander for subsea injection, ROV monitoring of the site will commence to help determine injection method/s	Incident Log IAP

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities		
Response Strategy	**Control Measures**	**Response Strategy**	**Measurement Criteria**
		If dispersant application is approved by the Incident Commander for subsea injection, operational monitoring of dispersant efficacy will be conducted	Incident Log IAP
		Prepare operational NEBA to determine if chemical dispersant application is likely to result in a net environmental benefit. NEBA will consider: + forecast spill modelling of oil comparing simulations with and without effect of chemical dispersants + laboratory dispersant efficacy testing results + operational monitoring results (surveillance and shoreline assessment) showing distribution of floating, stranded oil and location of sensitive fauna and habitats + operational water quality monitoring results showing distribution and concentration of subsea oil (once available) + scientific monitoring water sampling results (SMP1) (once available) + consultation with DoT	Incident Log IAP
		NEBA undertaken each operational period by the relevant Control Agency to determine if response strategy is continuing to have a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP Incident Log

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities		
Response Strategy	**Control Measures**	**Response Strategy**	**Measurement Criteria**
		Surface Dispersant Application Area will be defined as part of the IAP. The base case for dispersant application is that no dispersants to be applied: + within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application permitted in the Multiple Use Zone) + within State Marine Parks + within State Waters + within 10 km of water depths <10 m LAT + within exclusion zones of offshore facilities + within 25 km of well site	IAP
		Surface dispersant will only be applied in the Dispersant Application Area and target oil above BAOAC 4 and 5	IAP Incident Log

13 Containment and recovery plan

Containment and Recovery Plan		
Initiation criteria	Notification of a crude spill	
Jurisdictional Authority	NOPSEMA (Commonwealth) or DoT (State)	
Control Agency	Santos (Commonwealth) or DoT (State Level 2/3 spills) NB: Santos will act as Control Agency/Lead IMT for containment and recovery operations unless notified otherwise	
Objective	To reduce amount of crude oil impacting sensitive receptors and other shorelines.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	X
Termination criterion	NEBA is no longer being achieved, and Agreement is reached with Jurisdictional Authorities to terminate the response	

Theo-3 (Van Gogh) is a heavy, viscous oil that will increase in viscosity throughout weathering, but due to the low wax content are unlikely to form solids over scales of 10s of days. Weathering studies on these oils indicate a low tendency to form stable emulsions. On the basis of their expected physical characteristics, containment and recovery is considered a suitable strategy.

It is not expected that the rise in oil viscosity through weathering would exceed the capacity of recovery equipment such as oleophilic disc and belt skimmers, elevating skimmers or submersion skimmers, but pumping equipment should be selected for capacity to pump high viscosity oil.

For the purpose of planning, it is estimated that, under ideal metocean conditions and when the oil is not highly dispersed, that a single containment and recovery operation can collect 30m^3 of oil per day. Effectiveness of containment and recovery is dependent upon equipment type but is generally considered effective only in winds below 22 knots and 1 knot of current.

Information gathered during operational monitoring and the application of NEBA will guide the containment and recovery response to reduce impacts to key sensitive receptors as part of the IAP process.

13.1 Equipment and personnel

Deployment of containment and recovery equipment occurs through staged escalation directed by the IMT through the IAP process throughout the response. This ensures the containment and recovery efforts are executed in a safe and controlled manner, and are effective at reducing the spill impacts to ALARP. Through this method, the response can scale up and scale down as required by the incident.

Santos has access to existing stocks of booms, skimmers, pumping equipment and oil storage containers via:

- Santos owned equipment, including;
  - 400 m of Ocean Boom and Skimmer (Dampier)
  - 800 m of Ocean Boom and Skimmer (Varanus Island)
- AMOSC owned (National) and Industry Mutual Aid (WA) stockpiles of offshore boom, skimmers and portable containers;
- AMSA National stockpiles of offshore boom, skimmers and portable containers;

- OSRL (Singapore) stockpiles of offshore boom, skimmers and portable containers; and
- North West Alliance waste containers.

Current stockpile inventories of AMSA, AMOSC, Santos, Industry Mutual Aid and OSRL offshore containment and recovery equipment can be accessed via the Santos Emergency Response Website.

Santos has access to personnel via:

- Santos Incident Response Teams (Santos facilities)
- AMOSC Core Group (national)
- AMSA National Response Team (NRT) (national)
- OSRL (international).

Santos' standard operations utilise a range of vessels that could be used in any OPEP response. IMT Logistics will use its extensive market knowledge to source vessels which may include:

- current on-hire vessels
- vessels of opportunity from contracted vessel operators or local vessel operators
- share agreements with other oil and gas operators.

For immediate deployment on a scale of hours Santos containment and recovery equipment (500 m of Ocean Boom and Skimmer) is available at the Exmouth Freight & Logistics Services (EF&LS) Yard. Vessels of opportunity will be arranged from the Exmouth marina through the Santos Marine Logistics Coordinator. Preference will be for the Go Marine *Southern Spirit*, the JWM *Maddison*, and the JWM *Fine Time*, as all these vessels undertake booming exercises with Santos; Sea-fastenings are in place to bolt the boom reels to the decks and the crews have been trained in the deployment.

Santos containment and recovery equipment is also available for immediate deployment from Dampier stockyard (400 m of Ocean Boom and Skimmer) and from Varanus Island (800 m of Ocean Boom and Weir Skimmer). For immediate deployment, Dampier equipment will either be loaded and deployed from Dampier Port, or be mobilised by road to Exmouth in the event deployment vessels are available at Exmouth, while Varanus Island personnel and vessels will be mobilised from Varanus Island to the spill site. Exercising has demonstrated Varanus Island equipment can be on the water within 2 hours notification and Exmouth capability can be on the water within 3 hours.

Spill modelling indicates that worst case volume of oil can begin arriving at Ningaloo Coast in 8 days and load onto shorelines for an extended period of ~50 days (**Figure 6-4**). The Santos owned equipment can mobilise to the spill site on the first day post spill, while equipment and personnel accessed from other providers can be rolled out in a staged escalation from the second day post spill up to 20 days post spill, such that a total of 12 boom/skimmer sets, and associated personnel and vessels, could be on water along the Ningaloo Coast, and relocated to other locations which will likely receive oil after Ningaloo Coast contact dependent on the spill trajectory. **Section 6.8** provides further detail on equipment locations, deployment locations and deployment schedule to meet resourcing needs based on spill trajectory modelling conducted for planning purposes.

13.2 Oil collection process

Vessels operating offshore will be collecting floating oil via booms and skimmers, with a variety of makes and models of equipment to be used in collection processes. If decanting is required, this discharge will be subject to approval by either AMSA or DoT depending on the location of recovery operations with respect to State or Commonwealth waters, and is to be discharged back into the boom area of the operation.

In the event that approval for discharge of the water-phase is not obtained through AMSA/DoT, the complete collected oil and water will remain in the collection tanks and all will be treated as a collected waste. In this event, the duration of containment and recovery operations will be reduced due to restricted available ullage.

Waste collection is via primarily Waste Collection Vessels, allowing on-water transfers through dynamic lifting of waste skips (solid oil) or on-water bunkering procedures (for liquid oil). Waste tanks can remain on collection vessels and delivered to Ports once operation has ceased.

Once collected the Waste Collection vessels are to deliver the waste to Port areas for pick up and dispersal by Santos' waste service provider.

13.3 Environmental performance

Table 13-1 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 13-1: Environmental performance – containment and recovery

Environmental Performance Outcome	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities		
Response Strategy	**Control Measures**	**Performance Standard**	**Measurement Criteria**
Offshore Containment and Recovery	**Response Preparedness**		
	Access to containment and recovery equipment and personnel through AMOSC, AMSA National Plan and OSRL	Maintenance of access to containment and recovery equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
	Waste service provider contract	Contract for access to waste oil tanks in place during the activity	Waste service provider contract
	Offshore waste transfer concept of operations (to help maximise waste storage availability for C&R vessels)	Develop waste transfer concept of operations procedure	Waste transfer concept of operations procedure
	Maintenance of MSAs with multiple vessel providers	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Offshore containment and recovery vessels	Maintenance of vessel specification for offshore containment and recovery vessels	Vessel specification

Environmental Performance Outcome	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities		
Response Strategy	**Control Measures**	**Performance Standard**	**Measurement Criteria**
	Response Implementation		
	Aerial surveillance reports (to direct operations to areas with greatest oil concentration)	Aerial surveillance reports communicated to C&R Team Leaders	Incident Log
	Decanting to free up liquid oil waste container storage)	Application for offshore decanting is made to AMSA (Commonwealth waters) or DoT (State waters). When approved decanting of water occurs back into boomed area.	Incident Log
	Spill response activities selected and reviewed on basis of a Net Environmental Benefit Analysis	Prepare operational NEBA to determine if containment and recovery is likely to result in a net environmental benefit	Incident Log
		Operational NEBA for containment and recovery is conducted each operational period and considers oil thickness and weather constraints to effectiveness.	IAP/Incident Log

14 Shoreline protection and deflection plan

Protection and deflection is part of an integrated nearshore/ shoreline response to be controlled by DoT as the relevant Control Agency. Santos will undertake first-strike activations of protection and deflection resources and support the ongoing response. Upon assumption of Control Agency responsibilities, DoT will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline protection. Santos will provide all relevant information on shoreline character and oiling collected as part of surveillance activities carried out under its control (refer **Section 10**).

Protection and Deflection Plan		
Initiation criteria	Level 2 or Level 3 spills where shorelines with identified or potential protection priorities will potentially be contacted, and Approval has been obtained from DoT IC or delegate (as the Control Agency) to initiate response strategy.	
Jurisdictional Authority	DoT	
Control Agency	DoT (Level 2/3 spills) NB: Santos will act as Control Agency/Lead IMT for shoreline protection and deflection activities if DoT has not yet assumed control.	
Objective	To deflect or collect oil to avoid contact with key sensitive receptors.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	✔
Termination criterion	NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s, and Agreement is reached with Jurisdictional Authorities to terminate the response strategy.	
Refer **Section 20** for relevant Performance Outcomes and Performance Standards		

Information gathered during Monitor and Evaluate activities, including Shoreline Assessments and will guide the shoreline protection, deflection and collection response to key sensitive receptors as part of the NEBA/ IAP process.

Booms can be used to create physical barriers on the water surface to protect sensitive receptors in near-shore environments in close proximity to the area requiring protection and/or in deeper water further from the protection priority with the intent of taking the oil plume off its trajectory path to the sensitive receptors. Booms can also deflect the oil spill to easier locations for other response strategies and collect oil prior to oil moving into sensitive areas. Strategies include:

+ the utilisation of earthen booming strategies where needed to prevent ingress of oil into tidal creeks;
+ near-shore booming using vessel-based operations while the spill remains on a predicted shoreline impact trajectory;
+ placement of shoreline boom around areas to protect and to deflect the oil back to ocean or to easier locations for shoreline clean-up;
+ the deployment of protection nets within intertidal areas to restrict movement of sunken oil into sensitive areas; and
+ deployment of collection booms out from shorelines to collect oil transported by longshore movements.

The effectiveness of a response will be dependent on seabed habitat (e.g. presence of underwater hazards), sea, current and wind conditions. These constraints may render a strategy ineffective or introduce further environmental impacts. Therefore, the net environmental benefit must be considered.

In preparation for shoreline protection, deflection and collection, the worst-case shoreline impact times were identified for all locations. Spill modelling indicates that oil could begin arriving at Ningaloo Coast within 8 days with minimum contact times for other Priority for Protection areas at greater intervals (**Figure 6-4**). Shoreline booming may need to be deployed within these time frames to minimise the predicted shoreline loadings and minimise the potential environmental damage.

14.1 Initial response

Initial first strike actions to be undertaken by the IMT are detailed below, with ongoing response actions conducted under the direction of DoT.

Action	Responsible
Notify Exmouth based oil spill response personnel trained by Santos to deploy oil spill response equipment (Exmouth Freight & Logistics Services, Santos contracted vessel providers). Request load-out of Santos boom and associated equipment.	Logistics Team Leader
Notify VI and request activation of VI Incident Response Team, including Santos AMOSC Core Group Responders on VI. Request mobilisation of VI support vessels and oil spill booms. Load booms onto response vessel.	Operations Team Leader VI responders
Notify AMOSC and stand-up the Exmouth Oil Spill Response capability of shoreline protection booms and AMOSC Core Group Responders.	Operations Team Leader
Notify Dampier based oil spill response personnel trained by Santos to deploy oil spill response equipment. Request load-out of Santos boom and associated equipment.	Logistics Team Leader
Notify Chevron, BHPB, Woodside, and AMOSC for stand-up of Emergency Oil Spill Response mutual support.	Operations Team Leader
Assess plume trajectory and observation data and verify likely contact location of oil. Nominate deployment locations for boom deployments.	Operations Team Leader Environmental Team Leader Planning Team Leader
Execute boom deployment as per directions from DoT IMT as the relevant Control Agency, if DoT has assumed control of nearshore/ shoreline operations. Otherwise the Santos IMT Incident Commander/ Operations Team Leader will direct response to deployment locations.	All Responders

14.2 Equipment and personnel

Equipment and resources identified for protection and deflection activities are a combination of Santos, AMOSC, AMSA NatPlan, OSRL, and other operator resources available through the AMOSPlan mutual aid arrangements.

Table 14-1 describes an indicative schedule for initial deployment and ongoing support of equipment and personnel for the protection and deflection response strategy.

Worst case spill modelling undertaken to aid protection and deflection preparation, indicates loading of worst volumes along Ningaloo coastline could begin at ~8 days post spill. **Table 14-1** indicates that initial deployment of protection boom can mobilise to the Ningaloo coastline within these timeframes. Subsequent deployments could be required over longer timeframes to other coastal areas (including the Priority for Protection areas identified).

Table 14-1: Indicative Equipment and Personnel Deployment Schedule

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
AMOSC nearshore boom and skimming equipment	AMOSC	Beach Guardian (98x 25m lengths) Zoom Boom (199 x 25m lengths) HDB Boom (2x 200 m lengths) Curtain Boom (58 x 30 m lengths) Skimmers: Passive Weir GT 185 Desmi 250 Weir Ro-skim Weir boom	Broome x 4; Exmouth x 20; Fremantle x 23; Geelong x 51 Broome x 8; Exmouth x 20; Fremantle x 30; Geelong x 141 Broome x 2; Fremantle x 18; Geelong x 40 Exmouth x 1; Fremantle x 1; Geelong x 1 Exmouth x 1; Geelong x 1 Geelong x 1 Geelong x 2	Response via duty officer within 15 minutes of first call-AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to stockpile location. For mobilisation timeframes refer **Section 6.8**
AMSA nearshore boom/skimmer equipment	AMSA	Canadyne inflatable Structureflex inflatable Versatech zoom inflatable Slickbar - solid buoyancy Structureflex - solid buoyancy Structureflex - land sea Skimmers: None for inshore crude	Karratha x 5; Karratha x 10; Fremantle x 15 Karratha x 5; Fremantle x 13 Karratha x 2 Karratha x 3; Fremantle x 10 Karratha x 30; Fremantle x 30 other locations around Australia	Access to National Plan equipment through AMOSC. For mobilisation timeframes refer **Section 6.8**
Santos owned nearshore boom/	Santos	Beach Guardian (8x 25m lengths)	Varanus Island	Within 12 h for deployment by vessel from VI

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
skimming equipment		Zoom Boom (16 x 25m lengths) 2x Desmi DBD16 brush skimmer	Varanus Island 1 each at Dampier and VI	
Personnel (field responders) for OSR strategies	AMOSC Staff	8	Fremantle x 2 Geelong x 6	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site.
	AMOSC Core Group (Santos)	12	Perth/ NW Australia facilities x 10 Port Bonython (SA) x 2	12+ hours
	AMOSC Core Group (Industry)	As per monthly availability (minimum 84)	Office and facility location across Australia	Location dependent. Confirmed at time of activation.

14.3 Deployment locations

Santos will direct first strike mobilisation of protection and deflection resources, as required based on spill trajectory mapping and operational monitoring. DoT will assume control of the response as the relevant Control Agency for shoreline response activities and will direct deployment following hand-over of control.

Monitor and Evaluate information will identify the probable shoreline contact sites by the oil spill. An Operational NEBA is undertaken by the relevant IMT Environmental/Planning unit to prioritise the potential shoreline impact sites. The shoreline sensitivity and feature mapping data provided in the following data sources is used to assist in evaluation of priority protection areas:

+ Santos GIS;
+ DoT Oil Spill Response Atlas –Web Map Application (OSRA WMA);
+ Pilbara Region Oiled Wildlife Response Plan;
+ spill trajectory modelling;
+ aerial Surveillance and Shoreline Assessment records where available; and
+ the EP.

The Santos GIS and the OSRA WMA, provides detailed information on shoreline features, sensitive receptors, and potential spill response equipment mobilisation locations in the North West Shelf region.

Priority for Protection areas have been pre-defined based on spill modelling conducted to inform capability requirements for shoreline protection and deflection (refer **Section 6.4.2** and **6.4.3)**. However, real-time data will provide for actual response requirements. Priority receptors within each of the Priority for Protection areas are identified within Performance Outcomes (refer **Section 20**) and would be targeted for protection, notwithstanding the constraints identified below, if oil was to reach these areas in the event of a spill.

Actual deployment locations will be guided by sea state constraints, seabed type, the presence direction of currents and the potential oil deposition locations. For the Ningaloo lagoon (relevant to Ningaloo Coast North and South Priority for Protection areas), the deployment of protection booming may be hazardous (safety and environmental aspects) within some lagoonal areas due to longshore currents and presence of coral outcrops. Typical current runs within the lagoon run North and South; parcels of oil will likely break away impacting shorelines and this oil may be more conducive to collection booming as opposed to protection booming. Final deployment locations will be identified by the relevant shoreline response Team Leaders.

In the event of a spill predicted to contact the shorelines of Indonesia, Santos will notify DFAT as per the notification procedure (**Section 7**), as well as notifying DFAT through NOPSEMA reporting, who notifies the DISER, who then notifies DFAT. DFAT will notify the Indonesian government, and engage with Indonesia on the preferred method for Santos to respond to minimise the impacts to ALARP. In most cases, NOPSEMA, DISER and DFAT will form an Inter-agency panel, the Australian Government Crisis Control Centre, who may request AMSA to coordinate the response operations across the trans-national boundary. Santos is willing to respond in Indonesia, following approvals established between DFAT and the Indonesian Government. Santos will mobilise in accordance with the Indonesian Government directions.

14.4 Environmental performance

Table 14-2 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 14-2: Environmental performance – shoreline protection and deflection

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Shoreline Protection and Deflection	**Response Preparedness**		
	Access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan and OSRL	Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
	Small vessel providers for nearshore booming operations	Maintenance of a list of small vessel providers for Exmouth, Dampier and Broome regions	List of small vessel providers
	Response Implementation		
	Mobilisation of minimum requirements for initial response operations	Minimum requirements mobilised in accordance	Incident log

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		with Section 14.1 unless directed otherwise by DoT	
	Shoreline Protection and Deflection Plan	Santos IMT to confirm protection priorities in consultation with DoT	IAP/Incident Log
		Prepare operational NEBA to determine if shoreline protection and deflection activities are likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing
		IAP Shoreline Protection and Deflection Sub-plan developed to provide oversight and management of shoreline protection and deflection operation	Records indicate IAP Shoreline Protection and Deflection Sub-plan prepared prior to shoreline protection and deflection operations commencing
		NEBA undertaken each operational period by the relevant Control Agency to determine if response strategy is continuing to have a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP/Incident Log
		Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination	Incident Log IAP
	Spill response activities selected on basis of a Net Environmental Benefit Analysis	A NEBA is undertaken for every operational period	Incident Log contains NEBA
	Use of shallow draft vessels for shoreline and nearshore operations	Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the	Vessel specification documentation contained in IAP.

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		designated Control Agency (i.e., DoT)	
	Conduct shoreline/nearshore habitat/bathymetry assessment	Unless directed otherwise by the designated Control Agency (i.e., DoT) a shoreline/nearshore habitat/bathymetry assessment is conducted prior to nearshore activities	IAP records assessment records

15 Shoreline clean-up plan

Shoreline Clean-Up		
Initiation criteria	Monitor and evaluate activities predict potential contact to shorelines from surface oil.	
Jurisdictional Authority	DoT	
Control Agency	Level 2 or Level 3 spills where shorelines with identified or potential protection priorities that will be, or have been, contacted; NEBA indicates shoreline clean-up will benefit receptors, and Approval has been obtained from DoT IC or delegate (as the Control Agency) to initiate response strategy.	
Objective	To clean-up all recoverable oil from targeted shorelines where this provide a net environmental benefit	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	✔
Termination criterion	As directed by DoT	

Diesel accumulated on shorelines will likely to be difficult to handle for removal given its light nature but is readily washed from sediments by wave and tidal flushing; contaminated sand and debris the likely waste products from a shoreline response. The crude oil from the Van Gogh field lends itself more to manual removal techniques due to its higher viscosity, higher residual fraction and greater potential for adherence.

Shoreline clean-up is part of an integrated nearshore/ shoreline response to be controlled by DoT as the relevant Control Agency. Santos will undertake first-strike activations as triggered (refer below), until such time as DoT assume control. Upon assumption of Control Agency responsibilities, DoT will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline clean-up. Santos will provide all relevant information on shoreline character and oiling collected as part of surveillance activities carried out under its control (refer **Section 10**).

	No.	Action	By whom
Actions	1	Identify contacted shoreline locations and conduct NEBA to recommend clean-up techniques	Planning Team Leader Environment Team Leader
	2	Identify resources for shoreline clean-up activities.	Operations Team Leader
	3	Mobilise resources to a designated port location for deployment, or directly to location via road transport.	Logistics Team Leader
	4	Deploy shoreline clean-up response teams to each shoreline location selected by DoT, as the relevant Control Agency, to begin operations (each team led by a AMOSC Core Group or NRT member)	Operations Team Leader
	5	Monitor progress of clean-up efforts and report back to Control Agency IMT.	Operations Team Leader
Resources			**Source/Location**
Equipment			
Dozers, Diggers, Bobcats, Forklifts, Hiabs/Cranes, and ATV with trailers			Exmouth/ Dampier/ Karratha/ Fremantle
Shoreline Clean-up Containers (Decontamination, Beach Wash Down and Beach Clean-up Kits)			AMOSC / AMSA/ OSRL / Spot purchase from various suppliers

Waste skips and associated waste equipment (as defined in **Section 17**)	North West Alliance (Karratha/ State wide)
Beach Clean-up equipment and PPE	Perth Petroleum Services/ PPE specialists/ Hardware stores
Personnel	
Shoreline Clean-up specialists	AMOSC, NRT (AMSA), SRT (DoT), OSRL
Santos Emergency Response Team Personnel	Santos Operations
Waste collection personnel	Through North West Alliance contract (Karratha/ State wide)
Santos labour hire	Various (as per contract suppliers) Capability >2,000 personnel

Maintenance of response

Shoreline clean-up efforts will be maintained through the forward operation(s) facilities setup at designated impact locations. Clean-up equipment will be operated and maintained by response crews who will be rostered from the forward operations centres, with additional personal procured on an as-need basis from existing human resource suppliers.

Santos has access to mass workforce labour through contract to workforce hire companies with a combined capability to provide >2,000 workforce personnel over several weeks of activation time, and can sustain those levels indefinitely through continual hiring mechanisms.

Clean-up equipment will be maintained and replaced if necessary through existing suppliers of this equipment or through supplies from existing stockpiles.

Waste resulting from the response will be collected and managed through the waste management plan outlined in this OPEP (**Section 17**).

15.1 Equipment and personnel

Shoreline clean-up equipment available for use by Santos is a combination of Santos owned, AMOSC, AMSA, DoT and OSRL equipment as well as other industry resources available through the AMOSPlan mutual aid arrangements. Shoreline consumables are available through hardware, PPE and specialist oil/chemical spill suppliers and mobile plant is available through hire outlets in Perth, Karratha and other regional centres. Where vessel deployments are required Santos will leverage from existing contracted vessel providers.

Shoreline clean-up personnel available to Santos is a combination of Santos Facility Incident Response Team members, AMOSC Core Group Responders (comprising AMOSC trained Santos and Industry personnel), State Response Team members and National Response Team members. Personnel for manual clean-up and mobile plant operation can be accessed through Santos' emergency response labour hire arrangements (Neutral Vendor contract).

The level of deployment of equipment and personnel for clean-up will be commensurate to the spatial extent of shoreline contact, the volume of oil arriving and the sensitivity and access constraints of the shoreline in question. An assessment of resources required for a worst case shoreline response is detailed in **Section 15.5**. Deployment will be under the direction of DoT and the advice of shoreline clean-up specialists from AMOSC Core Group and National/State response teams. Shoreline Assessments (**Section 10**) will provide information to guide the clean-up strategy and deployment of resources.

15.2 Shoreline clean-up decision guides

Marine diesel and crude oil may accumulate on shorelines in the case of worst case spill scenarios. Given the light and semi-volatile nature of marine diesel, this oil is difficult to handle for removal; contaminated sands and debris are the likely waste products. Stranded diesel will continue to volatilise, remobilise and degrade.

Due to the high viscosity and adhesion potential of weathered Theo-3 (Van Gogh) crude oil, stranding of this material onto unconsolidated sediments on shorelines has the potential to result in large quantities of sediment binding to the viscous oil.

If the oil gets churned by wave action along a sandy shoreline, and suspended sediment bind with the oil, the density of the sediment/oil mixture could potentially be raised above that of seawater sinking the oil/sediment mixture near shorelines.

Although the viscous nature of the oil will tend to reduce penetration into the subsoil or subsoil aquifer, oil deposits could occur if the oil becomes buried by sediment turned over by wave action, or the oil percolates into sediments, if the viscosity is lowered by heating in the sun.

The high cohesive properties of the oil indicate that the oil would be difficult to physically remove from contaminated vegetation on shorelines.

The shoreline clean-up tactics will initially concentrate on Phase 1 (mass removal) of shoreline clean-up operations for removing any available stranded residue and contaminated debris.

Shoreline Clean-up Specialists and Supervisors will liaise with the DoT IMT to determine when Phase 2 can commence. This phase will recognise a shift into natural recovery and bioremediation through the use of mechanical interventions to turn and aerate contaminated sands and to facilitate surf washing and water flushing to remobilise the oil back into the ocean.

As well as providing initial assessment of shorelines and specifying clean-up tactics, the Shoreline Clean-up Specialists shall verify clean-up effectiveness and conduct final evaluations.

The following figures contain decision guides which can be referred to for selecting the most appropriate clean-up technique. These three guides direct the user to one or more clean-up techniques applicable to the specific situation with the most preferable technique listed first. If the first technique cannot be used because of the lack of equipment or access to the shoreline, then the next technique should be chosen.

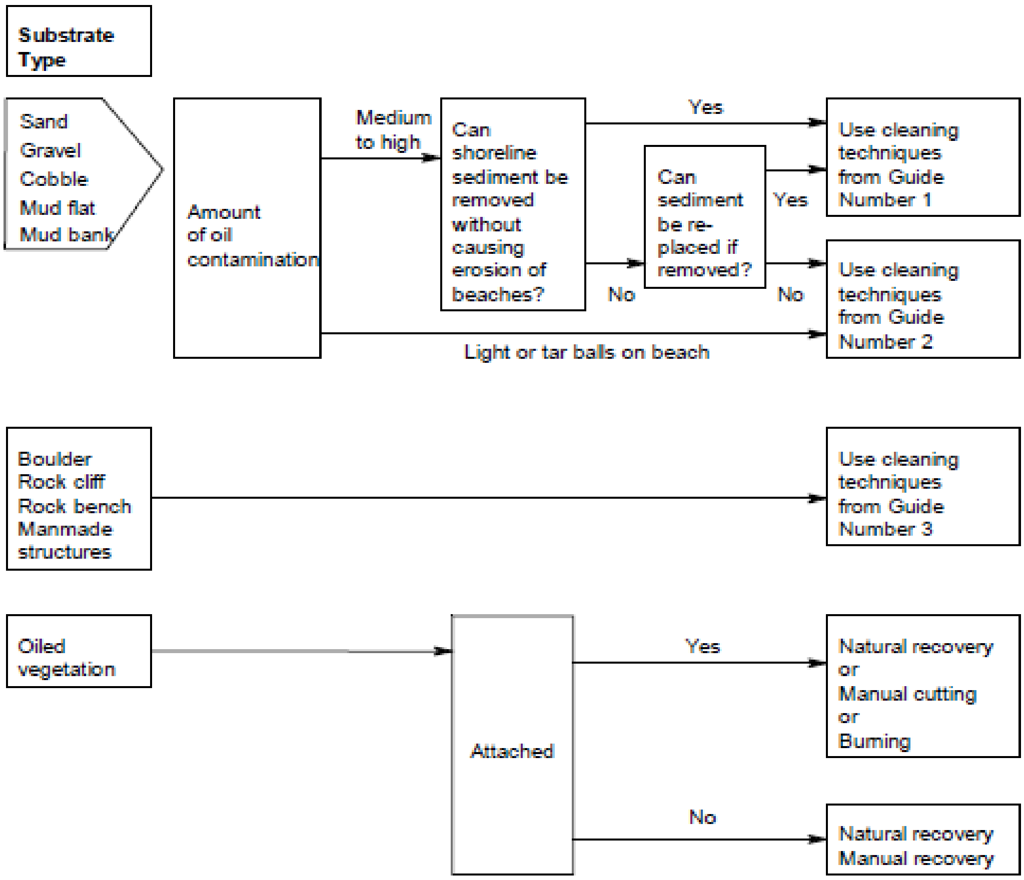

Figure 15-1: Shoreline clean-up master decision guide

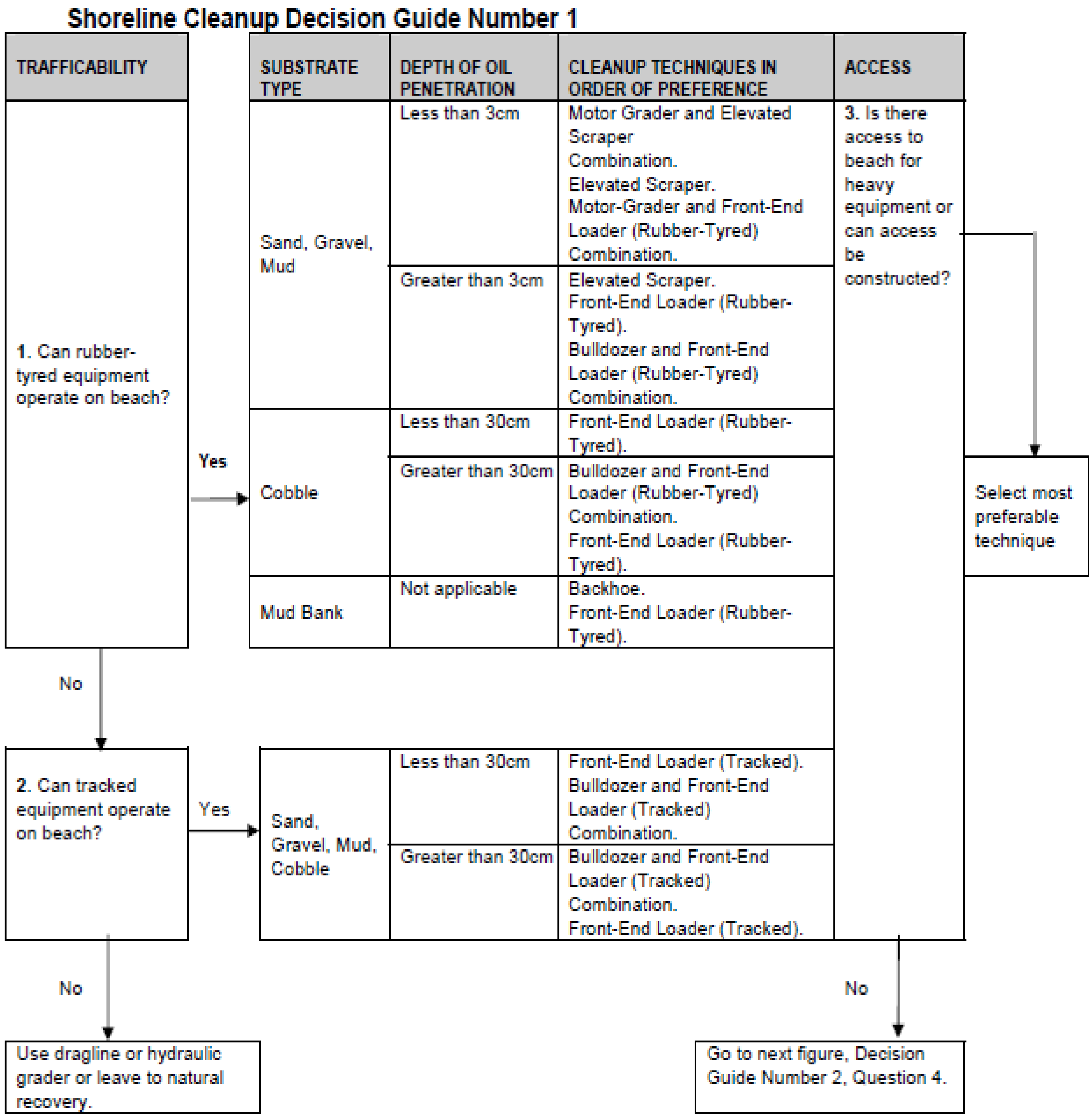

Figure 15-2: Shoreline clean-up decision guide 1

Shoreline Cleanup Decision Guide Number 2

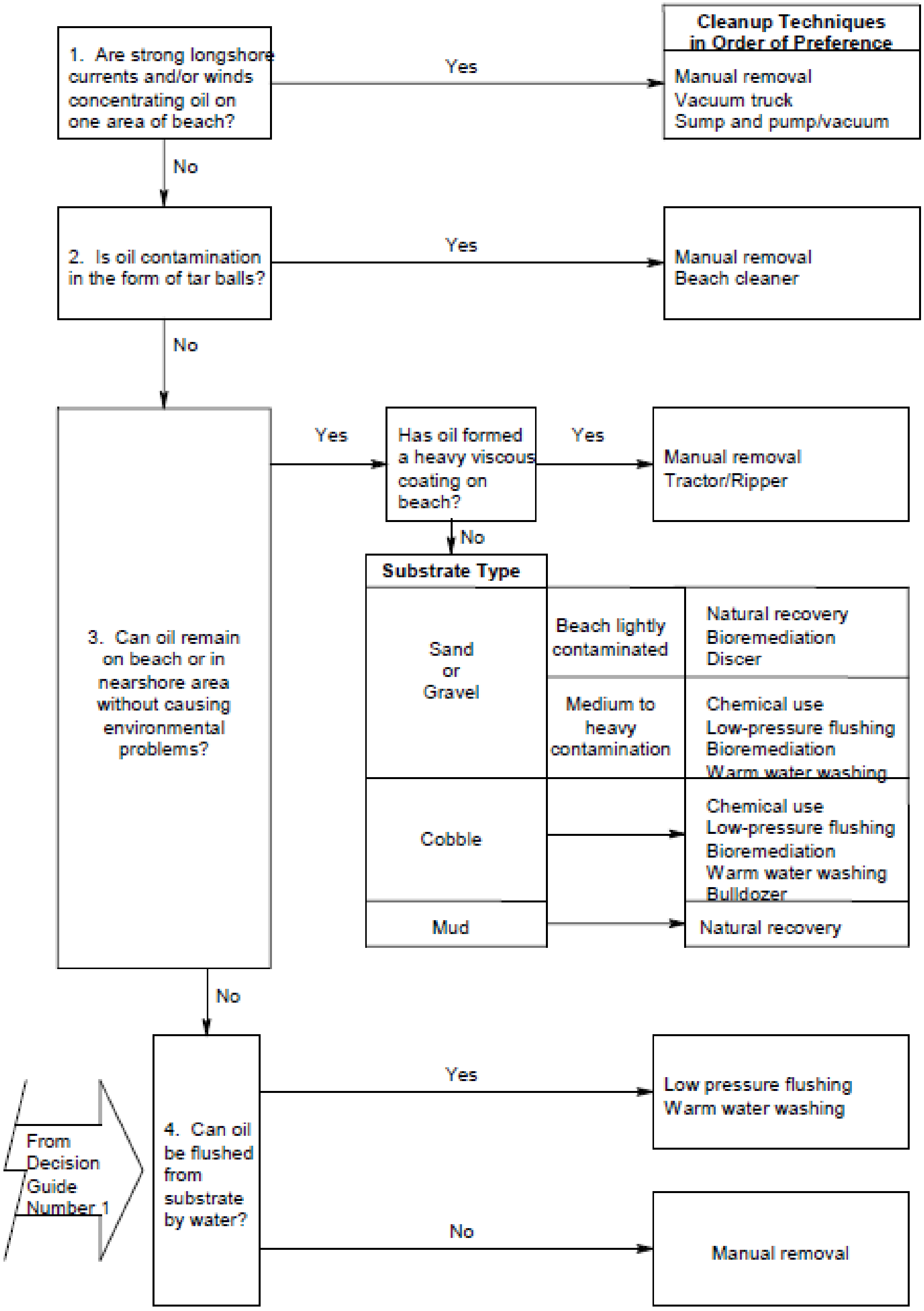

Figure 15-3: Shoreline Clean-Up Decision Guide 2

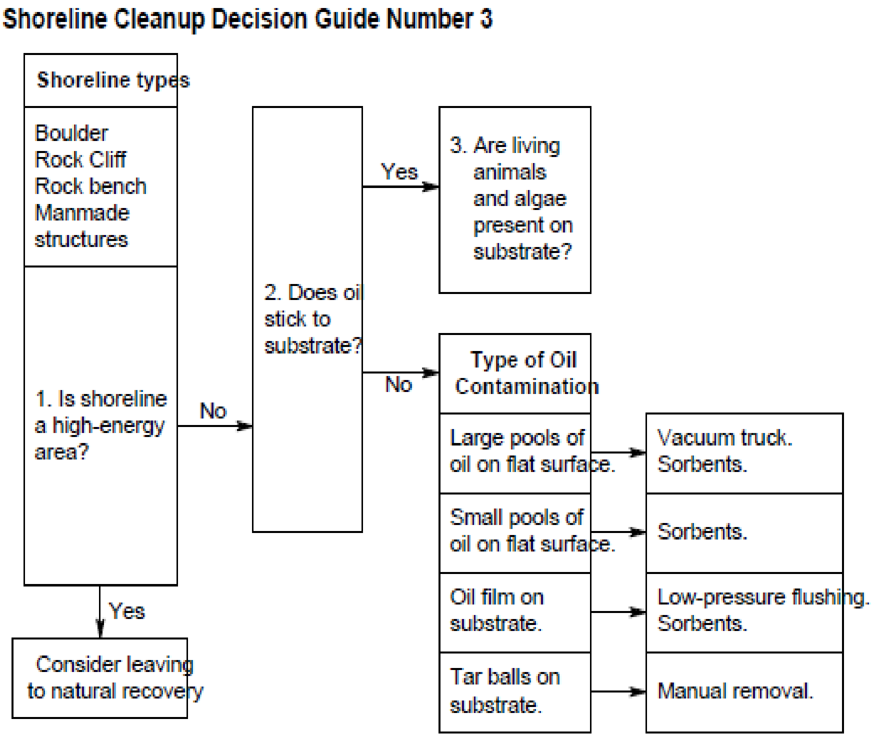

Figure 15-4: Shoreline clean-Up decision guide 3

A number of habitats could be encountered at oiled shorelines, including:

+ mangroves;
+ rocky shores including cliffs, intertidal platforms, boulder and cobble beaches, pebble/gravel beaches;
+ sandy beaches; and
+ mudflats and sandflats.

These shoreline types are amenable in varying degrees to clean-up methods (refer **Table 15-1** and **Table 15-2**). The most appropriate clean-up method will be assessed and defined by the Shoreline Clean-up Specialists and Supervisors and included in the IAP issued to the clean-up team at the beginning of each operational period.

Table 15-1: Shoreline clean-up methods

Methods	Strategy Guidance
Mechanical clean-up	Mechanical clean-up techniques may utilise a number of equipment types. It is best to use equipment in the way for which it was designed. Front end loaders, bulldozers and elevating scrapers can all be used to rework beach sediment (e.g. cobble, pebble, and boulder) or to push such sediments into the shoreline for cleaning by waves. Note: Vehicles should not be allowed to pass over oiled sediment since this tends to result in the burial and compaction of oil into sediment.
Manual clean-up	Manual clean-up is the preferred option for cleaning inaccessible shorelines or those where mechanical clean-up is undesirable. Manual clean-up is slower than mechanical clean-up but generally results in the removal of much less sediment. Hence disposal requirements are reduced. Equipment is usually basic and consists of wheelbarrows, rakes, buckets, shovels, plastic bags (industrial strength) or other temporary storage. The requirements for manual beach clean-up are highly variable but generally a 10 person team, plus one supervisor is required in order to clean 1 km of lightly oiled beach in one day.
Low pressure flushing	Low pressure flushing can be used, with care, to remove surface oils from most beach type surfaces. Given the viscous nature of the weathered Theo-3 (Van Gogh) crude oil, it may require addition of washing agents It is important that refloated oil is collected in booms or other containment devices and recovered using skimmers or sorbents. Low pressure flushing is not expected to result in emulsification of oil given the low emulsification potential and so sorbents may be used. It is preferable to check the condition of refloated oil and choose a suitable skimming device and pump. It is important also that refloated oil does not pass over clean sediment.
Use of sorbents	Two types of sorbent materials can be used either synthetic or natural fibre. Where sorbent material may be difficult to recover, only use natural fibre biodegradable types to prevent uncontrolled waste released into the environment. Solid sorbents may be used in the form of sorbent booms to recover light oil films or as pads or rolls to absorb free oil from the surface of sediments in cases where vacuum systems cannot gain access or where oil is too fluid for manual recovery.
Enhanced bioremediation	Machinery is used to breakup large paddies of stranded oil on beaches and to till and turn the oiled sands to aerate the sandy sediment and enhance the biological breakdown of the oil. This can be applied to oil that has deposited on sands above the normal high-tide area, typically during large storms, and there is little likelihood of the water reaching the stranded deposits. Natural recovery and bioremediation may be very limited and slow for the long carbon chains that make up the bulk of Theo-3 (Van Gogh) crude oil but may have net benefit over physical removal from vegetated habitats where physical disturbance and damage to natural drainage might result in higher and longer-term impacts, given the absence of soluble (bioavailable) hydrocarbons in the weathered oil mixture.
Monitoring of natural attenuation and bioremediation	Natural attenuation and bioremediation will be monitored once the amount of oil remaining stranded on shorelines is reduced to ALARP, the remaining oil will be very difficult to access or remove and the activity is no longer preferred under NEBA. In addition, and also assessed under NEBA, some areas of coastline will not be subjected to any clean-up methods due to access issues or possible impacts from the clean-up activities. Natural attenuation and bioremediation areas will be monitored until no visible oil is remaining in the contacted area.

Table 15-2: Clean-up and protection strategy for coastal sensitivities

Receptor	Strategy Guidance
Mangroves	+ All efforts should be mounted to prevent any oil from moving towards this area by either dispersing and/or containing the oil offshore or using booms where practical to divert the oil away from this area. + However, if oil is expected to move into this area, multiple rows of booms, or earthen booms can be deployed at the entrance of creeks or along the mangrove fringe to prevent/minimise oiling. + Sorbents can be used to wipe heavy oil coating from roots in areas of firm substrate. Close supervision of clean-up is required. + Where thick oil accumulations are not being naturally removed, low-pressure flushing may be attempted at the outer fringe – sorbent pads and sorbent sweeps can be used to recover the sheen. + No attempt should be made to clean interior mangroves, except where access to the oil is possible from terrestrial areas. + Oily debris should be removed; it is extremely important to prevent disturbance of the substrate by foot traffic; thus most activities should be conducted from boats. + Live vegetation should not be cut or otherwise removed.
Seabirds, shorebird and migratory wader habitat	+ All efforts should focus on deflecting oil away from this area or dispersing and/or containing the oil offshore or using booms offshore to divert the oil away from this area. + If oil is expected to move into the coastal colonies and roosting areas, multiple booms can be deployed along the reserve to prevent/minimise oiling. Bird hazing is also an option that can be used in consultation with Santos contracted experts.
Turtle nesting beaches during or near nesting season	+ All efforts should be mounted to prevent any oil from moving towards this area by either dispersing and/or containing the oil offshore or using booms to divert the oil away from this area. + However, if oil is expected to move into this area, booms can be deployed along the reserve to prevent/minimise oiling.
Fringing coral reef communities (Note: submerged coral reef communities are less susceptible to oiling)	+ Little can be done to protect coral reef along exposed (intertidal) sections of shoreline at low tides. + Floating oil would potentially coat living reef communities, which are usually slightly elevated and are consequently exposed at low tide. + Natural recovery with a close monitoring program is the preferred clean-up technique as entering these areas will cause greater damage.. + As much as practicable, oil should be removed from adjacent intertidal areas to prevent chronic exposure of the corals to oil leaching from these sites. + Use of sorbents should be limited to those that can be contained and recovered.

Receptor	Strategy Guidance
Macroalgal and seagrass beds	+ All efforts should focus on deflecting oil away from this area, or dispersing and/or containing the oil offshore, or using booms to divert the oil away from this area. + Extreme care should be taken not to disturb the sediments during clean-up operations in the vicinity of macroalgal and seagrass beds, which could result in total loss of the macroalgal and seagrass beds. + Removal of oiled parts of the macroalgal and seagrass beds should only be considered when it can be demonstrated that special species are at significant risk of injury from contact or grazing on the macroalgal and seagrass beds. + Otherwise, the best strategy for oiled seaweed is to allow natural recovery.
Rocky coast	+ Where practicable, booms can be deployed parallel to the rocky coasts to prevent/minimise oiling. + Flushing rocky shoreline is considered the most effective method of cleaning. Care must be taken to assess the fate and transport of the flushed oil and sorbent snares can be used to recover if deemed necessary to reduce impacts to ALARP. + Flushing can also be used to form a water barrier along high relief rocky coastlines (e.g. oyster stacks) to limit contact of oil against these shorelines. + For small areas of contamination, rocky structure can be manually wiped with sorbent pads or scraped to remove oil.
Commercial fisheries and tourism	+ Avoid the use of dispersants where possible. + Request the DoT/AMSA authorities to issue a marine notice to enforce an exclusion zone and fishing ban.
Hydrocarbon exploration and production industry	+ Report spills that may have implications to exploration and production areas to DoT and to relevant oil companies as per Stakeholder Consultation Plan.

15.3 Shoreline vessel access

In the initial instance, shoreline clean-up assessment of remote shorelines can be conducted by using aerial reconnaissance operations, and are used to monitor the spill and undertake regular assessment of shorelines throughout the region.

There are seven landing craft vessels in and around the North West Shelf area that are capable of grounding out; therefore the vessels can access a contacted area on high tide, ground out, unload equipment and personnel, reload with waste oil then depart on the next high tide. Landing craft vessels are supplied through Santos existing vessel suppliers.

Mechanical equipment and PPE are to be mobilised to the nominated marine operational base for onward movement to the affected locations.

Response personnel will be transferred on shallow draft vessels that are able to beach at drop-off points. Due to distance to some of the potentially contacted locations, travel times by water can be significant. In these cases, accommodation for clean-up personnel on vessels is to be considered. Where small clean-up teams are to be deployed, the Santos Logistics Team Leader will source high speed crew boats.

15.4 Preparation planning

The following sections provide guidance on staging area set-up for consideration, noting that DoT as the relevant Control Agency for shoreline operations will be in control of the selection and set-up of shoreline clean-up staging areas and waste collection points.

Organisation and worksite set-up

The worksite does not only include the polluted areas that require cleaning. Several other specific areas must be identified and cordoned off and routes for pedestrians and vehicles should be signposted.

These specific areas are:

+ the polluted area;
+ the waste storage area, with different types of containers suitable for the different kinds of waste;
+ the decontamination area: whatever the size of the spill, a decontamination phase for operational personnel, equipment and tools must be carried out in order to provide some comfort to personnel after each work session, avoiding oiling clean areas, and group together personal clean-up equipment and protective gear, to facilitate the management of the site (cleaning, storage, re-use);
+ a rest area, with at least changing rooms, toilets, a first aid kit and cold and hot beverages. Cold or even hot meals can also be organised on the spot provided that a canteen tent or temporary building is available; and
+ a storage area for tools and machinery (or equipment warehouse).

Access to the worksite should be restricted and traffic of vehicles should be strictly regulated to avoid accidents. Use the red-yellow-green zoning structure to prevent secondary contamination (**Figure 15-5**).

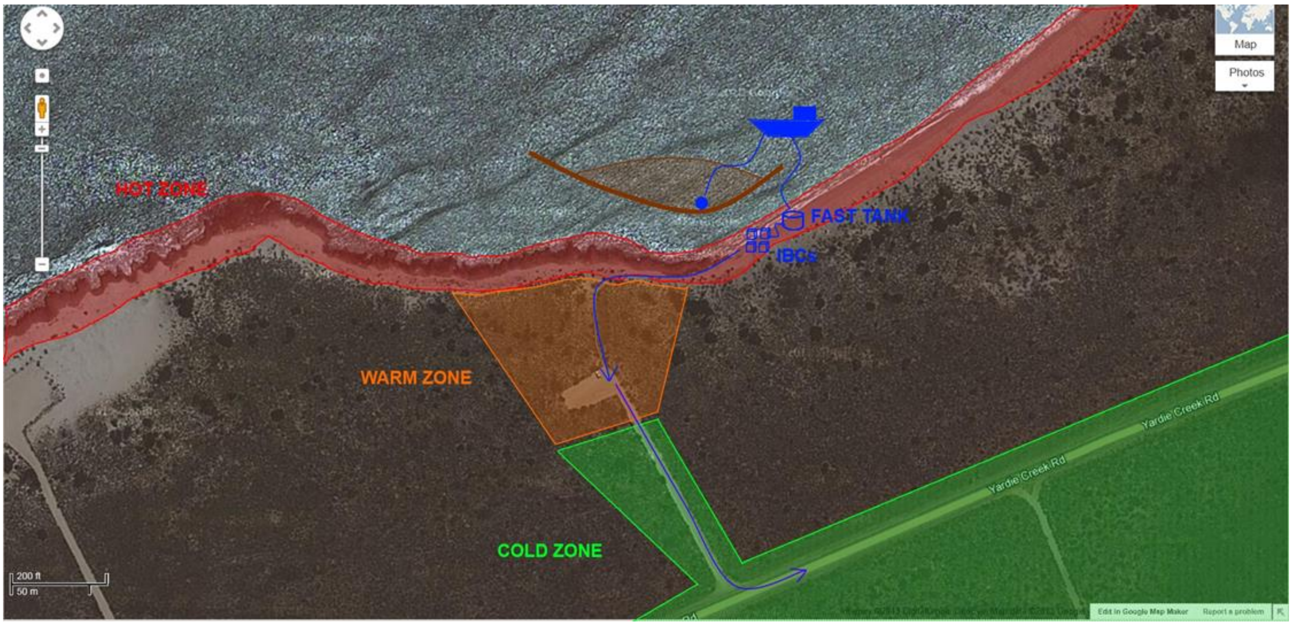

Figure 15-5: Example of collection process of waste during shoreline clean-up

Clean-up Operations:

In the case of heavy pollution, clean-up begins with **Phase 1, initial clean-up** operations, which are followed by **phase 2, final clean-up** operations.

INITIAL CLEANUP (PHASE 1	FINAL CLEANUP (PHASE 2)
The aim of this first phase is to prioritise the removal of accumulations of oil and various heavily polluted materials (sediment, floating debris, seaweed...) as quickly as possible. The objectives are two-fold: To limit the spreading of the pollution, by reducing the risk of the beached oil being reclaimed by the sea or moved by the wind. To limit the ecological impact, by reducing the duration of oil contact with the environment, and/or employing the least detrimental techniques.	The aim of final clean-up is to return sites to their previous uses and to allow the affected environment to resume normal ecological functioning. Final clean-up should only begin once initial clean-up of large accumulations of oil are complete and all threat of new significant deposits has been eliminated. It involves employing a range of techniques, both basic and more advanced, to remove residual pollution which impedes either the site's economic use of leisure activities, or the ecological function or general aspect of the sites affected.

Preparation

+ prevent the general public from accessing the worksite
+ delineate accesses for vehicles and machinery (check load-bearing capacity) and routes
+ channel vehicle and pedestrian traffic
+ protect the ground (geotextile, roll out mat system...) during operations in sensitive areas (dunes...)
+ prepare and signpost the different areas of activity (on the beach), living areas (locker room, meals, showers, toilets...) and stockpiling areas presenting a risk (fuel, equipment, waste pit....)
+ define a site for fluid storage away from the locker room:
  - provide an extinguisher for each cabin
  - set up a recovery system for fuel leaks
+ provide at least minimum lighting for installations and the surrounding area during the winter.

Basic Equipment	Extra Equipment
+ Plastic liners, geotextiles + Barrier tape and stakes + Signposting equipment	+ Bins, barrels, skips, tanks + Hot and cold beverages (Welfare) + Cooking oil, soap (Welfare) + Earthmoving equipment

Primary storage of waste

A primary storage site is an emergency staging area of the immediate deposit of the waste collected before its transfer to either an intermediate long-term storage site or if possible directly to a treatment facility. It is a key stage in the waste management process for sorting, labelling and quantifying the types and volumes of waste collected and when possible, reducing volumes to be transported by pre-treatment.

The storage site must be closed as soon as clean-up operations are completed.

The return of the site to its original condition implies:

- a contamination diagnosis made by an organisation specialised in ground pollution, decontamination operations if needed and the approval of the authorities
- in some cases, botanical evaluations to define a plant cover restoration operation

> - Segregate the different types of waste
> - Protect containers from rainwater ingress and to contain odours
> - Protect containers from prolonged exposure to sunlight if necessary
> - Ensure security to prevent unauthorised dumping

Primary waste storage sites should meet certain criteria:

- close proximity to the site of clean-up
- good access to roads for heavy lorries
- a flat area with enough space away from environmentally sensitive areas (vegetation, groundwater) and out of reach of the sea tides and waves

> - Depending on the volume of waste, site characteristics and availability of containers, prepare:
>   - Staging areas
>   - Pits if necessary
>   - Platform within earth berms
>   - Platform for bagged solids and liquids in tank.
> - Protect areas using watertight plastic liners
> - Lay fine gravel or sand at the base of the storage area to protect the membranes
> - Prepare rainwater or effluent management
> - Ensure correct labelling of the containers to avoid mixing the different types of waste (liquid, solid, non-biodegradable – oiled plastics, contaminated cleanup equipment, biodegradable – oiled seaweed, faunal)
> - Control access to the cleanup sites and protect access routes using lining and/or geotextiles

Base camp / rest area

The rest area (base camp) should at least consist of:

- changing rooms
- toilets
- a rest area.

At base camp, operators must be provided with:

- a first aid kit
- hot and cold beverages, meals.

Selection of the rest area must meet certain criteria:

- close proximity to the clean-up site
- easy access
- a flat area with enough space away from environmentally sensitive areas.

Equipment

+ shelter/rest area (tent, temporary building
+ portable toilets (at least one for men and one for women)
+ locker rooms
+ first aid kit
+ fire extinguisher
+ communication equipment

Storage area for equipment and machinery

This area consists of and equipped repair and maintenance site.

In order to avoid incidents and clean-up equipment failures, equipment should only be used by trained personnel and all equipment should regularly be checked for conformity with standard operating procedures and safety.

+ check and adjust daily levels of diesel, oil, water and other fluids
+ regularly maintain the machines (pumps, pressure washers...)
+ equipment must be checked, counted by the person in charge of logistics and stored daily at the end of the workday
+ some pieces of equipment must be washed or at least rinsed daily, with proper recovery of cleaning effluent, other kinds of equipment should be washed weekly or at the end of operations
+ set up a systematic maintenance-cleaning-repair operation at the end of each week
+ small tools and equipment and even detachable parts of all equipment remaining outside should be securely stored away (e.g. stainless steel bucket of small sand screeners)
+ in case of interruption of operations, large pieces of equipment should be moved to a supervised site
+ regularly check equipment for conformity and safety

The storage area for equipment and machinery must meet certain criteria:

+ close proximity to the site of clean-up
+ easy access
+ a flat area with enough space away from environmentally sensitive areas.

Equipment

+ cabins
+ hut
+ maintenance equipment and tools
+ cleaning equipment.

15.4.1 Manual Clean Up

Oil, polluted sediment, and debris are removed by hand or with the help of manual tools and then stored for disposal.

Clean-up equipment lists to be deployed with the clean-up teams based on the type of clean-up activity undertaken are provided in **Appendix G**.

Conditions of use

+ pollution: all types; most often scattered pollution; on large spills, if implementation of other techniques is impossible
+ pollutant: all types
+ substrate: all types; sufficient load bearing capacity for pedestrians and light equipment
+ site: all types sufficiently accessible and which tolerate intensive traffic.

Equipment

Basic Equipment:

+ scrapers (paint scrapers, long handle scrapers...), rakes, brushes, forks....
+ landing nets, shovels, trowels...

Extra Equipment:

+ waste containers, big bags, bins, plastic bags....
+ front-end loader (for disposal)

PPE: At least protective clothing: overalls, boots, gloves, etc. depending on the nature of the pollutant, expose and responder activity.

+ divide the response personnel among three functions:
  - Collection/scraping/gathering
  - Placing in bags/waste containers
  - Disposal
+ rotate the teams among the three functions
+ the waste can be disposed of manually or with the use of mechanical means if possible.
+ don’t overfill bins, plastic bags
+ don’t remove excessive quantities of sediments

Impact

+ impact insignificant to heavy, depending on the type of substrate. Risk of destroying the structure of the substrate in wetlands. Erosion.
+ potentially destructive effects on vegetation (dunes, marshland)
+ deconstruction and destabilisation of the foot of the dune (upper end of beach); erosion, destruction of the dune and the associated vegetation, decrease in biodiversity and fertility by reduction of the low water mark
+ can tend to fragment the oil in certain conditions

Performance

This is a highly selective technique, but requires a lot of time and personnel. If not done correctly, there is a risk of removal of large quantities of clean sediment.

15.4.2 Mechanical Collection

This technique consists of collecting the oil in order to facilitate its removal from the beach. Collection is carried out using a tractor, ATV, earthmoving vehicle or earthmoving equipment.

Conditions of use

+ pollution: heavy pollution, continuous slick
+ pollutant: slightly to very viscous oil
+ substrate: vast, flat foreshore with wet fine-grain sand (very damp to saturated) and a good load-bearing capacity, without ripple marks
+ site: accessible and sufficient load bearing capacity for earthmoving equipment, sufficiently large to allow vehicles to manoeuvre

Equipment

Basic equipment:

+ backhoe loader
+ gGrader/bulldozer
+ tractor or loader with front blade
+ front-end loader (for removal)

PPE: At least suitable for heavy machinery operation

Impact

+ normally only removes the oil, but some sediment may also be taken with it (if the operator is poorly supervised or inexperienced), especially if used on light pollution or an unsuitable site
+ high risk of disturbance due to traffic and mixing of oil with sediment
+ may lead to reduction of beach stability and beach erosion/loss of beach area.

<u>Minimum workforce required</u>: 2 people per vehicle (1 drive + 1 assistant)

<u>Waste</u>: oil mixed with a varying quantity of sediment; but can rapidly become unselective if scraping is carried out on moderate pollution (should be avoided)

+ Consists of bringing the oil together in order to facilitate its removal from the beach. Scraping is carried out using a tractor or earthmoving equipment fitted with a front-end blade in an oblique position. According to the viscosity of the oil, two options are available:
    - (case 1) fluid oil: radial or converging scraping towards a collection point on the foreshore; removal by pumping
    - (case 2) more viscous oil /solids: concentration to form windrows, by successive slightly curing passes parallel to the water line; subsequent removal of windrows
+ Should only be carried out on heavy pollution; do not use on moderate to light pollution
+ Inform and supervise operators; use experienced operators
+ Work methodically
+ Set up traffic lanes on the beach in order to reduce oil and sediment mixing
+ Don’t remove excessive amounts of non-contaminated materials

- Don't fill the bucket of loader more than 2/3 capacity
- Don't drive on polluted materials

15.5 Priority for Protection area deployments

Monitor and Evaluate information and NEBA will help identify and prioritise shoreline sites for clean-up operations. Shoreline sensitivity and mapping data provided in the following data sources will be used to assist in evaluation of priority protection areas:

- Santos GIS;
- DoT Oil Spill Response Atlas –Web Map Application (OSRA WMA);
- Pilbara Region Oiled Wildlife Response Plan;
- spill trajectory modelling;
- aerial surveillance and shoreline assessment records where available; and
- the Van Gogh Phase 2 drilling and completions EP.

Santos GIS and the OSRA WMA, provides detailed information on shoreline features, sensitive receptors, and potential spill response equipment mobilisation locations in the North West Shelf region.

A number of shoreline locations and sensitive receptors may receive stranded oil in the event of a spill as predicted by spill fate modelling. In order to guide response planning, Priority for Protection areas have been identified and worst case loading of oil determined at each of these areas from spill fate modelling (**Section 6.4.2** and **6.4.3**).

A summary of worst case resourcing needs for each of the Priority for Protection areas have been identified in **Section 6.8** based on modelling results. Deployment schedules for each area have been identified in further detail below such that through a combination of manual and mechanical pick-up, the entire theoretical worst case volume of oil (as identified in worst-case modelling) could be removed from each of the Priority for Protection areas. The deployment schedules below are based on a pick-up capability of 1 tonne per person per day and 50 tonne per earthmoving vehicle (e.g. front-end loader) per day. The volume of oil loaded onto shorelines has had a bulking factor of 10x applied to account for adherence of sediment and debris to the heavy Theo-3 (Van Gogh) crude oil. For each schedule, Phase 1 refers to the bulk collection of oil and oiled waste such that the entire volume could be theoretically removed in this timeframe. Phase 2 refers to the secondary phase where bulk oil has been removed and other processes that facilitate natural biodegradation (e.g. tilling and surf flushing) may be employed.

To facilitate and adaptive response, calculations used to inform these deployment schedules do not consider the success of other strategies (e.g. offshore containment and recovery and chemical dispersant application).

15.5.1 Ningaloo North Coast

The worst case modelled run use to identify spill clean-up needs along the Ningaloo Coast North has identified a peak loading of 11,180 m^3 which begins ~7 days after the spill occurring and peaks at day ~47 (refer **Figure 6-4**). Loading of oil was predicted to occur over ~230 km of coastline.

To deal with this volume of shoreline loading, a deployment of personnel and equipment based at two forward staging areas could be implemented as per the deployment schedule in **Table 16-3** starting 4-days post-spill occurrence. Staging areas could be relocated during the spill as per worst affected and priority areas. Road/track access to this coastline and shoreline habitats of sandy beaches would allow earthmoving vehicle access. The worst-case volume of oil could theoretically be removed after 12 weeks using manual and mechanical pick-up (Phase 1), although in reality residual oil may remain dependent on the shoreline type, shoreline accessibility and the outcome of a NEBA. A reduced workforce would remain to execute Phase 2 clean-up (e.g. assisted bioremediation).

A 6-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements, with up to 200 clean-up personnel onsite at a time per staging area (400 total) with up to an additional 200 rostered off in support.

Table 15-3: Deployment schedule for clean-up response at Ningaloo Coast North based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	EARTHMOVING VEHICLES	CLEAN-UP PERSONNEL ON SITE	ROSTER					
				CREW 1	CREW 2	CREW 3	CREW 4	CREW 5	CREW 6
Deployment starting 4 days post-spill occurrence									
Week 1	1	2	25	25					
Week 2		2	50	25	25				
Week 3		2	100	OFF	25	75			
Week 4		4	200	50	OFF	75	75		
Week 5		4	300	50	100	OFF	75	75	
Week 6		4	375	OFF	100	100	OFF	75	100
Week 7		4	400	100	OFF	100	100	OFF	100
Week 8		4	400	100	100	OFF	100	100	OFF
Week 9		4	400	OFF	100	100	OFF	100	100
Week 10		4	400	100	OFF	100	100	OFF	100
Week 11		4	200	100	50	OFF	100	50	OFF
Week 12		2	50	OFF	OFF	OFF	OFF	50	OFF
Week 13	2	2	25	25	OFF	OFF	OFF	OFF	OFF
Week 14		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 15		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 16		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 17		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 18		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 19		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 20		2	25	OFF	25	OFF	OFF	OFF	OFF

15.5.2 Ningaloo Coast South

The worst case modelled run use to identify spill clean-up needs along the Ningaloo Coast South has identified a peak loading of 7,026 m^3 which begins after ~27 days post-spill occurrence and peaks at day ~48 (refer **Figure 6-6**). Loading of oil was predicted to occur over ~160 km of coastline.

To deal with this volume of shoreline loading, a deployment of personnel and equipment based at two forward staging areas could be implemented as per the deployment schedule in **Table 15-4** starting 24-days post-spill occurrence. Staging areas could be relocated during the spill as per worst affected and priority areas. Road/track access to this coastline and shoreline habitats of sandy beaches would allow earthmoving vehicle access to some areas. The worst-case volume of oil could theoretically be removed after 9 weeks (Phase 1), although in reality, residual oil may remain dependent on the shoreline type, shoreline accessibility and the outcome of a NEBA. A reduced workforce would remain to execute Phase 2 clean-up (e.g. assisted bioremediation).

A 6-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 200 clean-up personnel onsite at a time per staging area (400 total) with up to an additional 200 rostered off in support.

Table 15-4: Deployment schedule for clean-up response at Ningaloo Coast South based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	EARTHMOVING VEHICLES	CLEAN-UP PERSONNEL ON SITE	ROSTER					
				CREW 1	CREW 2	CREW 3	CREW 4	CREW 5	CREW 6
Deployment starting 24 days post-spill occurrence									
Week 1	1	2	50	50					
Week 2		2	50	50					
Week 3		2	200	OFF	100	100			
Week 4		4	400	100	100	100	100		
Week 5		4	400	100	OFF	OFF	100	100	100
Week 6		4	400	OFF	100	100	OFF	100	100
Week 7		4	400	100	100	100	100	OFF	OFF
Week 8		2	200	100	OFF	OFF	100	OFF	OFF
Week 9		2	50	OFF	50	OFF	OFF	OFF	OFF
Week 10	2	2	25	OFF	25	OFF	OFF	OFF	OFF
Week 11		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 12		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 13		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 14		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 15		2	25	OFF	25	OFF	OFF	OFF	OFF
Week 16		2	25	25	OFF	OFF	OFF	OFF	OFF
Week 17		2	25	25	OFF	OFF	OFF	OFF	OFF

15.5.3 Muiron Islands

The worst case modelled run use to identify spill clean-up needs at Muiron Islands has identified a peak loading of 586 m^3 which begins after ~26 days post-spill occurrence and peaks at day ~30 (refer **Figure 6-5**). Loading of oil was predicted to occur over ~8 km of coastline (western shorelines).

To deal with this volume of shoreline loading, a deployment of personnel and equipment could be implemented as per the deployment schedule in **Table 15-5** starting 23-days post-spill.

The predicted impact areas on the western shores of Muiron Islands are difficult to access. Generally, beach landings by transfer vessel are possible on the eastern side of the islands where the wave energy is reduced and sand accumulation occurs. The western side of the island is typified by rocky outcrops and cliff walls, with the occasional sand cover. The use of manual pick-up here is envisaged, with transfer of equipment and personnel by vessel from Exmouth.

The worst-case volume of oil could be theoretically removed after 8 weeks (Phase 1) although in reality residual oil may remain dependent on the shoreline type, shoreline accessibility and the outcome of a NEBA. A reduced workforce would remain to execute Phase 2 clean-up (e.g. assisted bioremediation).

A 3-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 30 clean-up personnel onsite at a time with up to an additional 15 rostered off in support.

Table 15-5: Deployment schedule for clean-up response at Muiron Islands based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	CLEAN-UP PERSONNEL ON SITE	ROSTER		
			CREW 1	CREW 2	CREW 3
Deployment starting 23 days post-spill occurrence					
Week 1	1	15	15		
Week 2		30	15	15	
Week 3		30	OFF	15	15
Week 4		30	15	OFF	15
Week 5		30	15	15	OFF
Week 6		30	OFF	15	15
Week 7		30	15	OFF	15
Week 8		15	15	OFF	OFF
Week 9	2	15	OFF	15	OFF
Week 10		15	OFF	15	OFF
Week 11		15	15	OFF	OFF
Week 12		15	15	OFF	OFF

15.5.4 Exmouth Gulf Coast

The worst case modelled run use to identify spill clean-up needs at Exmouth Gulf Coast has identified a peak loading of 354 m^3 which begins after ~30 days post-spill occurrence and peaks at day ~37 (refer **Figure 6-7**). Loading of oil was predicted to occur over ~16 km of coastline, with modelling indicating loading restricted to the upper western Gulf (upper eastern side of North West Cape). Other modelling available indicates some loading may be possible on the eastern upper side of the gulf, although no loading has been predicted into the lower gulf.

To deal with this volume of shoreline loading, a deployment of personnel and equipment could be implemented as per the deployment schedule in **Table 15-6** starting 24-days post-spill.

The predicted impact area on the eastern side of the North West Cape can be accessed by road/track and therefore the use of earth moving vehicles is possible. While not predicted during the worst-case loading provided by modelling, some loading is also possible on the upper eastern side of the Gulf. Here, access may be via vessel given the habitat may be mangrove lined shores and/or have limited accessibility from road/track.

The worst-case volume of oil could be theoretically removed after 5 weeks (Phase 1) although in reality residual oil may remain dependent on the shoreline type, shoreline accessibility and the outcome of a NEBA. A reduced workforce would remain to execute Phase 2 clean-up (e.g. assisted bioremediation).

A 3-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 50 clean-up personnel onsite at a time with up to an additional 25 rostered off in support.

Table 15-6: Deployment schedule for clean-up response at Exmouth Gulf based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	EARTHMOVING VEHICLES	CLEAN-UP PERSONNEL ON SITE	ROSTER		
				CREW 1	CREW 2	CREW 3
Deployment starting 24 days post-spill occurrence						
Week 2	1	1	25	25		
Week 3		1	50	25	25	
Week 4		1	50	OFF	25	25
Week 5		1	25	OFF	OFF	25
Week 6	2	1	25	25	OFF	OFF
Week 7		1	25	25	OFF	OFF
Week 8		1	25	OFF	25	OFF
Week 9		1	25	OFF	25	OFF

15.5.5 Outer Shark Bay Coast

The worst case modelled run use to identify spill clean-up needs at Outer Shark Bay Coast has identified a peak loading of 8,314 m^3 which begins ~41 days post-spill occurrence and peaks at day ~50 (refer **Figure 6-8**). Loading of oil was predicted to occur over ~246 km of coastline, with modelling indicating loading restricted to the western shorelines of Bernier, Dorre and Dirk Hartog islands and the cliffs extending southwards from Steep Point.

The predicted oil contact area, which includes western shorelines of Bernier, Dorre and Dirk Hartog islands and the coastline south of Steep Point, comprises predominantly rocky shoreline and steep cliffs which receive high wave energy. There is no track access on Bernier or Dorre islands and limited track access to the western shoreline of Dirk Hartog Island. Some sandy shoreline areas with vehicle (sand track) access exist in pockets on Dirk Hartog Island, particularly on the north and south ends of the island, for example Cape Inscription area to the north and the Sandy Bay area (Surf Point to Cape Ransonnet) on the southern end of the island. The cliffs extending south from Steep Point have some track access but there is virtually no access down to the water line.

Given that the majority of the potentially contacted shoreline of Outer Shark Bay is inaccessible, the deployment resources and schedule (**Table 15-7**) has been based on manual pick-up teams accessing sandy shoreline areas with vessel and/or track access. These areas are typically those with the highest tourist use (e.g. Sandy Bay area).

Through the use of a relatively small and mobile clean-up team the worst-case volume of oil could be theoretically removed after 13 weeks (Phase 1), although in reality residual oil is likely to remain given limited accessibility and the outcome of a NEBA. The high energy environment indicates that natural bioremediation through wave-induced entrainment and biodegradation may be the best outcome for reducing oil volume along much of this coastline. A reduced workforce would remain to monitor and execute Phase 2 clean-up.

A 3-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 30 clean-up personnel onsite at a time with up to an additional 15 rostered off in support (**Table 15-7**).

Table 15-7: Deployment schedule for clean-up response at Outer Shark Bay Coast based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	CLEAN-UP PERSONNEL ON SITE	ROSTER		
			CREW 1	CREW 2	CREW 3
Deployment starting 38 days post-spill occurrence					
Week 1	1	15	15		-
Week 2		30	15	15	-
Week 3		30	OFF	15	15
Week 4		30	15	OFF	15
Week 5		30	15	15	OFF
Week 6		30	OFF	15	15
Week 7		30	15	OFF	15
Week 8		30	15	15	OFF
Week 9		30	OFF	15	15
Week 10		30	15	OFF	15
Week 11		30	15	15	OFF
Week 12		30	OFF	15	15
Week 13		15	OFF	OFF	15
Week 14	2	15	15	OFF	OFF
Week 15		15	15	OFF	OFF
Week 16		15	OFF	15	OFF
Week 17		15	OFF	15	OFF
Week 18		15	15	OFF	OFF
Week 19		15	15	OFF	OFF
Week 20		15	OFF	15	OFF
Week 21		15	OFF	15	OFF

15.5.6 Carnarvon to Inner Shark Bay

The worst case modelled run use to identify spill clean-up needs at Carnarvon to Inner Shark Bay has identified a peak loading of 344 m^3 which begins ~44 days post-spill occurrence and peaks at day ~51 (refer **Figure 6-9**). Loading of oil was predicted to occur over ~31 km of coastline, with modelling indicating loading restricted to the northern end of Dirk Hartog Island (including Turtle Bay) and the Wooramel coastline extending a short way south from Carnarvon on the mainland coast. No oil has been predicted by modelling

(150 replicated runs) to extend into the Shark Bay inner gulfs or reach the Peron Peninsula shorelines. This is supported by research into the circulation patterns of Shark Bay which indicate inner-gulf currents restrict surface water influx and exchange from adjacent open marine waters and contribute to the unique biological and physical characteristics of the inner gulf waters (Nahas, 1994)

The predicted contact area at Dirk Hartog is the northern tip of the island, including Turtle Bay, which comprises an interspersed rocky and sandy shoreline; access is via vessel or sand track. South of Carnarvon the contacted shoreline comprises intertidal flats and mangroves along the Wooramel coastline. Accessibility is via vessel from Carnarvon or via track from the main highway, although personnel and heavy vehicle accessibility is likely limited via track given the terrain and sensitivity of habitat (mangroves and mudflats). Manual clean-up teams are considered the most effective in this environment given the potential volume stranded, type of shoreline and the likely difficulty in accessing shorelines with earth moving equipment.

To deal with this volume of shoreline loading, a deployment of personnel and equipment could be implemented as per the deployment schedule in **Table 15-8** starting 42-days post-spill.

The worst-case volume of oil could be theoretically removed after 6 weeks (Phase 1), although in reality residual oil is likely to remain given limited accessibility, sensitivity of habitat (mangroves) and the outcome of a NEBA. A reduced workforce would remain to monitor and execute Phase 2 clean-up using assisted bioremediation where considered to provide a net environmental benefit.

A 3-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 50 clean-up personnel onsite at a time with up to an additional 25 rostered off in support (**Table 15-8**).

Table 15-8: Schedule for clean-up response at Carnarvon to Inner Shark Bay based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	CLEAN-UP PERSONNEL ON SITE	ROSTER		
			CREW 1	CREW 2	CREW 3
Deployment starting 42 days post-spill occurrence					
Week 1	1	25	25		-
Week 2		50	25	25	-
Week 3		50	OFF	25	25
Week 4		50	25	OFF	25
Week 5		25	25	OFF	OFF
Week 6		25	OFF	25	OFF
Week 7	2	25	25	OFF	OFF
Week 8		25	25	OFF	OFF
Week 9		25	OFF	25	OFF
Week 10		25	OFF	25	OFF

15.5.1 Eighty Mile Beach

The worst-case modelled run use to identify spill clean-up needs at Eighty Mile Beach has identified a peak loading of 1 313m^3 which begins ~62 days post-spill occurrence. Loading of oil was predicted to occur over ~21 km of coastline (20% of the total length). The build-up of accumulated hydrocarbons is slow and unlikely to reach the moderate exposure threshold (14%). The time for shoreline accumulation to reach the moderate exposure threshold is 68 days.

To deal with this volume of shoreline loading, a deployment of personnel and equipment could be implemented as per the deployment schedule in **Table 15-9** starting 62-days post-spill.

The worst-case volume of oil could be theoretically removed after 6 weeks (Phase 1), although in reality residual oil is likely to remain given limited accessibility, sensitivity of habitat (mangroves) and the outcome of a NEBA. A reduced workforce would remain to monitor and execute Phase 2 clean-up using assisted bioremediation where considered to provide a net environmental benefit.

A 3-crew roster with a deployment of 2 weeks on, 1 week off could provide the required personnel requirements with up to 50 clean-up personnel onsite at a time with up to an additional 25 rostered off in support (**Table 15-9**).

Table 15-9: Schedule for clean-up response at Eighty Mile Beach based on worst-case loading

WEEK INTO OPERATION	RESPONSE PHASE	CLEAN-UP PERSONNEL ON SITE	ROSTER		
			CREW 1	CREW 2	CREW 3
Deployment starting 62 days post-spill occurrence					
Week 1	1	25	25		-
Week 2		50	25	25	-
Week 3		50	OFF	25	25
Week 4		50	25	OFF	25
Week 5		25	25	OFF	OFF
Week 6		25	OFF	25	OFF
Week 7	2	25	25	OFF	OFF
Week 8		25	25	OFF	OFF
Week 9		25	OFF	25	OFF
Week 10		25	OFF	25	OFF

15.6 Remote islands deployment

For shoreline clean-up of remote islands the following process could be implemented so as to minimise the secondary impacts of high numbers of spill response personnel on shorelines.

Vessels are to be mobilised to the designated deployment Port to mobilise shoreline clean-up teams by water. The shoreline clean-up will be undertaken through on-water deployment to the defined shorelines in 4 stages:

1. Drop off of 6-person clean-up containers (contents list **Appendix G**) to shoreline contact locations defined by IMT through observation data;
2. Deployment of marine and environmental specialists to demarcate the clean-up zones with barrier posts and tape to prevent secondary impacts to flora and fauna by the clean-up teams;
3. Deployment of clean-up teams in 6-person squads with a trained/competent shoreline responder as a Team Leader to conduct clean-up methods (flushing, bag and retrieve, etc.) with all waste being bagged and stored in temporary bunding made of HDPE above the high- tide mark; and
4. Deployment of the waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

Multiple 6-person teams are to be utilised based on the actual volume of oil deposited.

15.7 Environmental performance

Table 15-10 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 15-10: Environmental performance – shoreline clean-up

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Shoreline Clean-Up	**Response Preparedness**		
	Access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan and OSRL.	Maintenance of access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity.	MoU for access to National Plan resources through AMSA.
			AMOSC Participating Member Contract.
			OSRL Associate Member Contract.
	Maintenance of MSAs with multiple vessel providers.	Santos maintains MSAs with multiple vessel providers.	MSAs with multiple vessel providers.
	Vessels for offshore island response.	Maintenance of vessel specification for resource transfer for offshore island response.	Vessel specification.
	Labour hire contract.	Maintenance of contract with labour hire provider.	Contract.
	Response Implementation		
	Shoreline Clean-Up Plan.	Santos IMT to confirm protection priorities in consultation with DoT.	IAP. Incident Log.
		Prepare operational NEBA to determine if shoreline clean-up activities are likely to result in a net environmental benefit.	Records indicate operational NEBA completed prior to shoreline clean-up activities commencing.
		Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination.	Incident Log. IAP.
		IAP Shoreline Clean-up Sub-plan developed to provide oversight	Records indicate IAP Shoreline Clean-up Sub-plan prepared prior to

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
		and management of shoreline clean-up operation.	shoreline clean-up operations commencing.
		Clean-up strategies will be implemented under the direction of DoT as the HMA.	Incident Log.
		Santos will make available AMOSC Core Group Responders for shoreline clean-up team positions to the Control Agency.	Incident Log.
		Santos will make available to the Control Agency equipment from Santos, AMOSC and OSRL stockpiles.	Incident Log.
		NEBA undertaken every operational period by the relevant Control Agency to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan.	IAP/Incident Log.
	Prioritise use of existing roads and tracts.	Unless directed otherwise by the designated Control Agency (i.e., DoT) access plans for shoreline operations will prioritise use of existing roads and tracks.	IAP demonstrates requirement is met.
	Soil profile assessment prior to earthworks.	Unless directed otherwise by the designated Control Agency (i.e., DoT) a soil profile assessment is conducted prior to earthworks.	Documented in IAP and Incident Log.
	Pre-cleaning and inspection of equipment (quarantine).	Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands.	Documented in IAP and Incident Log.
	Use of Heritage Adviser if spill response activities overlap with potential areas of cultural significance.	Unless directed otherwise by the designated Control Agency (i.e., DoT) a Heritage Adviser is consulted if shoreline operations overlap with areas of cultural significance.	Documented in IAP and Incident Log.

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
	Select temporary base camps in consultation with DoT and DBCA.	Any establishment of forward staging areas at shoreline areas done under direction or in consultation with DoT and DBCA.	Documented in IAP and Incident Log.
	OSR Team Leader assessment/selection of vehicle appropriate to shoreline conditions.	OSR Team Leader assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met.
	Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat.	Unless directed otherwise by the designated Control Agency (i.e., DoT) demarcation zones are mapped out in sensitive habitat areas.	IAP demonstrates requirement is met.
	Operational restriction of vehicle and personnel movement to limit erosion and compaction.	Unless directed otherwise by the designated Control Agency (i.e., DoT) action plans for shoreline operations include operational restrictions on vehicle and personnel movement.	IAP demonstrates requirement is met.
	Stakeholder consultation.	Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas.	Consultation records

16 Oiled wildlife response plan

Oiled Wildlife Response Plan		
Initiation criteria	Operational monitoring shows that wildlife are contacted or are predicted to be contacted by a spill	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: For spills entering State waters it is expected that DoT will assume Control Agency for oiled wildlife response for both State and Commonwealth waters response. Santos will act as Control Agency/Lead IMT for oiled wildlife response until notified otherwise	
Objective	To undertake response activities for the protection and treatment of wildlife that are or likely to be impacted by a spill.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	✔
Termination criterion	Oiling of wildlife have not been observed over a 48-hour period, and Oiled wildlife have been successfully rehabilitated, and Agreement is reached with Jurisdictional Authorities and stakeholders to terminate the incident response	

The greatest potential for oiled wildlife will be from spills adjacent to, or moving towards shorelines and shallow waters in State waters. DoT is the relevant Control Agency/Lead IMT for oiled wildlife response for spills moving from Commonwealth to State waters and will coordinate both State and Commonwealth response in this scenario.

DBCA are the Statutory Authority for the protection of wildlife in State waters and will play an advisory role in the response. Santos will provide all necessary resources to assist DoT in an oiled wildlife response, initially through its access to AMOSC oiled wildlife resources. Timely provision of equipment and personnel will be provided by AMOSC to DoT as the Control Agency/ Lead IMT through a combination of owned and operated equipment, call-off contracts with suppliers, and the management of industry OWR response personnel through an Industry Oiled Wildlife Advisor (OWA). This team will work in conjunction with DBCA OWR capability under the direction of the DoT Incident Controller.

This Oiled Wildlife Response Plan describes how, in the event of a spill that will or could potentially oil wildlife, the IMT will activate DBCA and Industry (AMOSC) Oiled Wildlife Advisors (OWAs) as stipulated in the WA Oiled Wildlife Response Plan (WAOWRP). These roles ensure minimum standards for Oiled Wildlife Response (OWR), as outlined within the WAOWRP, are met and ensure timely mobilisation of appropriate resources (equipment and personnel) through communication with the wildlife logistics team.

16.1 Administrative structure

The SHP-MEE indicates that both the petroleum industry and DBCA have operational plans for OWR and that these plans should align with SHP-MEE. The WAOWRP addresses both these requirements and outlines the OWR regardless of the spill source.

The WAOWRP applies to all instances of OWR in State and Commonwealth Waters; it details the legislative responsibilities, relationships to other plans, roles and responsibilities, wildlife division structure, standards and best practice procedures for OWR. While the WAOWRP is a sub-plan to the SHP-MEE, it is the responsibility of DBCA to administrate and approve the WAOWRP. See **Section 5.2.4** for the oiled wildlife marine arrangements.

16.2 Activation procedure

The Control Agency/Lead IMT will activate the WA OWRP when there is an oil spill incident that has potential to result in oiled wildlife. **Figure 16-1** details the WAOWRP activation process.

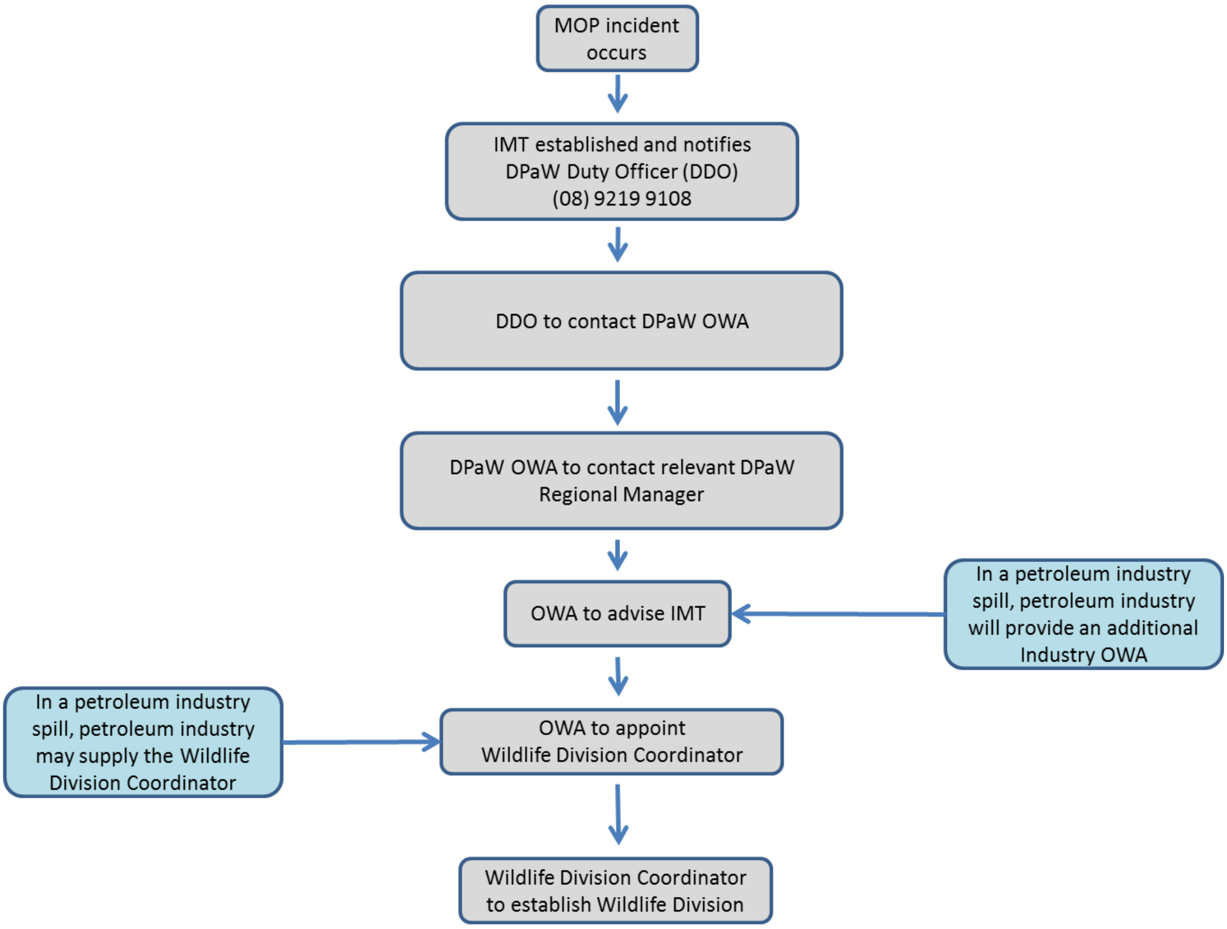

Figure 16-1: WAOWRP activation process (Note: MOP = Marine Oil Pollution)

On occasions, a single oiled animal is found and the animal can be treated using local resources (veterinaries, wildlife carers or DBCA staff), no additional resources may be required and hence the OWR may not need to be escalated.

The level of escalation of the OWR is under the authority of the DoT Incident Controller, and developed as a result of the incident specifics and advice given by the OWR Advisors as per the protocols set out in the WAOWRP.

Santos will provide all relevant information with respect to oiled or at risk wildlife (location, access, number, species, and condition of oiled wildlife) to the DoT, that is acquired during operational monitoring under its control.

The Santos IMT will stand up AMOSC in the capacity of the Industry OWA to support DoT/ DBCA. Decisions on levels of response, and therefore resources (equipment/personnel) required will be made by DoT IMT in consultation with DBCA OWA and with input and advice from the Industry OWA. All of these decisions will be approved by the DoT Incident Controller.

16.3 Oiled wildlife advisor roles

16.3.1 DBCA OWA

The OWA role is to advise the Control Agency IMT on the OWR, ensuring that the minimum standard for OWR is being adhered to whilst providing expert advice for critical decision making. The OWA's role is to carry out the following:

+ provide advice on behalf of the DBCA, the State statutory agency responsible for wildlife care and protection;
+ provide updates to the IMT on the OWR situation;
+ serve as the link between the DBCA Director General and the response;
+ provide critical wildlife risk information to the IMT;
+ provide on-the-spot licenses to non DBCA responders for the pre-emptive capture of wildlife or for deterrence activities in state waters;
+ liaise with logistics to ensure the availability and provision of resources to the wildlife response operations;
+ provision of licensing authority for hazing and/or pre-emptive capture of wildlife;
+ provision of critical advice on the priority wildlife concerns and general wildlife response; and
+ serve as the link between the DBCA Director General and the response.

16.3.2 Petroleum Industry OWA

Santos will provide a suitably qualified Industry OWA through its association with AMOSC. This role will maintain the interface and therefore effective communication between the Santos IMT and DBCA/ Control Agency IMT.

This person shall:

+ be trained in the detail of the OWR State and regional plans;
+ have the authority to act on the petroleum company's behalf;
+ monitor compliance with the plans on the petroleum company's behalf; and
+ liaise with logistics to ensure the availability and provision of resources to the OWR operations.

In an OWR both OWA's will work together to ensure access to equipment and personnel.

16.4 Personnel and equipment requirements

The WAOWRP describes the personnel and equipment resources required to satisfy the OWR activities. AMOSC support Santos' commitment to providing the prescribed resources through a combination of owned and operated equipment, call-off contracts with suppliers, and the management of an industry OWR Core Group of personnel.

To supplement this capability, the AMOSC OWA has been funded by the AMOSC Participating and Associate Members to undertake discussions and develop arrangements with international Oiled Wildlife Response Organisations to facilitate activation of global capability in the event of an oiled wildlife response. These international organisations represent the global capability in oiled wildlife response and are noted in **Table 16-3.**

In addition, Santos maintains supply agreements with several Workforce Labour Hire Companies that have the combined ability to provide >2,000 personnel suitable to undertake the Level 1 role within the oiled wildlife response. These personnel can be accessed quickly and maintained for an extended duration.

Under the WAOWRP arrangement, DBCA and AMOSC may request assistance from either party if their internal pool of trained personnel and expertise has been exhausted.

16.4.1 Oiled wildlife response levels

OWRs are characteristically minor (1-20 birds and <1 week response duration) or major (100+, >30 days response duration), with each response having different resource needs for personnel and equipment and variations on the duration of the response efforts. However, it is important to define the levels in between, to provide a minimum number of personnel required and skill level required in filling roles within the OWR structure.

16.4.2 Personnel required for each level

Table 16-1 defines the number of personnel required from the different competency levels to respond to an escalating Oiled Wildlife Response from level 1 to Level 6. The number of personal may change depending on the complexity response (spatial scale and variety of wildlife impacted). The skill level required is indicated as OWR 1-4, these correspond to competency-based levels that ensure personnel have adequate knowledge to effectively perform the indicated roles / functions.

Table 16-1: Oiled Wildlife Response Level and Personnel Numbers as per the WAOWRP

SKILL REQUIREMENT	OWR RESPONSE LEVEL & PERSONNEL NUMBERS					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
OWR 4	1	1	3	2	2	2
OWR 3	2	0	4	4	4	4
OWR 2	4	9	15	17	18	18
OWR 1	0	14	33	47	84	90
Technicians (i.e Vets)	0	1	2	4	4	4
Other Specified Skills	0	0	2	3	4	4
Total	**7**	**25**	**59**	**77**	**116**	**122**

Table 16-2 provides an indication of the number of personnel required to fill positions relative to the scale of the response. Additional personnel will be required as scribes/PAs for key functional positions.

Table 16-2: Indicative Oiled Wildlife Response Personnel Resourcing

Category	Role	OWR Skill Level	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Strategic	Oiled Wildlife Advisor	OWR 4	1^{+1}	1^{+1}	1^{+1}	1^{+1}	1^{+1}	1^{+1}
	Wildlife Division Coordinator**	OWR 4		1	1	1	1	1
	Wildlife Operations Officer**	OWR 3			1	1	1	1
	Wildlife logistics Officer	OWR 3			1	1	1	1
	Wildlife Plannning Officer	OWR 3			1	1	1	1
	Wildlife Finance/Admin Officer	OWR 3			1	1	1	1
	Wildlife Communications Officer	OWR 2		1	1	1	1	1
	Wildlife Situation Officer	OWR 2			1	1	1	1
	Wildlife Supply/Resource Officer	OWR 2			1	1	1	1
	Wildlife Safety Officer	OWR2			1	1	1	1
	Wildlife Volunteer Coordinator	OWR 2			1	1	1	1
Staging Area / Facilities	Wildlife Staging Area Manager*	OWR 2	1	1	1	1	2	2
	Wildlife Staging Area / intake Team	OWR 1			3	3	6	8
	Wildlife Facilities Manager *	OWR 2			1	1	1	1
	Wildlife Trades assistants	Specified Skill			1	2	3	3
	Wildlife housekeeper	OWR 1			1	1	2	3
	Wildlife Security	Specified Skill			1	1	1	1
Re-connaissance	Wildlife Reconnaissance Officer	OWR 2	1	1	1	1	1	1
	Wildlife Aviation Supervisor	OWR 2			1	1	1	1
	Wildlife Vessel Supervisor	OWR 2				1	1	1
	Wildlife Shoreline Supervisor	OWR 2				1	1	1
	Wildlife Reconnaissance Team	OWR 1			2	4	6	8
	Wildlife Rescue Officer	OWR 2		1	1	1	1	1
Rescue	Wildlife Rescue Officer	OWR 2	2	1	1	1	1	1
	Wildlife Exposure Modification Officer	OWR 2		1	1	1	1	1
	Wildlife Field Collection Team	OWR 1		3	6	9	22	22
	Wildlife Transport Officer	OWR 2		1	1	1	1	1
Rehabilitation	Triage officer	OWR 2	2	1	1	1	1	1
	Triage team	OWR 1		1	4	5	5	6
	Wildlife Vetrinarian *	Specified Skill		1	1	3	3	3
	Wildlife Vetrinarian technician *	Specified Skill			1	1	1	1
	Wildlife Stabilisation Officer	OWR 2		1	1	1	1	1
	Wildlife Rehabilitation Officer	OWR 2		1	1	1	1	1
	Facilities Team	OWR 1		3	4	6	8	8
	washing/drying personnel ***	OWR 1		4	6	10	15	15
	Recovery/release personnel ***	OWR 1		3	8	10	20	20
Total number of personnel			6	26	59	77	116	122
NOTES	* 1 person per facility	*** Volunteers can be used to make up more numbers in this category where necessary						
	** May have deputy	Note: All Supervisor/coordinator positions should employ a scribe from level 4>						
	1^{+1} = In an industry spill there may be two oiled wildlife advisors (1 DPaW, 1 industry)							

Given the characteristics of the oil and the high potential volume of oil that could accumulate on shorelines (e.g. Ningaloo coastline) the level of oiled wildlife response is assessed at being a potential Level 6 incident as per the WA Oiled Wildlife Response Plan (WAOWRP), with the potential to be greater than Level 6.

To support an adaptive approach, the level of the OWR can be raised or lowered based on the actual circumstances of the spill, with sufficient resources available internationally and through the Santos Workforce Labour Hire providers to scale up well beyond the defined Level 6.

16.5 Industry sources of personnel and equipment

In the event of a spill impacting wildlife, Santos will commence arrangements to mobilise personnel and equipment to fill responder positions as identified in the WAOWRP. An overview of sources of personnel is provided in Table 1 and an overview of 'first-strike' equipment for initial deployment is provided in Table 2.

In the event of large-scale OWR, further specialised OWR equipment and personnel will be provided by in-country and international organisations, as necessary, accessed through AMOSC (primary) and OSRL (secondary). Equipment and personnel required for the development and operation of staging areas/ treatment facilities can be provided locally (for example veterinary personnel and supplies). The Pilbara Region OWR Plan provides detail of local organisations and suppliers for personnel and equipment.

In addition to OWR providers mobilised through AMOSC and OSRL/Sea Alarm, Santos maintains access to the workforce marketplace during an emergency response. Level 1 oiled wildlife responders, of which the WAOWRP indicates 90+ could be required for a Level 6+ event, could be provided through Santos' workforce hire arrangements. On the job training requirements for Level 1 responders could be provided by DBCA, AMOSC or Sea Alarm personnel. Skilled but ubiquitous roles required for manning and maintaining facilities and staging areas, such as trades, technicians and vets, could also be filled through workforce hire arrangements. The Pilbara Region OWR Plan provide contact details for local trade personnel, vets and wildlife specialists that could be employed for manning/maintenance of forward response wildlife response facilities.

Table 16-3: Sources of oiled wildlife response personnel

<table>
<tr><th colspan="2">AMOSC / INDUSTRY RESPONDERS</th><th>Activated through</th><th>Capability</th></tr>
<tr><td colspan="2">AMOSC Technical Advisor – Oiled Wildlife – assistant in IMT (as industry OWA if required)</td><td rowspan="3">AMOSC Duty Officer</td><td>1*</td></tr>
<tr><td colspan="2">AMOSC OWR Industry Team–Level 2-4 responders (DBCA training)</td><td>18*</td></tr>
<tr><td colspan="2">WA Petroleum Industry Personnel – Trained by individual petroleum industry companies – activated via mutual aid</td><td>~50*</td></tr>
<tr><td colspan="2">AUSTRALIAN OWR EXPERTISE</td><td>Activated through</td><td>Capability</td></tr>
<tr><td colspan="2">Blue Planet Marine (ACT and WA) – Oiled Wildlife Responders (Dave Paton – 02 6251 2608)</td><td rowspan="3">AMOSC Duty Officer</td><td>10-20*</td></tr>
<tr><td colspan="2">Phillip Island National Parks (VIC) – Oiled Wildlife Responders (Roz Jessop – 03 5951 2800)</td><td>~70 staff
~45 volunteers*</td></tr>
<tr><td colspan="2">NatPlan Mutual Aid</td><td>50-100*</td></tr>
<tr><td rowspan="2">Perth Zoo – Duty Veterinarian</td><td>Wildlife Veterinarian advice, expertise and management</td><td colspan="2" rowspan="2">Personnel potentially available to petroleum industry – (currently there is no formal arrangement)</td></tr>
<tr><td>Links to wildlife rehabilitation networks</td></tr>
<tr><td colspan="2">OWA Personnel</td><td rowspan="2">DBCA State Duty Officer</td><td>1 per shift</td></tr>
<tr><td colspan="2">DBCA staff with wildlife and emergency management skill set who currently operate in fire preparedness and response</td><td></td></tr>
<tr><td colspan="2">INTERNATIONAL OWR EXPERTISE</td><td>Activated through</td><td>Capability</td></tr>
</table>

DwyerTECH NZ - Facilities Management Personnel Call-off contract	AMOSC Duty Officer	2*
Wild base, Massey University (NZ) - Oiled Wildlife Responders (Louise Chivers - +64 6 350 5701)		4-6*
International Bird Rescue (USA)- Oiled Wildlife Responders		4*
Sea Alarm (Belgium) – Expert assistance with organisational set-up and global OWR resourcing	OSRL Duty Officer	2/3** (Sea Alarm) + additional OWR responders accessed through global network

* As per AMOSC Capacity Statement 25 June 2020

** As per Sea Alarm/OSRL Service Level Agreement Statement

Table 16-4: First Strike Deployment-Ready OWR Equipment

AMOSC OWR Equipment*	Activated through	Location
1 x AMOSC owned OWR container 1 x AMOSC owned box kit 1 x Fauna Hazing and Exclusion kit	AMOSC Duty Officer	Fremantle
1 x AMOSC owned OWR container 1 x AMOSC owned box kit 1 x Fauna Hazing and Exclusion kit		Geelong
1 x AMOSC owned box kit		Exmouth
1 x AMOSC owned box kit		Broome
National Plan (NatPlan) OWR Equipment*	**Activated through**	**Location**
1 x NatPlan OWR container 1 x NatPlan/DBCA Box/trailer kit	AMSA RCC	Dampier
1 x NatPlan OWR container		Darwin
1 x NatPlan OWR container		Townsville
1 x NatPlan/OWR Container		Devonport
WA DBCA OWR Equipment*		
1 x DoT OWR container	**DoT Duty Officer**	Fremantle
DBCA OWR trailer kit		Karratha
DBCA OWR trailer kit		Kensington
NSW Maritime OWR Equipment*	**Activated through**	**Location**
1 x NSW Maritime OWR container	AMSA RCC	Sydney
OSRL OWR Equipment**	**Activated through**	**Location**
1 x Search and rescue response package 1 x Cleaning and rehabilitation response package	OSRL Duty Officer	UK
1 x Cleaning and rehabilitation response package		Singapore
2 x Search and rescue response package		Bahrain

1 x Cleaning and rehabilitation response package		
1 x Cleaning and rehabilitation response package		Fort Lauderdale, USA

* As per AMOSC Capacity Statement 25 June 2020 ** As per OSRL SLA Equipment Report 13 April 2021.

16.5.1 AMOSC OWR arrangements

Santos' primary strategy for accessing in-country OWR personnel is to stand-up arrangements maintained by AMOSC through Santos' Participating Member contract. AMOSC supports Santos' commitment to providing OWR resources through a combination of owned and operated equipment, call-off contracts with suppliers, and the management of industry trained OWR personnel. AMOSC's arrangements include both Australian and International Oiled Wildlife Response Organisations as per **Table 16-3.** AMOSC will be requested to stand up an oiled wildlife response on behalf of Santos, sourcing personnel from this list. Oiled wildlife response equipment to be sourced through AMOSC is included in **Table 16-4**.

The building of OWR capacity through AMOSC is an ongoing process. Any significant changes in oiled wildlife response capacity developed through AMOSC will be captured in this OPEP through Santos' Environmental Management of Change (MOC) process.

16.5.2 OSRL/Sea alarm foundation OWR arrangements

In the event of a spill requiring a high level of OWR resourcing and/or a prolonged response, Santos can access global OWR resources through its membership with OSRL. OSRL provides OWR assistance through the availability of deployment ready OWR equipment packages and through its relationship with Sea Alarm Foundation (Belgium). Through the OSRL contract, Santos has access to 2-3 OWR specialists from Sea Alarm to provide expert response advice (built on a knowledge gained from past global oiled wildlife incidents) and coordination of resources.

Sea Alarm has developed an infrastructure by which international expert groups can be quickly mobilized in order to support an oiled wildlife response if requested. Sea Alarm keeps an overview of existing global mobile units and can assist with the mobilisation of these units.

During an actual oiled wildlife response Sea Alarm can be mobilised to help assess the situation, provide input on ways forward based on previous experience, coordinate joint stakeholder meetings or decision-making processes, and activate international assistance where appropriate.

A major benefit to Santos from this relationship is access to global expert personnel and response equipment through Sea Alarm's global network.

16.5.3 Santos OWR arrangements

In addition to OWR providers mobilised through AMOSC and OSRL/Sea Alarm Santos maintains access to the workforce marketplace during an emergency response through a Neutral Vendor contract. This arrangement provides for the rapid on-boarding of personnel from the marketplace through multiple recruitment agencies. The arrangement allows recruitment against spill response position descriptions to be managed by the Neutral Vendor, reducing the burden on Santos for managing workforce labour. Level 1 oiled wildlife responders, of which the WA OWRP indicates 90+ could be required for a Level 6+ event, could be provided through Santos' workforce hire arrangements. On the job training requirements for Level 1 responders could be provided by DBCA, AMOSC or Sea Alarm personnel. Skilled but ubiquitous roles required for manning and maintaining facilities and staging areas, such as trades, technicians and vets, could also be filled through workforce hire arrangements. The Pilbara Region OWR Plan provide contact details for local trade personnel, vets and wildlife specialists that could be employed for manning/maintenance of forward response wildlife response facilities.

16.6 Oiled wildlife response activities

Figure 16-2 shows the stages of OWR following activation of the WAOWRP. Each stage is described in detail in the WAOWRP, and will only be activated upon approval from the Incident Commander of the Control Agency IMT. Approval will be based on the incident specific conditions and circumstances and the advice received from the DBCA and Industry OWAs.

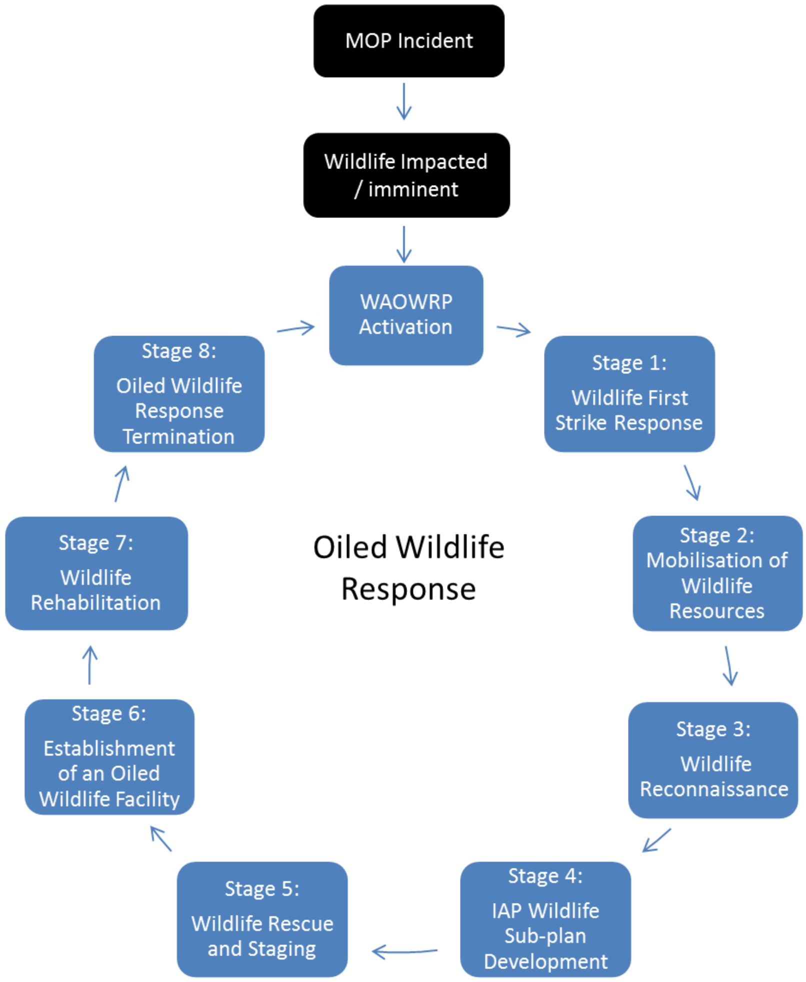

Figure 16-2: Stages of Oiled Wildlife Response

Based on the incident size, as the incident and the OWR progresses, an IAP Wildlife Sub-plan may be developed by the Wildlife Planning Officer, within the Control Agency IMT. Information gathered from operational monitoring and sensitive receptor mapping, including the Pilbara Region OWR plan will inform the development of the sub-plan. The sub-plan will include the appropriate response options for oiled wildlife, including wildlife priorities for protection from oiling; deterrence measures; and recovery and treatment of oiled wildlife (provided by Wildlife Planning Officer & Field Coordinator); resourcing of equipment and personnel.

The OWAs will then discuss recommendations with the Control Agency Incident Commander to provide final approval for the sub-plan.

16.7 Termination procedure

Once the decision has been made to terminate operations, the Control Agency Incident Commander will stand down individual participating and supporting agencies when parties agree that the incident/emergency has been satisfactorily controlled and their input is no longer required. This is likely to involve the progressive stand down of different sections of the response teams as some may need resourcing for longer than others.

In the event of a spill that impacts on wildlife, ongoing resourcing may be required, beyond the termination of clean-up operations, to complete the rehabilitation of some affected animals and to conduct monitoring programs after their release. Demobilisation of the wildlife response will be guided by parameters established by the Wildlife Coordinator at the beginning of operations and incorporated into the Incident Action Plan in consultation with the Control Agency Incident Commander.

16.8 Environmental performance

Table 16-5 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 16-5: Environmental performance – oiled wildlife response

Environmental Performance Outcome	Implement tactics in accordance with the WAOWRP to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Oiled Wildlife Response	**Response preparedness**		
	Maintenance of access to oiled wildlife response equipment and personnel	Maintenance of access to oiled wildlife response equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
			AMOSC Participating Member Contract.
			OSRL Associate Member Contract.
	Santos Oiled Wildlife Response Framework	Development of a Santos Oiled Wildlife Response Framework (to be completed by end of 2020)	Santos Oiled Wildlife Response Framework
	Labour hire contract	Maintenance of contract with labour hire provider	Contract
	Labour hire onboarding procedure (for low skilled shoreline clean-up personnel)	Development of onboarding procedure for oil spill response labour hire	Onboarding procedure
	Santos personnel trained on OWR	Additional Santos personnel trained in OWR during 2020	Training records
	Response Implementation		
	OWR managed in accordance with the WAOWRP	Prepare operational NEBA to help classify OWR level and determine if OWR activities are likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to OWR operations commencing
		IAP Wildlife Response Sub-plan developed to provide oversight and management of OWR operation	Records indicate IAP Wildlife Response Sub-plan prepared prior to OWR operations commencing

17 Waste management plan

Collection of bulk oily waste associated with the spill response will be primarily from offshore containment and recovery operations controlled by Santos or shoreline clean-up activities controlled by DoT as the relevant Control Agency/ Lead IMT. Waste management will also be required to any other response activities that generate oily water and oil-contaminated material requiring disposal (e.g. cleaning of wildlife, cleaning contaminated equipment, disposal of oiled consumables and PPE).

Waste Management Plan		
Initiation criteria	Response activities that will be generating waste have been initiated	
Jurisdictional Authority	Spill from MODU (onsite): NOPSEMA (Commonwealth) or DoT (State) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State)	
Control Agency	Spill from MODU (onsite): Santos (Commonwealth) or DoT (State Level 2/3 spills) Spill from Support Vessel: AMSA (Commonwealth) or DoT (State) NB: It is expected that Santos will be the relevant Control Agency for waste management associated with offshore containment and recovery and DoT the relevant Control Agency for shoreline clean-up waste management. Santos will act as Control Agency/Lead IMT for waste management until such time that the control is assumed by a designated Control Agency.	
Objective	Recycle waste and comply with waste treatment, transport and disposal regulations to prevent secondary contamination.	
Applicable hydrocarbons	Crude Oil	Diesel
	✔	✔
Termination criterion	All waste generated from the oil spill response has been stored, transported and disposed as per the regulatory requirements, and Agreement is reached with Jurisdictional Authorities to terminate the response	

Santos will engage its contracted Waste Service Provider (WSP) to manage all aspects of oily waste collection, transport and disposal associated with response activities under Santos' control. Santos will also engage its WSP to provide waste management for activities under the control of DoT, if requested by DoT. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to the final disposal points.

Santos will provide a Waste Support Officer to the DoT IMT Logistics Unit to support the DoT IMT Logistics Team in coordinating waste management services provided through Santos' WSP.

Santos' contracted WSP is North West Alliance (NWA). Detailed guidance on NWA's responsibilities for spill response waste management is provided within the Santos Waste Management Plan – Oil Spill Response Support (SO-91-IF-10053). This plan outlines the capability for a response commensurate to a worst-case spill across all existing and planned activities undertaken by Santos across its facilities and permit areas, including operations, drilling campaigns and project work.

17.1 Legislative requirements

State Government Legislation
Environmental Protection Act 1986
Environmental Protection Regulations 1987
Environmental Protection (Rural Landfill) Regulations 2002

Environmental Protection (Unauthorised Discharges) Regulations 2004
Environmental Protection (Controlled Waste) Regulations 2004
Pollution of Waters by Oil and Noxious Substances Act, 1987
Waste Avoidance and Resource Recovery Act 2007
Dangerous Goods Safety Act 2004 *and regulations*
Soil and Land Conservation Act 1945
Contaminated Sites Act 2003 *and regulations*
National Environmental Protection (Movement of Controlled Waste between States and Territories) Measures as Varied December 2004
Occupational Safety and Health Act 1984 *and regulations*
Road Transport Act 1985
Emergency Management Act 2005
Commonwealth Legislation
Protection of the Sea (Prevention of Pollution from Ships) Act 1983

17.2 Codes and standards

Other codes or standards that may be relevant include:

+ AS/NZS ISO 9001:2000 – Quality Management Systems – Requirements;
+ AS/NZS ISO 14001:2004 – Environmental Management Systems;
+ AS/NZS 4801:2001 – Occupational Health and Safety Management Systems;
+ AS/NZS 4306:2004 – Risk Management;
+ AS/NZS 4452:1997 – The storage and handling of toxic substances;
+ AS/NZS 5667.10:1998 – Water Quality – Sampling – Guidance on sampling of waste waters;
+ AS 3833: The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers;
+ AS 1692: Tanks for flammable and combustible liquids;
+ AS 3780:1994 The storage and handling of flammable and combustible liquids;
+ APPEA, 2008: Code of Environmental Practice;
+ DEC, 1996: Landfill Waste Classifications and Waste Definitions;
+ DEWHA, 2010: National Waste Policy: Less Waste – More Resources; and
+ DNV 2.7-1 Offshore Containers.

17.3 Regulatory approvals

DoT as the HMA, will facilitate appropriate waste management approvals that will be required for temporary storage, transport, disposal and treatment of waste, with the relevant Regulatory Authority (DWER).

17.4 Waste service provider responsibilities

Santos' WSP has the capacity to receive and deliver all waste material from oil spill response activities to predetermined disposal points.

Key capabilities include:

+ the WSP will maintain emergency response standby preparedness arrangements:
  - have access to personnel, equipment and vehicles required for a first strike and ongoing response commensurate to Santos' worse case spill and waste requirements
  - provide primary and secondary contact details for activation of spill response waste management services
  - have suitably trained personnel for completing critical tasks in spill response waste management
  - participate in exercising undertaken by Santos.
+ ability to assist in the Control Agency's IAP and Waste Management Sub-plan process as required
+ mobilise resources to waste collection points identified by the Control Agency
+ ensure waste handling, transport and disposal practices meet legislative requirements
+ keep auditable records of waste streams from collection points to final disposal points
+ provide regular progress reporting to the Control Agency IMT and a final report relating to quantities and destinations of collected waste
+ provide a project manager responsible for the rollout of spill response resources to meet spill response waste management objectives
+ provide location specific Operations Supervisor/s to handle on-site operational aspects (management of personnel and equipment, reporting, liaison with relevant field based spill responders).

17.5 Waste management services

17.5.1 Waste collection

Shoreline waste collection points, also referred to as Temporary Storage Site (TSS), will be determined by the DoT and will depend upon the location of shoreline clean-up activities and staging areas and the availability of vehicle access routes.

For offshore containment and recovery operations and clean-up of offshore islands, waste will initially be transported back to designated port locations by vessels for collection by the WSP. If required, the WSP will provide waste receptacles at collection points and arrange for transporting of waste from collection points to final disposal locations (via staging areas as appropriate). Segregation of oily waste should occur prior to collection by the WSP to reduce inefficiencies in transport and reduce potential for delays associated with classification of waste types. The WSP will arrange for sampling and analysis of collected waste for the purpose of controlled waste/ landfill site classification as required.

Controlled wastes are waste materials which are considered hazardous and are subject to controls regarding their transport, storage, treatment and disposal. Oiled waste is considered controlled waste if;

+ the oiled waste is in liquid form (e.g. emulsions, recovered oil, oily water); and

+ the oiled waste cannot be disposed of at a Class I, II or III landfill site (e.g. oiled sand and debris, oiled sorbents and waste that has been immobilised or encapsulated after treatment with solidifying or gelling compounds).

The type of transport and receptacle provide will depend upon the type and quantity of waste, regulatory requirements, haulage distance and access constraints to the collection site.

17.5.2 Waste transport

Waste material collected from shoreline staging areas or port locations by the WSP will be directed to an approved and licensed waste facility. The WSP will comply with the *Environmental Protection (Controlled Waste) Regulations 2004* in terms of transportation requirements.

The regulations are designed to ensure the safe transportation of controlled waste, by suitably licenced personnel to an approved location and to monitor and track controlled waste to prevent unauthorized discharge into the environment.

17.5.3 Waste treatment and disposal

Where possible waste will be segregated, recycled and reused. The WSP will make available licenced waste handling and transfer facilities to consolidate and recycle waste prior to transport to final disposal and treatment sites. Waste staging at Karratha is likely the most practicable option.

NWA as Santos' current WSP has a DWER licensed liquid and solids waste treatment facility in Karratha with the following capabilities:

+ liquid and hazardous waste management;
+ solid waste management including the supply of onshore and offshore receptacles;
+ solid waste recycling – MRF, shredding, baling, etc;
+ industrial services – tank cleaning, marine services, vacuum loading, asset maintenance; and
+ quarantine decontamination.

The options for waste treatment and final disposal will depend upon the type and classification of the waste. Oily water can potentially be treated (dewatered) at specialised facilities. NWA has options to treat water at Veolia Water and Western Resource Recovery.

The Santos operated Devil Creek Gas Plant has 4 x 50ML evaporation ponds designed to treat process waters and general wastewaters generated through the gas production lifecycle (**Figure 17-1**). The evaporation ponds are suitably constructed and lined for ongoing use, and in the event of exceeding the WSP's waste disposal/storage capacity could be used for temporary storage, based on regulatory approval.

Figure 17-1: Devil Creek Gas Plant, south of Karratha

Solid wastes will generally be disposed at landfill with the disposal site depending upon the classification of waste. Analysis of solid waste will be undertaken by the WSP to determine which classification the waste belongs to, as per the DEC *Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009)*. Most oiled waste will go to Class III or IV landfill. There are multiple Class III facilities in WA but currently only one Class IV facility at Red Hill Landfill, operated by the Eastern Metropolitan Regional Council.

17.6 Waste equipment requirements

Waste disposal requirements during spill response must meet the volume of waste collected as per the Shoreline Clean-up Plan (**Section 15**). For the Priority for Protection areas the Phase 1 bulk pick-up of oily waste may continue over a combined 17 week period in order to remove the theoretical waste generated from the single worst case modelled run, although pick-up schedules will begin and end at different times during this worst case spill event (refer **Section 15.5**). The combined average weekly amount of waste picked up across there Priority Protection areas has been calculated as 3,650 tonnes (combined total of 62,000 tonnes picked up over 17 weeks). This volume is considered an overestimate as it assumes all waste loaded onto shorelines could, or would be picked up. In reality it is likely that some waste would remain, either due to difficulties in accessing shorelines or poor removal efficiency. The outcome of a NEBA may also indicate that the most environmentally beneficial strategy is to leave some habitats to bio-remediate. Shoreline loading volumes also do not take into account the potential success of chemical dispersant application which has been shown, through laboratory studies and dispersant addition modelling, to potentially reduce shoreline loading (refer **Section 6.5.3**).

Santos' WSP will provide all waste storage and transportation equipment required to store and move oily waste from collection points to final destination points. **Table 17-1** provides oily waste storage and transportation equipment commensurate to the worst case spill, and resultant worst case waste generation, as outlined above.

Santos

Table 17-1: North West Alliance vehicle and equipment availability

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Indicative waste stored/shifted per week (m^3)	NWA mobilisation schedule to meet estimated capacity			
						No. Sourced locally	No. Sourced State-wide and Nationally		
Waste removal						**48 hours**	**1 week**	**2 weeks**	**1 month**
Skip Lift Truck	12	Lift up to 15 tonnes	Servicing of skip bins	7	1,260	4	3	3	2
Front Lift Trucks	10	28 m^3 Body	Servicing of front lift bins	7	1,960	4	3	2	1
Side Loading Truck	10	18 m^3 Body	Servicing of MGBs	7	1,260	1	2	4	3
Hook Lift Truck	5	70-tonne rated	Servicing of hook lift bins	7	2,450	3	2	2	N/A
Flat Bed Truck	16	15 pallet spaces	Servicing of bins	7	840	3	6	4	N/A
Waste storage						**48 hours**	**1 week**	**2 weeks**	**1 month**
MGB’	500	240 litres	Mobile bins	2	240	200	300	N/A	N/A
Offshore eight-pack Lifting Cradle (MGB)	2	16 × 240 litre MGBs	Able to remove 16 × 240 L MGBs simultaneously	continuous		0	2	N/A	N/A
Waste storage						**48 hours**	**1 week**	**2 weeks**	**1 month**
Lidded Bins	6	1,100 litres	Contain various waste streams	2	13	6	N/A	N/A	N/A
Front Lift Bins	50	3 m^3	Various waste streams	2	300	20	30	N/A	N/A
Front Lift Bins	25	4.5 m^3	Various waste streams	2	225	10	15	N/A	N/A
Offshore Rated Front Load Bins	100	3 m^3	Various waste streams	2	600	40	60	N/A	N/A
Offshore Rated Bins	45	7 m^3	Various waste streams	2	630	20	25	N/A	N/A
Marrell Skip Bins	60	6-9 m^3	Various waste streams	2	960	20	40	N/A	N/A

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Indicative waste stored/shifted per week (m^3)	NWA mobilisation schedule to meet estimated capacity			
						No. Sourced locally	No. Sourced State-wide and Nationally		
Hook Lift Bins	12	15-30 m^3	Various waste streams	25	6,900	12	N/A	N/A	N/A
Forklift	4	4 tonne	All areas	Continuous	N/A	4	N/A	N/A	N/A

17.7 Environmental performance

Table 17-2 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 17-2: Environmental performance – waste management

Environmental Performance Outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, reusing and recycling waste where possible		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement Criteria**
Waste Management	**Response preparedness**		
	Maintain access to waste management equipment, personnel, transport and disposal facilities	Maintain access to waste management equipment, personnel, transport and disposal facilities throughout activity	Contract with WSP for emergency response services
	Response Implementation		
	Implement Oil Pollution Waste Management Plan (QE-91-IF-10053)	WSP to appoint a Project Manager within 24 hours of activation	Incident Log
		Provision of liquid oil waste tanks for containment and recovery operations to deployment port, if requested, within 24 hours	Incident Log
		Provision of waste bins for oil and oily waste for shoreline clean-up operations to clean-up site or deployment port, if requested, within 24 hours	Incident Log
		WSP shall track all wastes from point of generation to final destination	Waste tracking records
		WSP to provide monthly waste management reports and more regular situation reports during the response until termination criteria are met	Waste reports

18 Scientific monitoring plan

Oil spill scientific monitoring is the principle tool for detecting and quantifying the level of environmental impact to sensitive receptors from an oil spill and the subsequent level of post-spill recovery. Santos is required to have oil spill scientific monitoring plans in place for Petroleum activities in State and Commonwealth waters.

DoT as the relevant Control Agency for State waters marine pollution may provide advice and direction in relation to scientific monitoring undertaken by Santos in consultation with the State Environmental Science Coordinator (ESC) provided through DBCA.

18.1 Objectives

The overarching objective of Santos' Scientific Monitoring Plans (SMPs) is to provide guidance to staff, consultants and contractors in developing a monitoring program for detecting impacts and recovery to environmentally sensitive receptors contacted by a spill.

Receptor-specific SMPs have different objectives as outlined in **Appendix D.**

18.2 Industry guidelines

The NOPSEMA *Information Paper: Operational and Scientific Monitoring Programs (OSMPs)* sets out general principles and practical advice to assist operators in their planning for, and application of, fit-for-purpose SMPs.

Features of these documents have provided the basis for which this SMP has been developed, with specific guidance utilised in the development of the monitoring program designs and application considerations.

18.3 Monitoring background

Scientific monitoring activities have different objectives to Operational Monitoring (refer **Section 10**) which influences the monitoring methods likely to be used, the degree of scientific rigour required to meet the monitoring objectives, and the scope of studies.

Operational monitoring (**Section 10**) is monitoring undertaken to obtain information which will provide situational awareness and assist in the planning and execution of the oil spill response. In contrast, scientific monitoring is designed to provide data for short term and longer-term environmental effects assessment. This is typically required to be quantitative in nature and appropriate for statistically analyses.

Table 18-1 provides the characteristics of each of the monitoring types.

Table 18-1: Characterisation summary of spill monitoring types

Monitoring Classification	Character or Criteria
Operational	+ Results generally required rapidly. + Lower requirement for statistical strength. + Lower requirement for the identification of control sites or to demonstrate baseline conditions. + Concentration on key habitats or species that are indicators of biological community health, are of particular 'value', or have slow recovery times. + Includes monitoring to help predict environmental effects or define the sensitivity of resources to guide spill response actions.
Scientific	+ May be longer-term studies and monitoring may extend beyond the time and location of the clean-up response. + Need for high statistical strength (e.g. potentially large number of samples or sample sites). + Need for high quality 'control' areas where practicable

18.4 Scientific monitoring plans

Owing to the diverse nature of sensitive receptors that could be contacted by an oil spill and the different techniques and skillsets required to monitor impact and recovery to these receptors, there are a number of Oil Spill SMPs that may potentially be activated for spill scenarios covered under this OPEP (**Table 18-2**).

These are detailed further in **Appendix D**; each SMP has corresponding objectives, initiation/termination criteria, methodologies, baseline data sources and analysis and reporting requirements.

Table 18-2: Scientific monitoring response programs

Study	Title
SMP1	Water Quality
SMP2	Sediment Quality
SMP3	Shorelines and Coastal Habitats – Sandy Beaches and Rocky Shores
SMP4	Shorelines and Coastal Habitats – Mangroves
SMP5	Shorelines and Coastal Habitats – Intertidal Mudflats
SMP6	Benthic Habitats
SMP7	Seabirds and Shorebirds
SMP8	Marine Megafauna
SMP9	Marine Reptiles
SMP10	Seafood Quality
SMP11	Fish, Fisheries and Aquaculture
SMP12	Whale Sharks – Ningaloo Coast

18.5 Monitoring service providers

During and post-spill scientific response monitoring activities require resources external to Santos which include specialist technical capabilities. Oil Spill Scientific Monitoring will be conducted on behalf of Santos by Monitoring Service Providers (MSPs). Astron Environmental Services Pty Ltd. (Astron) is currently Santos' primary support agency for scientific response monitoring activities.

Santos holds a contract with Astron for the provision of standby monitoring services for SMPs 1-11. For SMPs where Astron requires the technical support of additional MSPs, Astron will sub-contract as required. This is considered normal practice for MSPs given the limited ability of any single provider to provide all expertise and equipment across the multitude of marine and coastal scientific disciplines.

As per the Santos Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162), Santos' MSP provides the following scientific monitoring services to Santos:

+ 24/7 monitoring support accessed through 24 hr call out number;
+ Provision of a suitably trained Monitoring Coordination Team including a Monitoring Coordinator, Monitoring Operations Officer, Planning and Logistics Officer and Safety Officer;
+ Provision of Technical Advisors and Field Teams (staff and contractors) for first strike deployments;
+ Maintenance of standby monitoring equipment;
+ Monthly personnel capability reports;
+ Provision and review of Scientific Monitoring Sub-plans;
+ Provision and review of Santos' MSP (EA-00-RI-10162) and associated response activation forms; and
+ Participation in drills and exercise.

Astron's current capability for provision of resources to implement SMPs is provided in **Appendix F**. The latest capability statement is saved within the IMT Environment Team Lead's functional folder.

18.6 Activation

In the event that one or more SMPs are activated, as per the initiation criteria for each, the Activation Process outlined in **Appendix D** will be followed, including the completion of an Activation Form.

The Santos IMT Environment Team Leader (ETL) with support from IMT Environment Team members is responsible for activating Astron as the primary MSP. The Santos Environment Team will assist the Astron Monitoring Coordination Team and relevant Technical Advisors in defining the monitoring study design, monitoring locations and field methodologies based on Operational Monitoring information (e.g. spill modelling and aerial surveillance information), relative location of sensitive receptors to the spill and the timing of the spill with respect to seasonality of sensitive receptors.

This process will identify monitoring operational objectives and resourcing/ mobilisation requirements which the ETL will feed back to the IMT for approval. Mobilisation times for the minimum resources that are required to commence initial scientific monitoring operations are listed in **Table 18-3**.

In the event that a designated Control Agency takes command of scientific monitoring, Santos will follow the direction of the Control Agency providing planning and resourcing support through its MSPs as required.

Table 18-3: Scientific monitoring – first strike response timeline

Task	Time from activation of SMP
Santos IMT approve initial monitoring plan	<24 hours
Santos to mobilise sampling platforms to deployment location	<96 hours (72 hours from monitoring plan approval)
SMP teams and monitoring equipment mobilised to deployment locations	<96 hours (72 hours from monitoring plan approval)
Minimum Resource Requirements	
Initial resourcing requirements will be dependent upon the number of SMPs activated and the requirement for post spill baseline data to be collected. First strike personnel requirements for scientific monitoring field teams at Protection Priority areas are presented in **Section 6.4.3** + Suitable vessels for on-water monitoring or transfer of personnel to remotes areas/islands + Vehicle/s as required + Helicopter for aerial surveys as required + Scientific monitoring personnel for first strike teams (refer **Appendix F**) + Scientific monitoring equipment as detailed in the relevant SMP	

18.7 Environmental performance

Table 18-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 18-4: Environmental performance – scientific monitoring

Environmental Performance Outcome	Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement criteria**
Scientific Monitoring	**Response preparedness**		
	Maintenance of Monitoring Service Provider contract for scientific monitoring services	Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity	Contract with monitoring service provider
	Capability reports from Monitoring Service Provider	Obtain monthly capability reports from Monitoring Service Provider	Capability reports
	Conduct periodical review of existing baseline data sources across the Santos combined EMBA	Regular review of baseline data	Baseline data review report
	Water quality monitoring vessels	Maintenance of vessel specification for water quality monitoring vessels	Vessel specification

Environmental Performance Outcome	Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill		
Response Strategy	**Control Measures**	**Performance Standards**	**Measurement criteria**
	Oil and water quality monitoring equipment	Oil and water quality monitoring located at Exmouth, Dampier and Varanus Island	Evidence of deployment to site
	Response implementation		
	Activate Scientific Monitoring Plans	Initiation criteria of SMPs will be reviewed during the preparation of the initial IAP and subsequent IAPs; and if any criteria are met, relevant SMPs will be activated	Incident Action Plan and Incident Log
		If any SMPs are activated, the subsequent activation of MSP is to follow the process outlined in Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Incident Log
		MSP shall commence activation process within 30 mins of initial notification form being received from Santos	Monitoring Service Provider records
		Santos personnel to support MSP through the provision of operational monitoring information and relative location of sensitive receptors to the spill	Incident Log and Monitoring Service Provider records
	Mobilisation of minimum requirements for initial scientific monitoring operations	Minimum requirements mobilised in accordance with Section 18.6	Incident log

19 Forward operations plan

The IMT operate from Perth within the Santos IMT room. These rooms are equipped and subject to reviews and updates as detailed in the Santos Incident Command and Management Manual (SO-00-ZF-00025).

To facilitate a streamlined response, forward operational bases are required close to the response operational areas equipped with near duplicated IMT equipment and personnel.

19.1 Forward operating base

The IMT will be supported by a local Forward Operating Base/s (FOB), also referred to as On-scene Command Centre/s (OCC). For a Commonwealth waters response, Santos will establish a FOB. For a State waters response the DoT will establish a FOB. For cross-jurisdictional spills there will be two FOBs working in collaboration. The FOB will be responsible for the coordination of resources, material, equipment and localised activities as directed by the relevant IMT.

Arrangements are in place for Santos to request the use of the Harold E Holt (HEH) Military Base for a local FOB through the HEH Facilities Manager. Activation of the Harold E Holt facility is done in accordance to the process outlined in Emergency Response Harold E Holt Access Procedure (SO-91-IF-20016).

To supplement the HEH facility, arrangements are in place for Santos to request the use of the Exmouth SES Incident Command Centre for a local FOB through the Exmouth Shire CEO. Refer to the Santos Oil Spill Coordinator to action this task.

The IMT will develop a communication strategy to support the FOB/s and forward operating centres.

19.2 Forward staging areas

Forward Staging Areas for shoreline operations will be set up at locations dictated by the shoreline impacts, as established by DoT as the relevant Control Agency.

19.3 Transport

Transportation on shoreline locations will be supported by 4x4 vehicles and all-terrain vehicles. These can be supplied by locally and nationally through hire/purchase 3rd parties and can be supplied internationally through the OSRL spill response capability.

19.4 Security

To ensure that the forward staging areas are secure, Santos can provide temporary fencing to contain facilities/equipment during the clean-up. Suppliers of temporary fencing are available in Karratha and Exmouth, or larger quantities may need to be sourced from Perth. If required, the specialist services of security providers will be engaged.

19.5 Messing

Messing and catering facilities will be provided through one of Santos' current service providers, under local arrangements as determined by capacity and facilities geographically available.

19.6 Freight movement

The transportation of all equipment and service out of Denham, Carnarvon, Exmouth, Onslow, Karratha, Dampier, Port Headland, Broome, Perth or other locations, as required, will be through Santos' third-party logistics providers.

19.7 Accommodation

Accommodation options for field responders and FOB personnel will be dictated by proximity to their respective activity areas, to ensure maximum utilisation of the shift time available.

Mainland accommodation is available at Dampier/ Karratha, Onslow and Exmouth. Santos' Devil Creek accommodation close to Karratha may also be used.

Where possible local facilities will be utilised to accommodate response personnel, however transportable accommodation and messing facilities can be supplied through contract suppliers if required.

Santos has access to transportable accommodation and messing facilities supplied through Sodexo and its subcontractors.

Transportation to respective work sites would be facilitated via modal and multimodal transport solutions, dictated by the geographical constraints of each site. Under current contractual arrangements, Santos has access to transportation providers for Land, Air and Marine operations. In general, from accommodation locations to operational areas transport would be via road using the services of Santos' third-party supplier. Should additional services be required to meet the demand, this would be engaged under a Service Agreement as determined and authorised by the IMT.

19.8 Personal Protective Equipment

Santos would utilise the services of specialist providers of PPE for clean-up operations. All PPE would be sourced in Perth and transported by one of Santos' third-party logistics providers to the forward operating centres.

In the event of a spill incident Santos would engage the services of a third party to provide and maintain PPE inventory for the duration of oil spill operations.

The disposal of contaminated PPE is provided by Santos' WSP.

PPE requirements for spill responders is detailed in the Santos Oil Spill Response HSE Management Manual (SO-91-RF-10016).

19.9 Radio communications

Santos has access to two communication systems in the Exmouth area: (1) utilisation of the Woodside mobile communication repeater stations under mutual aid arrangements, and (2) utilisation of specialist communications providers to hire hand-held and vehicle mounted UHF radios to support response and clean-up personnel.

Portable deployed repeater stations (battery or mains powered) can be positioned along the shoreline to provide a 'voting' system for transmitting and receiving during the clean-up operation. Communication equipment will be supplied through local, national, and international suppliers as per the operational situation.

20 Spill response termination

The decision to terminate the spill response is made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role (e.g., DBCA). This decision will be made with consideration of:

+ the efficacy and benefit of current response options;
+ any potential for additional pollution;
+ any potential for additional environmental damage caused by further clean-up efforts; and
+ an assessment of prevailing weather conditions that can increase risk to response teams or increase the efficacy in weathering hydrocarbon.

A NEBA will be conducted to inform the decision making process. Termination criteria are defined within each section of contingency response activities defined within the OPEP.

Upon conclusion of the spill response activity, Santos will:

+ prepare detailed reports and collate all documents;
+ report on the performance objectives of each individual spill response that was mobilised;
+ undertake an inventory of consumables and prepare accounts;
+ arrange for the return of equipment;
+ arrange for the refurbishment of consumed equipment;
+ conduct an investigation into the cause of the incident and report to relevant authorities; and
+ assess long-term environmental monitoring requirements.

21 Oil Pollution Emergency Plan administration

21.1 Oil Pollution Emergency Plan custodian

The custodian of the OPEP is Santos Senior Adviser – Oil Spill Response based in the Santos Perth Office.

21.2 Oil Pollution Emergency Plan review

In line with regulatory requirements, this document shall be reviewed, updated and submitted to NOPSEMA within every 5 years from date of acceptance.

The document may be reviewed and updated more frequently, if required, in accordance with the Santos Management of Change Procedure (EA-91-IQ-10001). This could include changes required in response to one or more of the following:

+ when major changes (e.g. new service providers) have occurred which may affect the Oil Spill Response coordination or capabilities;
+ changes to the EP that affect Oil Spill Response coordination or capabilities (e.g. a significant increase in spill risk);
+ following routine testing of the OPEP; and
+ after an actual incident.

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

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RPS APASA (2015c) Van Gogh Field – Oil Spill Modelling Interrogation: Dispersant Application - Scenario 1 – Surface Blowout. J0362. Prepared by RPS APASA for Santos, 4 September 2015.

RPS APASA (2015d) Van Gogh Field – Oil Spill Modelling Interrogation: Dispersant Application - Scenario 2 – Subsea Blowout. J0362. Prepared by RPS APASA for Santos, 29 September 2015.

RPS Group (2020) Santos Van Gogh Phase 2 QSRA Final Report MAW0957.000 1 . Prepared for Santos by RPS Group, 8 October 2020

Appendix A: Oil Assay Reports

Oil Assay Reports:

Marine diesel

In the marine environment diesel will behave as follows:

+ Diesel will spread rapidly in the direction of the prevailing wind and waves;
+ In calm conditions evaporation is the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
+ As wind increases, and breaking waves form, entrainment of diesel below the surface increases;
+ The evaporation rate of diesel will increase in warmer air and sea temperatures; and
+ Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

ITOPF (2011) and Australian Maritime Oil Spill Centre-AMOSC (2011) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering.

Table A1: Characteristics of diesel

Hydrocarbon	Initial density (kg/m^3)	Viscosity (cP) @ 25°C	Component	Volatiles (%)	Semi-volatiles (%)	Low volatility (%)	Residual (%)
			Boiling Points (°C)	<180	180–265	265–380	>380
Diesel	836.8	4.0	% of total	6	34.6	54.4	<5

Source: APASA (2013a)

Hydraulic oils

These are medium oils of light to moderate viscosity and behave similarly to marine diesel when spilt to the marine environment. They have a relatively rapid spreading rate and dissipate quickly in ocean conditions. Similar to diesel, hydraulic oil residue will have a tendency to sit on the surface during calm conditions and will entrain during variable winds between 4-19 knots; returning to the surface when conditions become calm. After several days up to 40% could be expected to evaporate and 15% decay (APASA 2013a).

Lubricating fluid

Lubricating oils vary widely but in general are comprised primarily of long-carbon chain, persistent, hydrocarbons (APASA 2013b). These are reasonably viscous and so the spreading rate of a slick of these oils would be slow. These will not readily move into the water column, therefore are likely to remain on the water's surface during calm to windy conditions. In the marine environment, approximately 90% residual of the total quantity of lubricating oil spilt is likely to remain after weathering (i.e. < 6% due to evaporation and < 8% due decay after several days). Lubricating oils also readily combine with sea-water to form a water-in-oil emulsion, taking up as much as 70% by volume as water (APASA 2013b).

Oily water

Oily water can be mixture of any hydrocarbon used or stored on the vessel mixed with stormwater, ocean water, or process water. The concentrations of oil in the water are usually quite low; thereby the volumes of hydrocarbons released in a spill event are quite low and tend to dissipate quickly.

Sample ID	2007-FED-032020		1	Fractions						
Crude ID	THEO 3 CRUDE OIL			2	3	4	5	6	7	8
Client ID	APACHE ENERGY LTD		Whole	IBP - 230°C	IBP - 260°C	230 - 360°C	260 - 360°C	360 - 540°C	360+°C	540+°C
Date	12 September 2007									
Test	Method	Unit								
Mass Yield	D2892 / D5236			1.29	5.15	31.62	27.76	45.66	67.09	21.43
Volume Yield				1.40	5.53	33.04	28.92	45.21	65.55	20.34
Density @15°C	D5002/D4052	kg/L	0.9541	0.8770	0.8896	0.9132	0.9159	0.9639	0.9764	1.0050
Specific Gravity @60/60°F		-	0.9547	0.8775	0.8901	0.9137	0.9164	0.9645	0.9770	1.0056
API Gravity		API	16.7	29.8	27.5	23.4	22.9	15.2	13.3	9.2
Aniline Point	D611	°C		53.80	57.60	60.90	61.40	63.90	69.70	
Aniline Gravity Product	Calc	-		3839	3731	3314	3264	2235	2094	
Arsenic	ICPMS	wt ppb	42							
Ash	D482	%mass	0.040						0.014	
Asphaltene	IP143	%mass	<0.5						<0.5	
Carbon Content	D5291	%mass	86.77							
Hydrogen Content	D5291	%mass	11.86							
Carbon Residue - Micro	D4530	%mass	2.3						3.5	
Cetane Index	D976	-				36.5	36.6			
Characterisation Factor	UOP375	-	11.2	11.1	11.1	11.1	11.1	11.4	11.4	11.5
Cloud Point	D2500	°C				NA	NA			
Colour - ASTM	D1500	-				L0.5	L0.5			
Copper Corrosion	D130	-		1a	1a	1a	1a			
FIA - Aromatics	D1319	%volume		2.2	3.9					
Flash Point - Abel	IP170	°C	NA1	69.0	88.0					
Freeze Point	D5972	°C		<-60	<-60					
Heat of Combustion - Gross	D4868	MJ/kg	43.55	45.13	44.94	44.54	44.49		43.36	
Heat of Combustion - Nett	D4868	MJ/kg	41.11	42.42	42.27	41.94	41.90		40.97	
Kinematic Viscosity @-20°C	D445	cSt		NA2	NA2					
Kinematic Viscosity @20°C	D445	cSt	787.7	3.537	4.824					
Kinematic Viscosity @40°C	D445	cSt	155.2	1.550	2.285	8.479	9.873			
Kinematic Viscosity @70°C	D445	cSt				3.698	4.162	47.83	185.8	
Kinematic Viscosity @100°C	D445	cSt						14.25	40.52	964.4
Mercury Content	UOP938	wt ppb	1							
Metal - Calcium	ICPES	mg/kg	6							
Metal - Potassium	ICPES	mg/kg	73							
Metal - Nickel	ICPES	mg/kg	1						2	8
Metal - Sodium	ICPES	mg/kg	92						21	74
Metal - Vanadium	ICPES	mg/kg	<1						<1	<1
Nitrogen - Basic	UOP 269	wt ppm	700					599	991	
Nitrogen - Total	D4629	mg/kg	1954	<1	1	50	57	1674	2796	5385
Pour Point - Upper	D5853	°C	-18							
Pour Point	D97	°C				-51	-48	-6	12	45
Reid Vapour Pressure	D323	psi	<0.05							
Salt Content as NaCl	D3230	PTB	>150							
Sediment by Extraction	D473	%mass	0.43							
Smoke Point	D1322	mm		15.5	15.0					
Sulphur - Mercaptan	UOP163/D3227	wt ppm	440	80	121	488	517			
Sulphur - Total	D4294	%mass	0.369	0.0620	0.0604	0.126	0.138	0.326	0.473	0.716
Total Acid Number	D3242/D974	mg KOH/g		0.055	0.037	0.28	0.35			
Total Acid Number	D664	mg KOH/g	1.57					2.19	1.98	
Water by Distillation	D4006	%volume	0.300							
Wax Content	UOP46	%volume	<5							

Note:
NA - Sample solidified without showing any signs of Cloud
NA1 - Flame off during test, unable to determine actual Flash.
NA2 - Flow time exceeds maximum limit of test method.

Appendix B: IMT Resourcing

IMT Resourcing:

Santos manages its IMT capability through a range of arrangements including internal Santos personnel and external support available through agreements with AMOSC, Industry Core Group and OSRL. The resourcing planning for Santos IMT and DoT IMT support as identified in **Table 5-2** and **Table 5-5** is given in the Tables below. The support roles for DoT IMT for which the responsibilities match various Santos IMT roles are listed together.

Table B1: IMT Roles and Resources Identified

#	Roles	Santos	AMOSC	Industry Core Group	OSRL	Total
1	EVPO	1	-	-	-	1
2	Incident Commander / DoT Deputy IC	8	-	-	-	8
3	Planning Team Leader /DoT Deputy Planning Officer	6	1	1	-	8
4	Operations Team Leader/DoT Deputy Operations Officer	9	-	-	-	9
5	Public Information/DoT Deputy Public Information Officer	4	-	-	-	4
6	Logistics Team Leader/DoT Deputy Logistics Officer	7	1	-	-	8
7	Supply Team Leader/ DoT Deputy Waste Management Coordinator	10	-	-	-	10
8	Environmental leader /DoT Environment Support Officer	7	-	-	1	8
9	HR/Welfare Team Leader	7	-	-	-	7
10	Safety Team Leader	6	-	-	-	6
11	IMT Data Manager	8	-	-	-	8
12	GIS/ DoT Deputy Intelligence Officer	4	-	1	1	6
13	Finance/DoT Deputy Finance Officer	5	-	-	-	5
14	Drilling/Source Control	4	-	-	-	4
15	Spill Response	2	1	1	1	5
16	Air Operations	1	1	-	-	2
17	Situation/Log Keeper	6	-	-	-	6
18	Information Systems (IS)	2	-	-	-	2
19	Subject Matter Expert - Level 3/ DoT CMT Liaison Officer	5	-	-	-	5
20	DoT Deputy Division Commander	-	1	1	1	3

Table B2: IMT Resourcing

#	Roles		Incident Response Timeline																						
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20	Wk 21	Wk 22	Wk 23
	Santos IMT																								
1	**EVPO**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	**Incident Commander**	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[a]	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3	**Planning Team Leader**	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[b]	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4	**Operations Team Leader**	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[c]	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
5	**Public Information**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[d]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
6	**Logistics Team Leader**	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[e]	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	**Supply Team Leader**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[f]	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
8	**Environmental Team Leader**	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[g]	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

#	Roles		Incident Response Timeline																						
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20	Wk 21	Wk 22	Wk 23
9	HR/Welfare Team Leader	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
10	Safety Team Leader	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11	IMT Data Manager	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
12	GIS	R	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0
		A[i]	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
13	Finance	R	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
		A[k]	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
14	Drilling/Source Control	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0
		A	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
15	Spill Response	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A[l]	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	Air Operations	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
		A	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Situation/Log Keeper	R	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
		A	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
18		R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

#	Roles	Incident Response Timeline																							
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20	Wk 21	Wk 22	Wk 23
	Information Systems (IS)	A	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	**Subject Matter Expert**	As required[m]																							
	Support to DoT IMT																								
1	**CMT Liaison Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2	**Deputy Incident Controller**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[a]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	**Deputy Intelligence Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[i, j]	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	**Deputy Planning Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[b]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	**Environment Support Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[g, h]	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	**Deputy Public Information Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A[d]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7		R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

#	Roles		Incident Response Timeline																						
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20	Wk 21	Wk 22	Wk 23
	Deputy Logistics Officer	A^e	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	**Deputy Waste Management Co-Ordinator**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A^f	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	**Deputy Finance Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A^k	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	**Deputy Operations Officer**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A^c	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	**Deputy Division Commander (FOB)**	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		A^n	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Legend:

R = Required number of resources

A = Available number of resources

= Available number of resources exceed required number of resources

= Available number of resources meet the required number of resources

Basis for the resourcing strategy:

#	Roles	Incident Response Timeline																						
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20	Wk 21	Wk 22	Wk 23

- The WCD Response timeline is estimated to be 23 weeks; This is estimated based on the timeline for relief well drilling (11 weeks) and shoreline clean-up activities (with Outer Shark bay Coast estimated to have the longest shoreline clean-up time of 21 weeks). Response termination and demobilization will follow a phased approach and additional two weeks is added to account for the final response termination and demobilization phase once the shoreline clean-up activities for Outer Shark Bay Coast is completed. Peak resourcing requirements for IMT is anticipated between week 3 to week 11 and thereafter to gradually decline until the response is terminated
- IMT resourcing comprises of Santos personnel and other competent IMT personnel available through agreements with AMOSC, Industry Core Group and OSRL
- Santos's Associate Membership agreement with OSRL gives access to 18 personnel for IMT and field response roles.
- Santos's Master Services Contract with AMOSC gives access to84 trained personnel through industry core group; An avg of 41 personnel plus 16 AMOSC staff members available as of 5th May 2021.

Notes:

a: Out of the 8 Incident Commander/Deputy DoT IC available, 6 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

b: Out of the 8 Planning Team Leader /DoT Deputy Planning Officer available, 6 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

c: Out of the 9 Operations Team Leader/DoT Deputy Operations Officer available, 7 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

d: Out of the 4 Public Information/DoT Deputy Public Information Officer available, 3 are allocated to Santos IMT and 1 is allocated to provide support to DoT IMT

e: Out of the 8 Logistics Team Leader/DoT Deputy Logistics Officer available, 6 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

f: Out of the 10 Supply Team Leader/ DoT Deputy Waste Management Coordinator available, 8 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

g: Out of the 8 Environmental leader /DoT Environment Support Officer available, 6 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

h: One of the resources for Environmental leader /DoT Environment Support Officer is from OSRL and a lead time of ~2 weeks for availability is estimated for this resource

i: Out of the 6 GIS/ DoT Deputy Intelligence Officer available, 6 are allocated to Santos IMT and 2 are allocated to provide support to DoT IMT

j: One of the resources for GIS/ DoT Deputy Intelligence Officer is from OSRL and a lead time of ~2 weeks for availability is estimated for this resource

k: Out of the 5 Finance/DoT Deputy Finance Officer available, 4 are allocated to Santos IMT and 1 is allocated to provide support to DoT IMT

l: One of the resources for Spill Response is from OSRL and a lead time of ~2 weeks for availability is estimated for this resource

m: Santos IMT has access to several SMEs (Security, Legal, Shipping, LNG, Pipeline) who will be available based on the incident requirements

n: One of the resources for Deputy Division Commander is from OSRL and a lead time of ~2 weeks for availability is estimated for this resource

Appendix C: Testing Arrangements Plan

Testing Arrangements Plan:

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
1.	**Source Control Options**				
	Relief Well Drilling - Access to MODU	MODU Register review	Once per month for the duration of drilling campaign	Identify suitable MODU that can be utilized in the event of a Source control incident requiring a relief well	Document the identified suitable MODU by: + Name + MODU Type + Location + Contract Status
	Well Capping - Access to Capping Stack	Contract/Plan Review	Annually (when drilling activity is occurring)	To confirm access to capping stack for well capping	Review to confirm access to Capping Stack through maintenance of service provision contract
	Access to Source Control Emergency Response Personnel	Desktop Exercise	Annually (when drilling activity is occurring)	To check arrangements for access to Well Control Specialists from WWC as per Source Control Planning and Response Guideline DR-00-OZ-20001	Confirmation (email) from WWC that listed Well Control specialists can be made available and will be mobilized within 72 hours of a notification
	Vessel Fuel Tank Rupture - SOPEP	Contract/Plan Review	Prior to vessel arrival in field	To confirm that each vessel within the field has an approved SOPEP in place	Review to confirm approved SOPEP in place for vessels
2.	**Monitor & Evaluate Options**				
	Vessel Surveillance a) Access to vessels	Contract/Plan Review	Annually	To confirm access to vessels for surveillance	Review to confirm Master Service Agreements (MSAs) with vessel providers to gain access to vessels
	Aerial Surveillance a) Access to aircrafts	Contract/Plan Review	Annually	To confirm access to aircrafts for surveillance	Review to confirm Master Service Agreements (MSAs)

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
					with aircraft providers to gain access to aircrafts for surveillance
	Aerial Surveillance b) Access to trained aerial observers	Contract/Plan Review	Annually	To confirm access to trained aerial observers	Review to confirm access to trained aerial observers through: + Trained Santos personnel or + AMOSC Member Contract or + OSRL Associate Member Contract
	Unmanned Aerial Vehicles (UAV) a) Access to UAV providers	Contract/Plan Review	Annually	To confirm access to UAV providers	Review to confirm access to UAV providers through: + AMOSC Member Contract or + OSRL Associate Member Contract
	Tracking Buoys a) Access to Tracking Buoys	Contract/Plan Review	Prior to activity commencement	To confirm access to tracking buoys	Review to confirm access to 12 Tracking Buoys
	Tracking Buoys b) Response readiness	Communication/Tracking software Test	6-monthly	To confirm response readiness for Tracking buoys	Tracking Buoys pass functional test as per operational instructions
	Oil Spill Modelling a) Access to oil spill modelling service provider	Contract/Plan Review	Prior to activity commencement	To confirm access to emergency response oil spill modelling services	Review to confirm access to emergency oil spill modelling services through maintenance of service provision contract

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	Satellite Imagery a) Access to Satellite Imagery service provider	Contract/Plan Review	Prior to activity commencement	To confirm access to satellite imagery services	Review to confirm access to satellite imagery services through: + AMOSC Member Contract or + OSRL Associate Member Contract
	Operational Water Quality Monitoring a) Access to monitoring service provider	Contract/Plan Review	Prior to activity commencement	To confirm access to operational water quality monitoring services	Review to confirm access to operational water quality monitoring services through maintenance of service provision contract
	Operational Water Quality Monitoring b) Access to fluorometry equipment	Contract/Plan Review	Prior to activity commencement	To confirm access to fluorometry equipment for water quality monitoring	Review to confirm access to fluorometry equipment through: + Maintenance of service provision contract with monitoring service provider + OSRL Associate Member contract
	Operational Water Quality Monitoring d) Access to Dispersant Efficacy Field Test Kit	Equipment Check	Annually	To confirm access to Dispersant Efficacy Field Test Kit	Review to confirm access to Dispersant Efficacy Field Test Kit
	Operational Water Quality Monitoring	Equipment Check	Annually	To confirm access to Oil Sampling Kit	Review to confirm access to Oil Sampling Kit

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	e) Access to Oil Sampling Kit				
	Shoreline Clean-up Assessment a) Access to trained Shoreline Cleanup and Assessment Technique (SCAT) personnel	Contract/Plan Review	Prior to activity commencement	To confirm access to trained SCAT personnel	Review to confirm access to trained SCAT personnel through: + AMOSC Member Contract + OSRL Associate Member Contract
		Desktop Exercise	Annually	To confirm access to a range of Monitor & Evaluate options to ensure situational awareness for IMT	Access to vessel and aerial platforms for surveillance confirmed Availability of trained aerial observers from day 2 confirmed through internal or external resources Spill modelling delivered to IMT within 2 hrs of request to service provider Availability of Tracking Buoy for deployment confirmed by onsite team Satellite imagery acquisition and timelines confirmed by the service provider upon notification Access to water quality monitoring services confirmed by service provider upon notification

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
					Availability of Dispersant Efficacy Field Test Kit confirmed by on-site team Access to SCAT trained personnel confirmed through AMOSC or OSRL contract
3.	**Containment & Recovery**				
	a) Access to offshore containment Booms	Contract/Plan Review	Annually	To confirm access to offshore containment booms	Review to confirm access to offshore containment booms through the following: + AMOSC Member Contract + OSRL Associate Member Contract
	b) Access to offshore recovery devices	Contract/Plan Review	Annually	To confirm access to offshore recovery devices	Review to confirm access to offshore recovery devices through the following: + AMOSC Member Contract + OSRL Associate Member Contract
	c) Access to vessels	Contract/Plan Review	Annually	To confirm access to vessels for containment and recovery operations	Review to confirm Master Service Agreements (MSAs) with vessel providers to gain access to vessels for containment and recovery operations

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	d) Access to trained responders	Contract/Plan Review	Annually	To confirm access to trained responders	Review to confirm access to trained responders through the following: + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA
		Desktop Exercise	Annually	To test activation procedure to access containment and recovery equipment and trained responders from external arrangements and service providers To confirm access to containment recovery equipment and trained responders from external arrangements and service providers	Emails confirming access to containment and recovery equipment and trained responders through external arrangements and service providers
4.	Dispersant Application				
	a) Access to Dispersants	Contract/Plan Review	Annually	To confirm access to dispersants	Review to confirm access to dispersants through the following: + AMOSC Member Contract + OSRL Associate Member Contract + OSRL Global Dispersant Stockpile Supplementary Agreement + AMSA National Plan

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	b) Access to Dispersant Vessel Spray System	Contract/Plan Review	Annually	To confirm access to Dispersant vessel spray systems	Review to confirm access to vessel spray systems through: + Santos' equipment + AMOSC Member Contract + OSRL Associate Member Contract
	c) Access to Aerial Dispersant Application System	Contract/Plan Review	Annually	To confirm access to Aerial Dispersant Application System	Review to confirm access to Aerial Dispersant Application systems through: + AMOSC FWAD Contract + OSRL Associate Member Contract
	d) Access to subsea dispersant injection equipment	Contract/Plan Review	Annually	To confirm access to Subsea Dispersant Injection equipment	Review to confirm access to subsea Dispersant Injection equipment through AMOSC SFRT participant contract
	e) Santos' Vessel Dispersant Spray System – Response Readiness	Deployment Exercise	Annually	To confirm response readiness for vessel dispersant spray system	Vessel Dispersant Spray system successfully deployed as per operational instructions
	f) Logistics arrangement for GDS dispersant stockpile mobilization for a Level 3 oil spill incident	Desktop Exercise	Annually	To confirm GDS dispersant stockpiles can be mobilized in the event of a Level 3 incident	Confirm mobilization time frames as per Dispersant Logistics Plan
		Desktop Exercise	Annually	To test activation procedure to access dispersants and application systems from external arrangements and service providers	Emails confirming access to dispersants and application systems from service

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
				To confirm access to dispersants and application systems from external arrangements and service providers	providers/external arrangements
5.	**Shoreline Deflection & Protection**				
	a) Access to shoreline deflection & protection equipment	Contract/Plan Review	Annually	To confirm access to shoreline deflection and protection equipment	Review to confirm access to shoreline deflection and protection equipment through the following: + Santos' equipment + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA
	b) Access to trained responders	Contract/Plan Review	Annually	To confirm access to trained responders	Review to confirm access to trained responders through the following: + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA
	c) Access to shallow draft vessels	Review of list of shallow draft vessel providers	Annually	To confirm access to shallow draft vessels to support shoreline deflection & protection	Review to confirm access to shallow draft vessel providers

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	d) Santos' shoreline deflection and protection equipment	Deployment Exercise	Annually	To confirm response readiness for Santos' shoreline deflection and protection equipment	Shoreline deflection and protection booms and recovery devices (disc/brush skimmers) deployed successfully as per operational instructions
		Desktop Exercise	Annually	IMT to confirm shoreline protection priorities and develop IAP shoreline deflection and protection sub-plan To test activation procedure to access shoreline deflection and protection equipment and trained responders from external arrangements and service providers To confirm access to shoreline deflection and protection equipment and personnel from external arrangements and service providers	Shoreline protection priorities established by IMT IAP shoreline deflection and protection sub-plan developed by IMT Emails confirming access to shoreline deflection and protection equipment and trained responders through external arrangements and service providers
6.	**Shoreline Clean-up**				
	a) Access to shoreline clean-up equipment	Contract/Plan Review	Annually	To confirm access to shoreline clean-up equipment	Review to confirm access to shoreline clean-up equipment through the following: + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	b) Access to trained responders	Contract/Plan Review	Annually	To confirm access to trained responders	Review to confirm access to trained responders through the following: + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA
	c) Access to labour hire	Contract/Plan Review	Annually	To confirm access to labour hire	Review to confirm access to labour hire through maintenance of contract with labour hire provider
		Desktop Exercise	Annually	To test activation procedure to access shoreline clean-up equipment and personnel from external arrangements and service providers To confirm access to shoreline clean-up equipment and personnel from external arrangements and service providers	Emails confirming access to shoreline equipment within 24 hrs of notification Confirmation of trained responders available to manage shoreline clean-up activities through external arrangements and service providers (e.g. DoT, AMOSC, AMSA National Plan, OSRL) Confirmation of labour personnel available to carry out shoreline clean-up activities.
7.	Oiled Wildlife Response				

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
	a) Access to OWR equipment	Contract/Plan Review	Annually	To confirm access to OWR equipment	Contract review to confirm access to OWR equipment through the following: + AMOSC Member Contract + OSRL Associate Member Contract + MoU for access to National Plan resources through AMSA
	b) Access to OWR personnel	Contract/Plan Review	Annually	To confirm access to OWR personnel	Contract review to confirm access to OWR personnel through the following: + AMOSC Member Contract + OSRL Associate Member Contract + Santos personnel
		Desktop Exercise	Annually	To confirm activation procedure for OWR services with external service providers To confirm access to OWR equipment from external arrangements To confirm access to OWR personnel through a combination of internal and external resources	Emails from service providers confirming OWR equipment availability. Access to OWR personnel confirmed through a combination of internal and external resources
8.	Waste Management				
	a) Access to personnel, equipment, and vehicles through Waste Service Provider	Contract/Plan Review	Annually	To confirm access to personnel, equipment, and vehicles for oil spill waste management	Contract review to confirm access to personnel, equipment,

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
					and vehicles for oil spill waste management
		Desktop Exercise	Annually	To confirm activation procedure for oil spill waste management services	Confirmation email from service provider on personnel, equipment, and vehicles for oil spill waste management within 24hrs of notification
9.	**Scientific Monitoring**				
	a) Access to specialist monitoring equipment	Contract/Plan Review	Annually	To confirm access to specialist monitoring equipment	Contract review to confirm access to specialist monitoring equipment
	b) Access to specialist monitoring personnel	Contract/Plan Review	Annually	To confirm access to specialist monitoring personnel	Contract review to confirm access to specialist monitoring personnel
		Desktop Exercise	Annually	To confirm activation procedure for scientific monitoring services To confirm access to personnel and equipment	Confirmation email from service provider (Astron) on monitoring personnel and equipment available
10.	**IMT**				
	a) Access to trained IMT personnel	Contract/Plan Review	Annually	To confirm access to trained IMT personnel	Review to confirm access to IMT personnel through the following: + AMOSC Member Contract + OSRL Associate Member Contract

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
					+ MoU for access to National Plan resources through AMSA
		Availability Test for IMT	Annually	To confirm appropriate Santos's personnel to fill the IMT roles outlined in this OPEP	Each role listed can be filled by appropriately qualified staff and reporting hierarchy understood
		Level 2/3 IMT exercise	Annually	To confirm the response capability and capacity for Santos IMT To confirm external capability and capacity arrangements for IMT	IAP is completed for the operational period and approved by the Incident Commander An operational NEBA is undertaken for the operational period of the incident by the IMT External arrangements tested and successfully integrated with IMT
11.	**Others**				
	Communications Testing a) Communications channels in place and functioning	Desktop	Required for every approved OPEP. When response arrangements have changed. Annually	To test all communication and notification processes to service providers and regulatory agencies defined within the OPEP	Notification and communication processes tested successfully for: + Service providers + Regulatory agencies + Communications Test Report completed + Corrections updated within the Santos Incident

#	Response Arrangements & Critical Components	Type of Test	Schedule	Objectives	KPIs
					Response Telephone Directory (SO-00-ZF-00025.020)

Appendix D: Scientific Monitoring Plans

12 Months
NO

1 Scientific Monitoring Principles

1.1 Monitoring Design

In the event of an oil spill the monitoring design will depend upon the nature of the spill, the availability of baseline data in relation to the spill extent and expert opinion. In order to ensure the application of robust designs and sampling approaches which have the highest likelihood of detecting an environmental impact while allowing suitable flexibility, this plan provides a set of Guiding Principles for monitoring design and sampling (**Table 1**). A structured decision making framework for allocating monitoring effort in both time and space is described in **Figure 1**.

Table 1: Guiding Principles for Oil Spill Monitoring Design and Methodologies.

Principle	Explanation	Key guiding references
Match baseline	Designs and methodologies should follow those used in appropriate baseline studies wherever possible.	N/A
Comprehensive sampling	Sampling methods should seek to sample the full range of taxa within each assemblage. This may require the use of several complimentary techniques (the exception is if indicator taxa are employed; see below).	N/A
Reliable indicator taxa	If indicator taxa are targeted then the choice of indicator should be defensible, and a link to the response of the broader assemblage demonstrated. Indicators of ecosystem function should also be considered.	Hilty and Merenlender (2000)
Appropriate sample area or volume	Size of sampling unit should be determined based on the level of clustering of individuals and whether the goal is to quantify this clustering, or establish low inter-sample variability (probably more the latter for oil spill studies).	Kenkel et al. (1989)
Reduce within sample variation over time	Wherever possible repeated measures are carried out on the same sample space in order to reduce within treatment variation.	N/A
Compositing of samples	Appropriate compositing to increase statistical power should be considered.	Carey and Keough (2002)
Account for environmental gradients and partition variations	Sources of variation are considered and compartmentalised to best reduce within treatment variation, and thereby maximise power to detect an impact. This is managed through several means:	English et al. (1997), Snedecor and Cochran (1989)

Principle	Explanation	Key guiding references
	Environmental covariates are considered in sampling design recorded and incorporated statistically. A hierarchical or stratified sampling design is used to address variation at multiple scales Design is standardized, by sampling equivalent strata (e.g., level of exposure, depth etc.).	
Assess statistical power	Where null-hypothesis tests are planned, statistical power of the design is assessed prior to execution.	Gerrodette (1987) Legg and Nagy (2006) Toft and Shea (1982)
Appropriate sampling extent	Sample the range of hydrocarbon concentration (and at least the upper end).	Skalski (1995)
Independence amongst samples	Site selection should aim for independence amongst samples and potential spatial or temporal autocorrelation should be considered.	Hurlbert (1984)
Reduce observation error	Observer bias and amongst observer variation should be considered.	Thompson and Mapstone (1997)
Appropriate spatial replication	Sites are replicated. A limitation is that there is only one spill, but control sites should be replicated and spatially Interspersed. Ideally, the design should be able to detect an impact at several possible scales.	Underwood (Underwood 1991, 1992, 1994)
Appropriate temporal replication	Sampling should account for natural temporal variation.	Underwood (Underwood 1991, 1992, 1994)

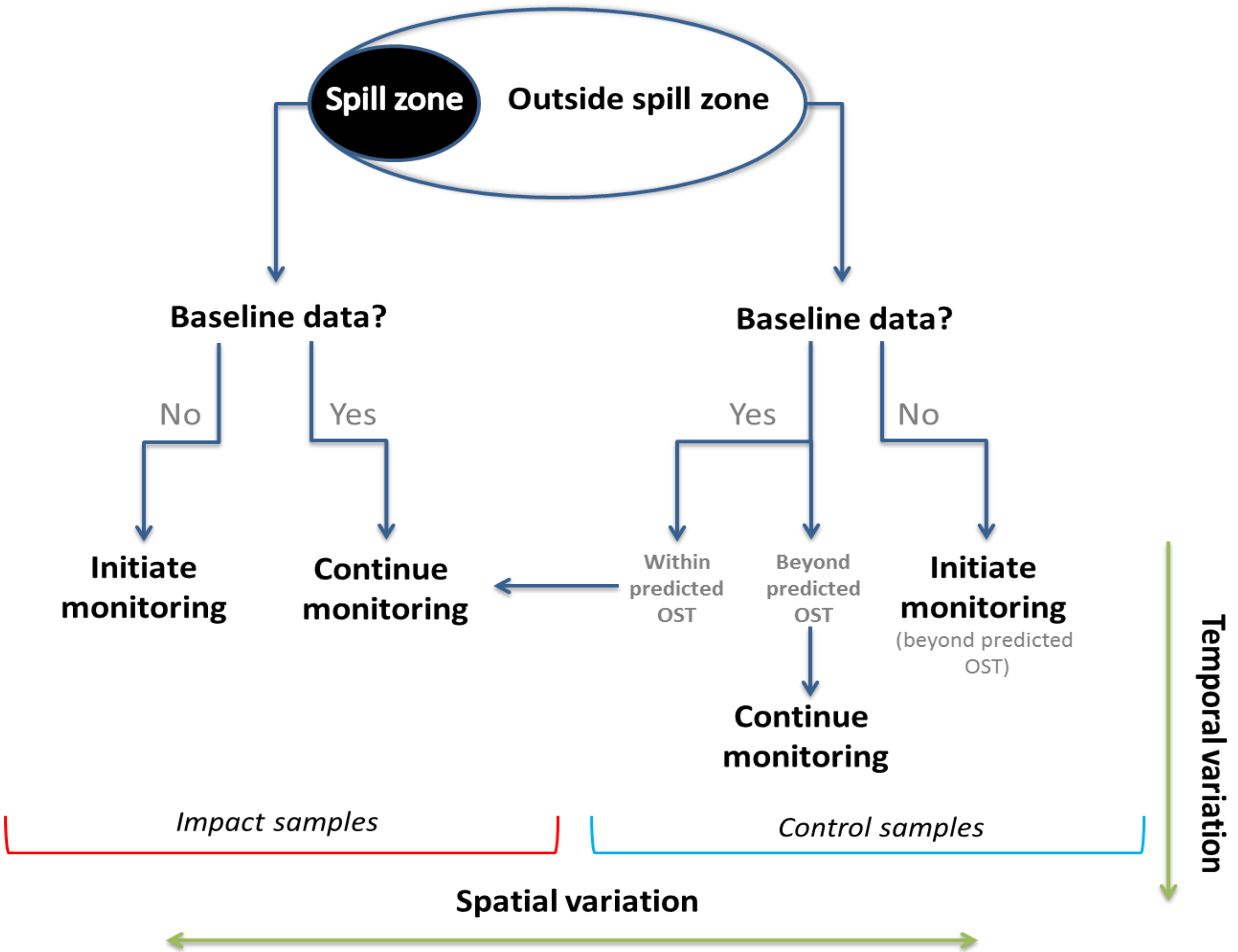

Figure 1: Structured Decision Making Process Based on Gregory et al. (2012) in Reference to Monitoring Programs, the Availability of Baseline Data, and Oil Spill Trajectory. An ideal design sampling would occur across a gradient of exposure rather than 'impact' and 'control' per se.

1.2 Data Analysis

Appendix B details the most important approaches to statistical analysis and related sampling design. These approaches are summarised in Table 2 (below). An important consideration is how this information is best summarised and communicated to guide further decision making and management. **Appendix B** also describes the reporting of environmental outcomes through the use of report card systems and includes a summary of their structure and design.

Table 2: Summary of Data Analysis Techniques.

Analysis type		Description	Strength	Limitations	Addressing limitations
Gradient analysis		Impact is quantified in terms of distance from spill.	Can be established post-spill.	Doesn't account for inherent spatial patterns present prior to spill.	Include spatial covariates in model. Incorporate a temporal component.
Control chart	Univariate	Single variable is monitored and plotted over time, and breaching of control limits tested.	Control sites are not required. Takes account of natural variation in system.	Control limits do not necessarily have biological meaning. Doesn't control for broader spatial scale temporal variation.	Include control charts for control sites which incorporate broad scale temporal variation.
	Multivariate	Multiple variables are combined, monitored and plotted over time, and breaching of control limits tested.	Ability to combine suite of data (e.g. community composition) into one variable. Sites plots not required.	Individual responses are masked. Control limits do not necessarily have biological meaning. Significant control limits challenging to define. Direction of change is undefined.	Compliment with graphical approaches to identify direction of change and individual species responses.
	Reference	Control limits are based on knowledge of biological system (e.g. minimum viable population size, toxicity).	Control limits have recognised biological meaning or consequence.	Control limits may be considered arbitrary.	Use established standards for control limits.

Analysis type	Description	Strength	Limitations	Addressing limitations
BACI	Quantifies state before and after potential impact, and also at impacted and control sites. Impact is tested by statistical interaction of terms.	Controls for natural variation, by incorporating control sites.	Limited power to detect significant impact. Requires appropriate matching of control (non-impacted) sites. Requires pre-impact data.	Increase power by increasing temporal component. Choose indicators with low natural variability.

2 Scientific Monitoring Plans by Receptor

Table 3 provides a glossary of an SMP as prepared in this report.

Table 3: Glossary of Scientific Monitoring Plans.

SMP Receptor	
Rationale	Importance of receptor, possible impact and importance of monitoring program.
Aim	Description of program aim(s)
Baseline	Refer to Error! Reference source not found., detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)
Contact	Contact is defined as occurring where any aerial, visual or florescence observation reports submitted to the Incident Command Team (ICT) show presence or likely presence of oil; or spill fate modelling predicts oil at sensitive receptors of > $1 g/m^2$ for surface oil, and >10 ppb for entrained and dissolved oil. This then activates the relevant SMP, which determines if any impact has occurred based upon applicable thresholds.
Initiation criteria	Initiation criteria, based on data from OMPs.
Termination criteria	Termination criteria based on analysis of Scientific Monitoring data translated to the Incident Management Team (IMT) through the planning function.
Receptor impact	Measured states and pressures according to the State-Pressure-Response model.
Methodological approach	Descriptions of sampling methods in order to carry out scientific monitoring, including reference to methods described in an appendix.
Scope of works	Timeline for scope of works (SoW) development.
Statistically significant	The basis of the significance is determined by the methodological approach as outlined in the relevant SMP.
Resources	List of required resources which may not necessarily be listed within a description of a particular method as described in **Appendix C**.
Implementation	Mobilisation requirements for service provider(s).
Analysis and reporting	Summary of analysis, data management and reporting.

2.1 SMP1 Marine Water Quality

SMP1 – Marine Water Quality	
Rationale	The release of hydrocarbons at sea will pollute marine waters via floating, entrained or dissolved aromatic hydrocarbons. The water quality SMP may also be used in conjunction with OMP1 (Surveillance and Monitoring), to inform the sampling design of other SMPs where objectives are to evaluate impact and recovery of sensitive receptors, in relation to hydrocarbon contamination.
Aim	To monitor changes in water quality following an oil spill and associated response activities for the purpose of detecting a potential impact and recovery and for informing other scientific monitoring studies.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). In addition, the Industry-Government Environmental Metadatabase (IGEM) (publicly available via the *Index of Marine Surveys for Assessments* (IMSA) website maintained by WA DWER) will be reviewed for applicable marine water quality baseline data. In the absence of baseline data for hydrocarbons, data from appropriate reference sites will be used in place of the baseline values.
Initiation criteria	Upon notification of a Level 2 or 3 incident -(a level 2 or 3 incident includes those which may have an adverse effect on the environment. This may be informed by operational water quality monitoring)
Termination criteria	Concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are not significantly higher than baseline data or similar non-impacted sites data. In the absence of baseline or similar non-impact sites data, concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are below the relevant hydrocarbon contaminant trigger level within the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower and values are not significantly different to reference sites. Forensic fingerprinting of the released hydrocarbon and water quality sample analysis by way of gas chromatography/mass spectrometry (GC/MS) may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impacts to specific receptors from hydrocarbons within marine waters are described in individual SMPs.
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied;

SMP1 – Marine Water Quality	
	2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied; 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design. Water profiles A water quality probe will be used to measure conductivity (to derive salinity), temperature and depth (CTD), dissolved oxygen (% and mg/L), turbidity, total dissolved solids and fluorometry along a depth profile. Sampling methods will be aligned with the recommended standard operating procedures for the use of sensors for oil spill monitoring found in Appendix F of the Oil Spill Monitoring Handbook (Hook et al. 2016). Water quality Water quality samples will be taken along a similar depth profile as the CTD measures using a Niskin bottle, Van Dorn water sampler, rosette sampler or equivalent instrument. The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sample. Water samples shall be analysed for key contaminants of concern including polycyclic aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons (including benzene, toluene, ethylbenzene, xylene), and nutrients, metals and chlorophyll-a. At each site, replicate water samples (at least three samples) will be collected to allow appropriate statistical analyses to be made including samples for quality assurance and quality control (QA/QC) purposes (i.e. split sample, triplicate sample, field blanks, transport blanks). Water sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al., 2016), specifically the following sections: + Appendix A & B hydrocarbon analysis; + Appendix C Volatile Organic Compounds Analysis; and + Appendix D Surface Oil Analysis. Environmental DNA (eDNA) will also be collected to detect for the presence of marine species in the water column. Water samples will be collected in Nalgene bottles and sent to an appropriate laboratory for analysis. Sample processing will

SMP1 – Marine Water Quality	
	depend on holding times required (<8 hours ideal) and may involve filtering and freezing of each sample (Grochowsi and Stat 2017).
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with experience in water quality sampling + Geographic Information Systems (GIS) personnel + National Association of Testing Authorities (NATA) accredited laboratories for water sample analysis + Vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Sampling equipment + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the SoW following approval by Santos (this time allows for costing, preparation of equipment and disposables and travel time to site).
Analysis and reporting	Chemical analysis will be carried out by NATA-accredited laboratories. A government endorsed laboratory for forensic fingerprinting (GS/MS) will be used. Data will be entered to spatially explicit database. Data will be analysed appropriately in order to determine if there was a statistical difference in water quality before and after a hydrocarbon impact. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.2 SMP2 Sediment Quality

SMP2 – Sediment Quality	
Rationale	Hydrocarbons released during a spill scenario may contact, settle and/or accumulate in marine sediments. Toxic substances found in accumulated hydrocarbons may lead to impacts to ecosystem processes associated with this primary producer habitat. Sediments and marine infauna will be sampled concurrently in order to establish potential correlations amongst the two parameters.
Aim	To monitor the fate and persistence of hydrocarbons in marine sediments following an oil spill and associated response activities.

SMP2 – Sediment Quality	
	To monitor marine benthic infauna assemblages as an indicator of sediment quality, in relation to an oil spill and associated response activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). In addition, the IGEM will be reviewed for applicable marine baseline sediment quality and infauna data. In the absence of baseline sediment quality data, hydrocarbon contaminant trigger values for marine sediments as listed in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) will be used as a proxy for baseline levels. Where other regulatory site-specific trigger levels exist, the lower of these levels and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) levels will be used as proxy baseline levels.
Initiation criteria	Operational Monitoring or SMP1 indicates that contacted sediment or sediment predicted to be contacted by a hydrocarbon spill as defined in Table 3. +
Termination criteria	Concentrations of hydrocarbons in marine benthic and shoreline sediments, attributable to the released hydrocarbon, are not significantly higher than baseline or similar non-impact sites. In the absence of baseline or similar non-impact sites data, concentrations are below marine sediment quality interim guideline levels within the ANZG (2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower. For infauna assemblages, abundance and species diversity/richness/composition are not significantly different from baseline (where baseline data exists) or are not statistically significantly different from comparable non-impacted benthic infauna assemblages. Forensic fingerprinting of the released hydrocarbon and sediment quality samples by way of GC/MS may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impact to sediment quality is measured through change in hydrocarbon content and concentration. Change to sediment quality is also reflected by changes to infaunal assemblages. Potential impact to infaunal assemblages are measured through change(s) in: + Taxonomic diversity + Assemblage composition + Abundance of indicator species Other pressures to these states are: + Discharge of other toxicants + Physical disturbance including dredging + Sedimentation

SMP2 – Sediment Quality	
	+ Introduction of marine pests + Shading from marine infrastructure + Climate change
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied; 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design <u>Sediment quality</u> Operational Monitoring (including spill trajectory modelling) and the results of SMP1 Marine Water Quality monitoring will be used to inform the location of potentially impacted sediment sites. Sediment monitoring sites in nearshore and shoreline locations will also consider and align where practicable, with sites selected for habitat monitoring (i.e. SMP3, 4, 5 and 6). Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design. At each site, replicate sediment samples will be taken including those for QA/QC purposes. Sediment grab (i.e. Van Veen or Box corer) or coring equipment will be selected based on water depth (offshore, inshore or shoreline) and sample size requirements. Sediment sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al. 2016), specifically the following sections according to sampling equipment utilised: + Appendix G hydrocarbon analysis (Grab samplers) + Appendix H hydrocarbon analysis (Ship borne corer) + Appendix H Manual push corer, and + Appendix O Sediment infauna.

SMP2 – Sediment Quality	
	The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sediment sample. Sediment samples shall be analysed for key contaminants of concern including metals, hydrocarbons, nutrients, particle size distribution, and nutrients. <u>Infauna samples</u> A subset of the sediment sample shall be sieved in the field (if time permits) with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of infauna to lowest taxonomic resolution possible. eDNA will also be collected to detect for the presence of marine infauna species in sediments. Sediment will be removed from the surface of a subset of the sediment sample and sent to an appropriate laboratory for analysis.
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with field experience in deep sea sediment sampling + Scientist with skills in infauna identification + GIS personnel + NATA accredited laboratory for sample contaminant analysis + Laboratory for infauna sorting and taxonomic identification + Vessel with appropriate davit/winch to deploy grab/corer equipment and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be capable of mobilising within 72 hours of the SoW having been approved by Santos. Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Sediment samples analysed by NATA-accredited laboratories for presence and concentrations of hydrocarbons associated with the spill including full suite PAHs and total organic carbon. A government endorsed laboratory for forensic fingerprinting (GC/MS) will be used. Infauna samples sorted and identified by qualified marine invertebrate specialist to acceptable taxonomic groups. Data will be entered to spatially explicit database and analysed statistically in order to detect significant differences among sites. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer

SMP2 – Sediment Quality	
	review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.3 SMP3 Sandy Beaches and Rocky Shores

SMP3 – Sandy Beaches and Rocky Shores	
Rationale	Contact of entrained oil and stranded floating oil of shoreline habitats may occur on sandy beaches and rocky shores. Rocky and sandy shores provide habitat for a variety of intertidal organisms, which in turn provide food for shorebirds. Large tides tend to create a large degree of horizontal zonation amongst taxa. Rocky and sandy shores are included within the one receptor as they are often spatially mixed and both represent high energy regions.
Aim	To monitor changes in biota of sandy and rocky shoreline habitats in relation to an oil spill and associated activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). In addition, the IGEM shall be reviewed for applicable rocky shoreline and sandy beach biota baseline data. Minimal baseline data currently exists for rocky shorelines and sandy beaches.
Initiation criteria	Operational monitoring, SMP1 or SMP2 indicates that rocky and/or sandy shorelines are contacted or predicted to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Shoreline assemblage structure, and hydrocarbon concentration levels in representative invertebrate species, are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated AND Shoreline clean-up at the site has been completed.
Receptor impact	Impact to shoreline invertebrates from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter/waste + Introduction of marine pests + Over-collection

SMP3 – Sandy Beaches and Rocky Shores	
	+ Nutrification + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied. Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority where no baseline data exists. If this opportunity is not available, a gradient approach to monitoring will be applied. Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Rocky shoreline intertidal assemblages (fauna and flora) will be monitored using a quadrat/transect approach, with the positioning of quadrats/transects accounting for any natural variation in assemblage structure along a seaward-landward gradient. Assemblage structure to be recorded through in-situ counts of fauna and flora or still images taken for further analysis. Sandy shoreline infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists, the methodology will be adapted to available data so that results are comparable. Samples to be sieved with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists. Biomonitoring of hydrocarbon concentrations in shoreline invertebrates will occur through collection of replicated tissue samples from representative, and preferably widely available species, across impact and non-impacted locations. The laboratory(ies) will supply and inform the appropriate method for collection, storage and holding times of tissue samples for required laboratory analysis and to avoid cross-contamination among samples. Where limitations in the distribution and abundance of representative invertebrate species preclude collection of sufficient samples for analysis, in-situ biomonitoring using a locally available species (e.g. the use of caged oysters) shall be considered for assessing spatial and temporal changes in bioaccumulation of hydrocarbon concentrations in invertebrates across impact and reference sites.
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in shoreline macroinvertebrates sampling + Supporting Scientist

SMP3 – Sandy Beaches and Rocky Shores	
	+ GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Laboratory facilities for sorting and taxonomic identification of specimens
Implementation	With the aim of collecting post-spill pre-impact data, service provider able to mobilise within 72 hours of the SoW having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Specimens not identified in situ (in the field) will be processed and identified in the laboratory by appropriately qualified scientists. Biota tissue samples (if collected) analysed for hydrocarbon contaminants by NATA-accredited laboratories. Data will be entered to spatially explicit database and analysed in order to test for significant difference between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.4 SMP4 Mangrove Communities

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
Rationale	In the event of Tier 2 or 3 spill, mangroves may be contacted by floating or entrained oil. Mangrove health may be adversely affected due to increased concentration of hydrocarbons in sediments and coating due to surface oil, which in turn can lead to leaf-loss, mortality and a reduction in areal extent of mangrove habitat. This plan's focus is mangrove vegetation. Associated monitoring of sediment quality and mudflat fauna is described in SMP2 and SMP5, respectively.
Aim	To monitor changes to mangrove extent and health in relation to an oil spill and associated activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). Santos holds long term data from field mangrove health surveys at Varanus Island/ Bridled Island (Lowendal Group). Baseline extent and of mangroves is monitored by remote sensing in several regions, and further historical and post-impact data for mangrove health and extent

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
	can be obtained as remotely sensed imagery (e.g., Sentinel, Landsat and Worldview).
Initiation criteria	Operational Monitoring, SMP1 or SMP2 indicates that mangroves are contacted or predicted to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Mangrove extent and health are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted mangroves; AND Sediment quality monitoring (SMP2) at the site has been terminated; AND Shoreline response at the site has been completed.
Receptor impact	Impact to mangroves from pressures including hydrocarbons is measured through change in: + Tree health + Aerial extent. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter + Introduction of marine pests + Dust + Sedimentation from human activities + Climate change.
Methodological approach	Remote sensing data will be accessed for the purpose of detecting change in aerial cover and change in canopy health through and index of plant health (e.g., NDVI or MSAVI) (Astron Environmental Services 2013). Where long term on-ground baseline monitoring has occurred, further post impact on-ground monitoring should be carried out to complement any analysis of remote sensing. Analysis of long-term on-ground monitoring data will be as follows: 1. Where long-term baseline data sites (only) are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). On-ground monitoring of mangroves will aim to detect change in mangrove health, including canopy cover and plant/leaf health indices.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
	Field methodology will follow the routine monitoring techniques currently employed for Santos at Varanus Island (Quadrant Energy Australia Limited 2018), adapting where required to align with pre-existing baseline field data, where available. Sampling of sediments as per SMP2 will occur at mangrove health assessment sites to allow any changes in mangrove health to be related to sediment hydrocarbon levels. In-field mangrove health sampling frequency will be dictated by the number and location of sampling sites and the sampling design applied.
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in mangrove condition assessment + Supporting Scientist + GIS and remote-sensing personnel + Available vessel in operation + Satellite and/or aerial imagery
Implementation	On-ground monitoring will only occur where long-term baseline data has been collected, and hence no post-spill pre-impact data collection will be required. On-ground post-spill data will be collected at an appropriate time as guided by the analysis of remote sensing imagery, and potential on-ground assessment.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to test statistically significant change to parameters associated with hydrocarbon spill. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.5 SMP5 Intertidal Mudflats

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
Rationale	Intertidal mudflat communities are primary producer habitats which support invertebrate fauna, which in turn provides a valuable food source for shorebirds. High diversity of infauna (particularly molluscs) occur within these habitats and may be affected by penetrating oil. At high tide, these habitats become foraging grounds for vertebrates such as rays and sharks. While there is some localised disturbance, most of the communities in the area of interest are generally in an undisturbed condition. These habitats are at high risk of impact as the sheltered environments promote high faunal diversity combined with low-energy wave action.
Aim	To monitor changes in intertidal mudflat communities associated with an oil spill and associated activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001).

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	In addition, the IGEM shall be reviewed for applicable intertidal mudflat infauna baseline data.
Initiation criteria	Operational Monitoring, SMP1 or SMP2 indicates that mudflat habitats are contacted or predicted to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Mudflat infaunal assemblages are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated; AND Clean-up of the shoreline site has been completed.
Receptor impact	Impact to mudflat epifauna and infauna from pressures, including hydrocarbons, is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Overfishing (bait collecting) + Introduction of marine pests + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites (e.g., Roebuck Bay) are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority if baseline data are not available. If this opportunity is not available, a gradient approach to monitoring will be applied. Mudflat infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists methodology to adapt to available data such that results are comparable. Sites selected for mudflat infauna sampling to be concurrently sampled for sediment quality as per SMP2.

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Samples to be sieved with collected infauna preserved (buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists.
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in epifauna and infauna assessment and sampling + Supporting Scientist + GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	With the purpose of collecting post spill pre-impact data, service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilization time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.6 SMP6 Benthic Habitats

SMP6 – Benthic Habitats	
Rationale	Benthic habitats are those habitats associated with the seafloor. Major benthic habitats at risk are: + Coral reefs (likely high susceptibility to spill) + Macroalgae and seagrass (likely moderate susceptibility to spill) + Non-coral benthic filter feeders (likely moderate susceptibility to spill) + Sub-tidal pavement (likely moderate susceptibility to spill)

SMP6 – Benthic Habitats	
	+ Soft-substrate (likely lower susceptibility to spill). Macroalgal and seagrass communities are important primary producers which also provide habitat, refuge areas and food for fish, turtles, dugongs and invertebrates. Seagrass and macroalgae also increase structural diversity and stabilise soft substrates. Western Australia contains the largest and most diverse assemblages of seagrasses in the world, which are found throughout the EMBA, including notably the vast meadows contained within the Shark Bay World Heritage Area. Non-coral benthic filter feeders, which include sponges, molluscs, sea whips and gorgonians, are considered indicators of disturbance due to their immobility and long life cycles. Corals are important primary producers that provide food, substrate and shelter for a diversity of marine life, including invertebrates and fish. They also protect coastlines from wave erosion and provide important substrate for algae. Undisturbed intertidal and subtidal coral reefs occur in several locations throughout the EMBA and are generally considered to be in good condition.
Aim	To monitor changes in the cover and composition of benthic habitats in relation to an oil spill and associated activities. To monitor change in hard coral health and reproduction in relation to an oil spill and associated activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). In addition, the IGEM will be reviewed for applicable benthic habitat and coral health and reproduction baseline data. Remote sensing data, satellite and aerial imagery previously acquired (for example Hyperspectral imagery along the Ningaloo lagoon) (Kobryn et al. 2013) may also be applicable for shallow clear-water benthic habitats to detect changes in benthic habitat cover and composition. Pollution-induced change to benthic habitat cover and composition may take some time to be detected. Therefore, post-spill, pre-impact benthic survey data will be collected when required to have a baseline state following initial oil contact.
Initiation criteria	<u>Benthic habitat cover and composition</u> Operational Monitoring, SMP1 or SMP2 indicates that subtidal benthic habitats are contacted or are predicted to be contacted by a hydrocarbon spill. <u>Coral health and reproduction</u> Operational Monitoring, SMP1 or SMP2 indicates that coral habitat is contacted or is predicted to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	<u>Benthic habitat cover and composition</u> Cover and composition of benthic habitats are not statistically significantly different from that of their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages. <u>Coral health and reproduction</u> Hydrocarbon concentration in corals, reproductive state and settlement indices are not statistically different from the baseline state (where baseline data exists) or from comparable non-impacted assemblages.

SMP6 – Benthic Habitats	
Receptor impact	Impact to benthic habitats from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Percent cover. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Introduction of marine pests + Shading + Climate change.
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Benthic Habitat Cover and Composition Field survey methodology will be based upon acquiring repeat digital imagery (video or still images) of benthic habitats along random transects (preferable), using a stratified sampling approach at each site to target different habitat types and depths where clear gradients in these conditions exist. Site selection and image acquisition methodology will aim to align applicable baseline studies where these exist, such that imagery is comparable. The number of sites and frequency of sampling will depend upon the sampling design philosophy. Divers, towed video or remotely operated vehicles (ROVs) will be employed to collect imagery considering safety aspects and the depth of water at survey locations. Where divers are employed, fish species will also be recorded where practicable (for example following methodologies employed by Babcock et al. (2008) to contribute to SMP11. Coral Health and Reproduction Using divers, selected coral colonies will have tissue samples removed for the purpose of laboratory analysis of the concentration of accumulated hydrocarbons and for determining reproductive state, noting sampling for reproductive state will be dependent upon the timing of coral spawning. Reproductive state will be

SMP6 – Benthic Habitats	
	determined from measures of gamete size, stage and fecundity determined from in-field examination and laboratory analysis of histological samples. In addition to the standard suite of ecotoxicology testing done on the released hydrocarbon as part of the Operational Monitoring Program, ecotoxicology testing of the released hydrocarbon on the larval competency of representative coral species will be conducted. Settlement plates will be deployed to monitor settlement of coral recruits following spawning periods to ascertain the level of coral recruitment at impacted and non-impacted sites.
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Marine Scientist with experience in benthic habitat assessment + Supporting Scientist + Divers or ROV operators + GIS personnel + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Diving equipment or ROVs + Video recording facilities + Satellite imagery
Implementation	Service provider is to be able to mobilise within 72 hours of the SoW being approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Digital imagery will be analysed using a point-count technique (using software such as AVTAS, Coral Point Count with Excel extensions (CPCe) or TransectMeasure (SeaGIS)) to estimate the percentage cover of biotic and abiotic categories (in line with the CATAMI classification scheme) comprising the benthic habitat. Biotic categories to include the following as applicable: corals; macroalgae and seagrass; and non-coral benthic filter feeders. Live, dead and bleached coral cover shall be recorded. The imagery collected will allow for the determination of percent cover, abundance, measurement of size (if scaling lasers are included in the image) and a visual assessment of health (Kohler and Gill 2006). NATA accredited laboratory analysis to determine the concentration of hydrocarbons within coral tissue.

SMP6 – Benthic Habitats	
	Reproductive output to be determined by complementary means, including in-field and laboratory analysis of gametes, including microscopic examination of histological samples preserved in the field. Coral larval competency tests to be conducted by ecotoxological laboratory in addition to standard suite of ecotoxological tests using released hydrocarbon. Data will be entered to spatially explicit database and analysed in order to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card provided as part of report. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.7 SMP7 Seabirds and Shorebirds

SMP7 – Seabirds and Shorebirds	
Rationale	The region supports around 25 species of migratory shorebirds, 20 species of resident shorebirds, and approximately 30 species of seabirds. Shorebird foraging is most highly concentrated on tidal mudflats, while seabirds tend to nest on offshore islands. Impacts to seabirds and shorebirds due to the presence of surface, entrained and dissolved hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical (e.g. matting of feathers, inability to fly). These effects may ultimately lead to death or failed breeding. For the purposes of this document, seabirds and shorebirds are defined as: + shorebirds – those birds that inhabit and feed in the intertidal zone and adjacent areas and are resident or migratory, using the area principally during the austral summer + seabirds – those birds associated with the sea and deriving most of their food from it, and typically breeding colonially, including the marine raptors osprey and white-bellied sea eagle.
Aim	Quantify seabirds and shorebirds, in the spill and response areas. Quantify lethal and/or sub-lethal impacts of hydrocarbon spill exposure on seabirds and shorebirds. Monitor changes in seabird populations (reproductive success) in relation to the hydrocarbon spill and clean-up activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). The Oil Spill Response Atlas (Department of Transport (DoT)),National Conservation Values Atlas (Department of Agriculture, Water and the Environment (DAWE) -(http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf)

SMP7 – Seabirds and Shorebirds	
	and Pilbara Region Oiled Wildlife Response Plan (Department of Parks and Wildlife and Australian Marine Oil Spill Centre 2014) should also be consulted. Long-term seabird monitoring has been conducted on Lowendal, Airlie and Serrurier Islands by Santos as part of seabird and shearwater monitoring programs.
Initiation criteria	Operational monitoring indicates that known foraging, roosting or nesting areas for seabirds and/or shorebirds has been contacted, or are predicted to be contacted, by a hydrocarbon spill; OR Operational monitoring indicates that seabirds and shorebirds have been contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in Table 3.
ermination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are not present in seabird and shorebird tissues; AND measured variables are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured variables at non-impacted sites; AND Monitoring is terminated in consultation with the relevant environmental authority (DBCA and/or DAWE).
Receptor impact	Impact to seabirds and shorebirds from pressures including hydrocarbons is measured through change in: + Species diversity + Bird abundance + Health/condition + Breeding success (resident species only). Other pressures to these states are: + Physical disturbance of foraging and nesting habitat + Accidental chemical spillage + Entanglement in litter + Displacement by less favourable species (e.g. Silver Gull) + Predation + Climate change.
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. Given the ease of survey establishment, post-spill pre-impact monitoring will be attempted wherever practicable in order to established pre-impact state.

SMP7 – Seabirds and Shorebirds	
	3. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Monitoring for seabirds and shorebirds will measure abundance and diversity in key foraging/roosting areas with the timing of surveys to coincide with seasonal peaks in abundance. The seabird and shorebird roost count monitoring will follow current accepted survey methodology conducted in the area, such as Bamford and Moro (2011) at Barrow Island, and survey guidelines standardised by the Department of the Environment and Energy (2017). Monitoring of seabirds to focus on nesting (burrow) density, breeding participation and breeding success, taking measurements of the number of adults, eggs and chicks with the timing of surveys to allow assessments immediately after egg laying and immediately prior to chick fledging. Bird mortality to be recorded during monitoring of seabirds and shorebirds with tissue samples taken from dead birds for hydrocarbon analysis in the laboratory. Necroscopies will follow the process of Gagnon and Rawson (2010).
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Experienced seabird biologist + Experienced shorebird biologist + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Draft annual report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.8 SMP8 Marine Mammals

SMP8 – Marine Mammals	
Rationale	Thirty-eight species of marine mammals are known to occur within the region. These include cetaceans (whales and dolphin) and sirenians (dugong). Effects to marine megafauna due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates and associated change are not often available. This plan will focus on assessing the extent of impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.
Aim	To monitor short and long-term environmental effects on marine mammals that may have resulted from the hydrocarbon spill and associated response.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). The Oil Spill Response Atlas (DoT), National Conservation Values Atlas (DAWE - http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and Pilbara Region Oiled Wildlife Response Plan (Department of Parks and Wildlife and Australian Marine Oil Spill Centre 2014) should also be consulted.
Initiation criteria	Operational monitoring indicates that marine mammals are contacted or predicted to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Restoration or resumption of key biological processes (e.g. abundance, distribution, breeding) necessary to ensure post-impact recovery is demonstrated. Specific criteria to be developed by Marine Scientist(s) with expertise in marine mammals in the north-west of Western Australia; AND No further instances of dead marine mammals with detectable levels of hydrocarbons attributable to the hydrocarbon spill; AND Monitoring is terminated in consultation with the relevant environmental authority (DBCA and/or DAWE).
Receptor impact	Impact to marine mammals from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Physical disturbance + Entanglement in fishing gear and litter + Accidental chemical spillage + Climate change + Over-exploitation.
Methodological approach	Aerial and marine surveys will be implemented to identify individuals in proximity of the spill and to quantify damage: + Aerial surveys will follow the protocols of Hedley et al. (2011), **Appendix C8**

SMP8 – Marine Mammals	
	+ Marine surveys will follow the protocols of Watson et al. (2009), **Appendix C8** Tissue sampling of dead or injured animals will follow the protocols of: + Department of Environment and Heritage (DEH) (2006) (Cetaceans) + Eros et al. (2000) (Dugongs).
Scope of works	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	**Aerial survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities **Vessel-based survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation + Sample container and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Data and conclusions will be summarised in an environmental report card. Statistical power related to these receptors is likely to be low, due to observational data and small sample sizes. Therefore, the assessment of quantified impacts will be corroborated with marine scientist(s) with expertise in relevant fauna in the north west of Western Australia. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.9 SMP9 Marine Reptiles

SMP9 – Marine Reptiles	
Rationale	Six species of marine turtle, 22 species of sea snake and one species of estuarine crocodile are considered to occur within the region. Impacts to marine reptiles due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural, physiological (e.g. disruption to digestion) or physical effects. This plan is primarily focussed on marine turtles, while assessing other reptiles where encountered.
Aim	To observe and quantify the presence of marine reptiles in the spill and response areas, and broader regional areas. To assess and quantify lethal impacts or sub-lethal impacts of this exposure or interactions. To monitor changes in turtle populations in relation to an oil spill and associated activities.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). The Oil Spill Response Atlas (DoT), National Conservation Values Atlas (DAWE - http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and Pilbara Region Oiled Wildlife Response Plan (Department of Parks and Wildlife and Australian Marine Oil Spill Centre 2014) should also be consulted.
Initiation criteria	Operational monitoring indicates that marine reptiles or nesting sites are contacted or likely to be contacted by a hydrocarbon spill; OR Operational monitoring indicates that marine reptiles are contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in Table 3.
Termination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are no longer present in marine reptile tissues collected from live or dead individuals; AND In the event that an impact attributable to the hydrocarbon spill is detected on marine reptiles, the measured parameters are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured parameters at non impacted sites; AND Monitoring is terminated in consultation with the relevant environmental authority (DBCA and/or DAWE).
Receptor impact	Impact to marine turtles from pressures including hydrocarbons is measured through change in: + Abundance + Health/condition + Nesting success. Impact to other marine reptiles from pressures including hydrocarbons is measured through change in observed injury and condition. Other pressures to these states are: + Lighting and flares causing disorientation (turtles)

<table>
<tr><th colspan="2">SMP9 – Marine Reptiles</th></tr>
<tr><td></td><td>
+ Vessel strike
+ Physical disturbance of nesting sites
+ Predation
+ Entanglement in fishing gear and litter
+ Accidental chemical spillage
+ Habitat loss or change due to dredging
+ Climate change
+ Over-exploitation.
</td></tr>
<tr><td>Methodological approach</td><td>
Abundance
In-water impacts – aerial surveys.
Shoreline impacts – ground surveys (either rapid track census survey or tagging program).
Health/condition
In-water impacts – vessel surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis).
Shoreline impacts – ground surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis).
Dead reptiles will be collected for autopsy following Gagnon (2009).
Reproductive success
Shoreline impacts – ground surveys (detailed tagging and/or nesting success studies).
Design of ground surveys for turtles will be applied as follows:
1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied.
2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied.
3. Where no baseline data sites are involved, and timing allows, a post spill pre-impact approach will be attempted
4. If a post-spill pre-impact approach is not practicable, a gradient approach to quantifying impacts will be applied
</td></tr>
<tr><td>Scope of works</td><td>Prepared by monitoring provider for issue within 24 hours of SMP being activated.</td></tr>
<tr><td>Resources</td><td>
Aerial survey
+ Senior marine scientist
+ Trained marine wildlife observers x 2
+ Fixed wing aircraft (incl. pilot/s)
+ Refuelling facilities
</td></tr>
</table>

SMP9 – Marine Reptiles	
	Vessel-based Survey + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Turtle data will be analysed in order to test for significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Owing to their observational nature and potentially low sample size, observed impacts to other reptile fauna will be corroborated with marine scientist(s) with expertise in relevant fauna in the north-west of Western Australia. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.10 SMP10 Seafood Quality

SMP10 – Seafood Quality	
Rationale	Exposure of commercial and recreationally targeted demersal and pelagic fish species to entrained and dissolved aromatic hydrocarbons can cause flesh tainting and increase the levels of toxicants above human consumption guidelines. Aromatic hydrocarbons are carcinogenic to humans. This scope includes finfish, sharks and invertebrates (principally crustacea).
Aim	To identify potential human health risks due to the presence of hydrocarbon concentrations in the flesh of targeted seafood species for consumption.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001). Human health benchmarks relating to the exposure of PAHs shall be used to determine health effects as per Yender et al. (2002). Flesh samples from non-impacted sites to be used as baseline for olfactory analysis for flesh taint.

SMP10 – Seafood Quality	
Initiation criteria	Operational monitoring and results from SMP1 predicts or observes contact of oil to target species for consumption as defined in Table 3.
Termination criteria	The following termination criteria will be adopted in consultation with WA DPIRD-Fisheries, DAWE – Fisheries, AFMA and Department of Health. Hydrocarbon concentrations in seafood tissues are not above levels considered a human health risk; AND Flesh taint is not detected from olfactory testing of seafood samples; AND Target species are no longer exposed to hydrocarbons in the water column.
Receptor impact	Impact to seafood quality from hydrocarbons is measured through change in: + Toxicity indicators + Olfactory taint. Other pressures to these states are: + Accidental chemical spillage + Disease.
Methodological approach	Target fish species determined from water quality monitoring results and relevant and available commercial and recreational-fished species. Sampling of target species will follow a gradient design (Gagnon and Rawson 2012) ranging from impacted to non-impacted (or non-suspect) catches using commercial and recreational fishing techniques undertaken by commercial and recreational fishers. Sampling method (netting, trawling, baited fish traps, spear fishing, line fishing) will be determined by habitat, target species and spill location. If more than one target species is affected, replicate samples of each species shall be collected, with a minimum of five replicate samples. Olfactory testing will follow Rawson et al. (Rawson et al. 2011) in **Appendix C10**, following the duo-trio method (Standards Australia 2005).
Scope of works	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine vessel + Sample containers and preservative + NATA accredited laboratory for sample analysis + Decontamination/washing facilities
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.

SMP10 – Seafood Quality	
Analysis and reporting	Laboratories will be NATA-accredited for food standards analyses. Data will be stored in spatially explicit database and analysed in order to test for significant differences between impacted and non-impacted seafood. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.11 SMP11 Fish, Fisheries and Aquaculture

SMP11 – Fish, Fisheries and Aquaculture	
Rationale	Impacts to fisheries species due to presence of entrained hydrocarbons may include lethal and sub-lethal physiological effects (e.g. reduced growth) and physical effects. The region comprises the Indo-West Pacific area which consists of a high diversity of fish species and assemblages and provides important spawning and nursery grounds for several fisheries species. Fish are concentrated in a number of biodiversity hotspots. The environment is also conducive to aquaculture including pearl production. Fisheries species that spawn or inhabit near shore areas face a greater risk to an oil spill than finfish found in deeper waters.
Aim	To monitor changes in structure and distribution of fish assemblages in relation to an oil spill and associated activities. To monitor the effect of hydrocarbon exposure and physiological condition on fisheries and aquaculture species.
Baseline	Further details in Baseline Data Review (SO-00-BI-20001. In addition, the IGEM shall to be reviewed for applicable baseline data.
Initiation criteria	Operational monitoring indicates fish, fisheries or aquaculture are contacted or likely to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Fish assemblages are not statistically significantly different than those of baseline or similar non-impacted assemblages; AND Hydrocarbon concentrations, physiological condition indices, and biomarker levels in affected fish and aquaculture species are not statistically significantly different from those of non-impacted samples; AND Termination of monitoring is done in consultation with the Department of Primary Industries and Regional Development (DPIRD).
Receptor impact	Impact to fish, fisheries and aquaculture from pressures including hydrocarbon concentrations is measured through change in: + Species diversity + Abundance of indicator taxa + Assemblage structure + Health.

SMP11 – Fish, Fisheries and Aquaculture	
	Other pressures to these states are: + Accidental chemical spillage + Overfishing + Introduction of marine pests + Habitat disturbance + Climate change.
Methodological approach	Fish assemblages will be assessed using the stereo-baited remote underwater videos (BRUVs) following Shortis et al. (2009), **Appendix C11**. Fish assemblages will be randomly sampled within discrete habitats at cross-shelf impact areas and non-impact areas. Sampling design for fish assemblages will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. If baseline data is not available, a gradient approach to quantifying impacts will be applied (See **Appendix B** for detailed description of these approaches and **Figure 1**). Where relevant, data available from DPIRD, including catch/effort data, will be assessed to determine potential changes from baseline levels in fishing grounds potentially affected by an oil spill compared to after the event. For fish and aquaculture species potentially exposed to an oil spill, species will be sampled across the contamination gradient as per Gagnon and Rawson (2012). Hydrocarbon concentrations (particularly PAH) within tissues of fish and aquaculture species will be determined. Exposure to hydrocarbons on fish health will also be determine through analysis of physiological indices and biochemical markers following Gagnon and Rawson (2012). If fish kills are observed, whole specimens will be obtained and preserved (frozen) for necropsy to determine the cause of death.
Scope of works	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine scientist trained in fish identification and necropsy + Marine scientist with BRUV experience + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby

SMP11 – Fish, Fisheries and Aquaculture	
	+ Resources to analyse BRUV data.
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	BRUV imagery will be processed using EventMeasure (SeaGIS) software. NATA-accredited laboratories will be employed for health analyses. Data will be entered to spatially explicit database and analysed to test for statistically significant differences between non-impacted and impacted fish assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

2.12 SMP12 Whale Sharks

SMP12 – Whale Sharks	
Rationale	The whale shark (*Rhincodon typus*) is known to occur within the region. Effects to the whale shark due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates and associated change are not often available. This plan will focus on assessing the extent of impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.
Aim	To quantify impacts of an oil spill on whale sharks within Biologically Important Areas (BIAs) along the Ningaloo Coast and north Western Australian coastline.
Baseline	Baseline monitoring information of whale sharks includes: 1. Aerial survey. Monthly surveys funded by Woodside Energy were completed from 2000 to 2002. The Department of Environment and Conservation (DEC; now DBCA) undertook monthly surveys of Ningaloo Reef during the whale shark season from 2006 to 2010. The results of work funded by Woodside were published by Sleeman et al. (2010). Because whale sharks are not constrained to visit the surface in the same way as marine mammals, both surveys recorded relatively few whale sharks. Analysis of the DBCA survey data by Professor Helene Marsh of James Cook University concluded its surveys did not account for problems of availability and perception errors and that due to the relatively low numbers of sharks available to be counted in the Ningaloo region, aerial survey was probably not an appropriate means to census these sharks (DBCA pers. comm.). Note that while aerial survey techniques have shortfalls for determining abundance patterns, they are still

SMP12 – Whale Sharks	
	useful for identifying aggregation sites of whale sharks in the Exmouth sub-basin. 2. 2) Photo-identification databases. Two databases of whale sharks sighted at Ningaloo Reef are available although there is likely to be considerable overlap in their content. The first of these is held by AIMS and uses open-source software to compare and match images of sharks. Access to this database is not restricted. The second is held by Ecocean and requires user-access agreements to deposit, match and retrieve images or access metadata. The software used by Ecocean to compare images is proprietary. In the case of the AIMS database, images are available from 1992 to the present day with most of them provided by ecotourism operators at the end of each whale shark season. As part of licence agreements with DBCA, videographers working with each tourist operator must surrender footage of each shark encountered by the operator. DBCA staff then download id-images from these videos. Metadata and id-images are provided to both Ecocean and AIMS databases. These databases can be used in mark-recapture modelling frameworks to examine trends in the composition and abundance of whale sharks at Ningaloo, but outputs must be considered in the light of the caveats mentioned earlier (i.e. representativeness, sampling protocol etc.). 3. Operator and researcher trip logs. Each time a whale shark is encountered by a tourist and research vessel, or by a spotter plane, a record is kept of the location, size and sex (where possible) of the animal and the date and time. These records now exist from 1994 to the present day. These data suffer from the same caveats applicable to photo-id databases (e.g. representativeness of sampling of the entire population within the Exmouth region). Furthermore, planes do not search for animals in any formally structured manner, but rather fly up and down the reef at varying distances from the reef crest until a whale shark is sighted. If animals are sighted early in the day and all operators have completed tourist swims with sharks, then searches are terminated and the plane returns to base. Conversely, if whale sharks are difficult to find the area of search is widened and the plane will search for longer. Thus, the area and duration of searches can be highly variable. There have been changes in the format of reporting (written logs to GPS records) of encounters both by the boats and the planes through time. Finally, at times when there are few whale sharks, encounters with the same shark may be shared among tourist vessels, so that there is the possibility of double (or even triple) counting of the same shark in the database. Despite these problems, analysis of tourist industry databases have returned valuable insights into physical drivers of whale shark abundance at Ningaloo Reef (e.g. Sleeman et al. (2010)). Other relevant baseline datasets include: 4. 4) Sightings by the oil and gas industry. Occasional sightings of whale sharks either from the decks of oil rigs or by remotely operated vehicles (ROVs) around oil platforms and deepwater facilities have been compiled by AIMS for the past six years. No formal sampling program exists and these sightings occur largely by chance, although they do indicate the presence of these animals around oil and gas facilities offshore and in deep water on the shelf. 5. 5) Tagging data. Satellite telemetry has been used to describe the movement patterns of whale sharks along the Ningaloo coast and extending into the Timor Sea and south-east Indian Ocean. This data cannot be used to estimate patterns of abundance, but does provide important insights into the feeding, residency and migratory behaviours of sharks under 'normal' oceanographic conditions within the Exmouth sub-basin. Much of this data has been gathered by tag deployments led or assisted by AIMS. Researchers from other institutions have also deployed tags on whale sharks at Ningaloo at tracked

SMP12 – Whale Sharks	
	movement, including a recent study by Ecocean/University of QLD (Reynolds et al. 2017). 6. Food chain studies. Surveys of euphausiids (a major food item of whale sharks at Ningaloo; (Jarman and Wilson 2004)) and other mesoplankton in the region of Ningaloo Reef have been published (Wilson et al. 2001, 2003). Preliminary work on the food chains leading to the prey of whale sharks is underway but has not been published as yet (Meekan et al., unpublished data). This ongoing research may identify the physical and biological factors correlated with whale shark abundance at Ningaloo and thus result in a better understanding of variability in the ecosystem. Such information is essential if the effects of an oil spill or development are to be discerned against a background of natural changes in distribution and abundance of whale sharks.
Initiation criteria	Operational monitoring indicates that whale shark aggregations are contacted or likely to be contacted by a hydrocarbon spill as defined in Table 3.
Termination criteria	Measured parameters of whale shark abundance and distribution are not significantly different to baseline levels; AND The water quality at feeding/aggregation sites has been measured as not significantly different to baseline levels.
Receptor impact	Impact to whale sharks from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Intentional and unintentional mortality from fishing outside Australian waters + Boat strike + Habitat disruption from mineral exploration, production and transportation + Marine debris + Climate change.
Methodological approach	During spill activities may require the following surveys and sampling: + Aerial surveys + Satellite tagging + Toxicology + Food chain studies + Photo-identification + Vessel and plane logs + Acoustic tagging. The methodologies adopted will follow the approaches of those baseline studies identified allowing consistency of data from baseline to impact and recovery phases.
Scope of works	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.

SMP12 – Whale Sharks	
Resources	+ Senior marine scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

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Appendix E: SMP Activation Process

Oil Spill Operational and Scientific Monitoring Activation Form

Instructions
In the event of a spill requiring a response from Astron follow these steps: **1. Activate a response – call 1300 902 700** **2. Immediately complete this Activation Form and email to spillresponse@astron.com.au** **You will receive a call back from the Monitoring Coordinator within 30 minutes. In the event that a call back is not received, please call 1300 902 700 again.** **Note:** If new information should become available after submitting this form, or the situation changes, please advise the Astron Monitoring Coordinator as soon as possible.

Section 1: Contact Details		
Name of notifying person		
Position in Incident Command Team		
Direct phone		
Mobile		
Email address		
Command centre location		
Command centre direct phone		
Date and time of notification	Click here to enter a date.	Enter time, i.e. 1400 WST

<table>
<tr><th colspan="7">Section 2: Spill Details</th></tr>
<tr><td colspan="2">Date and time of spill</td><td colspan="3">Click here to enter a date.</td><td colspan="2">Enter time, i.e. 1400 WST</td></tr>
<tr><td colspan="2" rowspan="2">Spill source location
(GDA94, MGA Zone 50)</td><td colspan="5">Insert coordinates in GDA94 MGA Zone 50 format (easting and northing).</td></tr>
<tr><td colspan="5">Insert location description</td></tr>
<tr><td colspan="2">Source of spill</td><td colspan="5"></td></tr>
<tr><td colspan="2">Cause of spill (if known)</td><td colspan="5"></td></tr>
<tr><td colspan="2">Status of spill</td><td colspan="5">☐ Secured ☐Uncontrolled ☐Unknown</td></tr>
<tr><td rowspan="3">Release rate</td><td>Instantaneous release</td><td colspan="5"></td><td rowspan="3">State units</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Continuous release</td><td></td><td>per hour for</td><td></td><td>☐Hours</td><td>☐Days</td></tr>
<tr><td rowspan="4">Description of spill</td><td>Estimated quantity</td><td colspan="5"></td><td rowspan="4">State units</td></tr>
<tr><td>Incident tier</td><td colspan="5">☐1 ☐2 ☐3</td></tr>
<tr><td>Direction of travel</td><td colspan="5"></td></tr>
<tr><td>Trajectory</td><td colspan="5"></td></tr>
<tr><td colspan="2">Modelling provider log in details</td><td colspan="5"></td></tr>
</table>

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Oil Spill Operational and Scientific Monitoring Activation Form

Section 3: OMP/SMP activation	
SMPs to be activated. Where there is doubt whether an SMP should be activated the SMP should be selected. Refer to the Oil Spill Scientific Monitoring Plan (EA-00-RI-10099) for initiation criteria for SMPS.	☒SMP1 – Water quality ☒Operational water quality monitoring ☐SMP2 – Sediment quality ☐SMP3 – Sandy beaches and rocky shores ☐SMP4 – Mangroves ☐SMP5 – Intertidal mudflats ☐SMP6 – Benthic habitats ☐SMP7 – Seabirds and shorebirds ☐SMP8 – Marine megafauna ☐SMP9 – Marine reptiles ☐SMP10 – Seafood quality ☐SMP11 – Fish, fisheries and aquaculture ☐ Yet to be determined ☐ Other:_______________________________

Section 4: Safety	
Detail any known safety or security risks	

Section 5: Approval	
I authorise the activation of a response by Astron Environmental Services Pty Ltd in connection with the above incident under the terms of Contract # [insert contract].	
Signature:	
Date and Time:	

Activate Our Team

In the event of a spill requiring scientific monitoring response call:

1300 902 700

Advise the operator:

1. **Your company**
2. **Your name and contact number**
3. **Brief reason for call (i.e. Exercise or Spill)**

A message will be relayed to our team to call you back.

↓

Provide additional details as requested by the Monitoring Coordinator on call-back

↓

Complete and submit the *Activation Form*

↓

Astron initiates Oil Spill Scientific Monitoring Activation & Response Process – refer to next page

Oil Spill Scientific Monitoring Activation and Response Process

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
Phase 1 – Activation					
1	Santos IMT (Environmental Team Leader (ETL))	Astron Monitoring Coordinator notified of incident.	On approval from Santos Incident Commander	Astron oil spill response phone number and answering service	
2	Astron Monitoring Coordinator (MC)	Call back client for further details, request *Activation Form* if not received.	Within 30 minutes of receiving initial notification	Activation Form	
3	Astron MC	Call Planning & Logistics Officer to advise of incident.	Immediately following Step 2	n/a	
4	Santos IMT (ETL)	Complete *Activation Form* and submit to Astron via email.	Within one hour following initial notification (Step 2)	Activation Form	
5	Astron Planning & Logistics Officer (PLO)	Notify MCT, Technical Advisors and key subcontractors via SMS Global.	Within 30 minutes of Step 3	SMS Global Guidance	
6	Astron PLO	Notify all staff of incident via SMS Global.	Within one hour of receiving Activation Form	SMS Global Guidance	
Phase 2 – Response Planning					
7	Astron MC	Maintain verbal communication with Santos IMT (ETL).	At least twice daily (0800 and 1700)	n/a	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
8	Astron MC Astron Operations Officer Astron PLO	Maintain Functional Log.	Daily	Functional Log	
9	Astron PLO	Set up Command Room.	Within 4 hours of activation (Step 5)	Command Room Resource Checklist	
10	Astron MC, PLO and BMT Oceanica Operations Officer	Attend Santos incident briefing and relay information to MCT.	As advised by the Santos IMT (ETL)	n/a	
11	Astron Operations Officer	MCT and Technical Advisors to meet at Royal St office, review personnel and equipment resource status.	Within 6 hours of activation (Step 5)	Capability report Training matrix Resource chart	
12	Astron PLO	Confirm availability of additional personnel and equipment resources.	Within 16 hours of activation (Step 5)	External Supplier Details Requisition Request Form	
13	Santos IMT (ETL)	Provide spill trajectory modelling and sensitive receptor information to Astron.	When available	APASA modelling Department of Transport database Santos GIS Mapping	
14	Astron MC in consultation with Santos ETL	Define the scale of response - identify which SMPs are activated. Identify if operational water quality monitoring is required.	Within 2 hours of receiving spill and receptor information (Step 13).	Scientific Monitoring Plan* Relevant OPEP Spill trajectory modelling Operational monitoring results	

Step	Responsibility	Action	Timeframe[#]	Resources	Date/Time Complete
15	Astron Technical Advisors in consultation with Santos ETL	**Determine monitoring locations for activated SMPs:** • Identify monitoring locations in order of priority for activated SMPs based on: o nature of hydrocarbon spill o spill trajectory modelling and time to shoreline impacts o sensitive receptors impacted or potentially at risk of being impacted o state of current baseline data o current environmental conditions o current results of operational monitoring. • Determine if post-spill pre-impact data is required to be collected from any locations. See SMP Work Method Statements for decision making process when considering availability of baseline data.	Within 6 hrs of relevant SMP activation (Step 14).	Relevant SMPs Information from Astron: • baseline information for relevant receptors. Information from Santos IMT: • sensitive receptor information (including relevant conservation/management plans) from relevant EP, Santos GIS mapping and online resources (DoT oil spill response atlas, DoE conservation values atlas, DoE species profile and threats database) • oil spill trajectory modelling • response strategies and priority protection areas • results from OMPs currently activated • baseline information for relevant receptors as reference in the relevant SMP.	
16	Astron Technical Advisors in consultation with Santos ETL	Submit Department of Parks and Wildlife Licence applications	Within 12 hrs of relevant SMP activation (Step 14)	• Proposed monitoring locations • SMP methods	

Step	Responsibility	Action	Timeframe[#]	Resources	Date/Time Complete
17	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine personnel requirements:** • Identify number and competencies of personnel required for monitoring teams for each SMP based on: o activated SMPs o number of locations to be monitored o number of locations where pre-spill baseline data needs to be collected o timing of hydrocarbon spill and overlap with sensitive receptors in activated SMPs o logistical and equipment resource constraints. • Arrange additional personnel if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Capability report • Training matrix • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • sensitive receptor information • oil spill trajectory modelling • response strategies and priority protection areas • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	
18	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine equipment requirements:** • Identify number and competencies of equipment required for each SMP based on: o activated SMPs o number of locations to be monitored o number of field teams and timing of mobilisation to the field o logistical and equipment resource constraints. • Arrange additional equipment resources if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
19	Astron MC, Operations Officer, PLO & Technical Advisors	**Prepare and submit Monitoring Action Plan** (mission, objectives, strategies, tactics, tasks), including scope of works. **Prepare and submit cost estimate.** **Prepare and submit logistics request:** • Allocate personnel and equipment resources to field teams for relevant SMPs. • Submit SOW and logistics request for each activated SMP to Santos IMT for approval.	Within 24hrs of request for SoW (Step 15) for relevant SMP if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS • agreed monitoring locations • Mobilisation and Logistics Form (incorporating SOW) • Monitoring Action Plan. Information from Santos IMT: • request for SoW • agreed monitoring locations.	
20	Santos IMT (ETL)	Santos to approve SOW, provide purchase order and initiate logistical arrangements.	Within 24 hours of SOW submission (Step 19).	Astron Mobilisation and Logistics Request	
21	Astron MC	Advise field personnel by email meeting invite, or phone if not in office.	Within 24 hours of SOW approval (Step 20).	Field team allocation	
22	Astron	Conduct incident briefing with all available Astron personnel.	Within 24 hours of SOW approval (Step 22).	Briefing template Monitoring Action Plan	
Phase 3 – Mobilisation					
24	Astron PLO	GIS and device preparation requests (field maps, data capture) submitted, and discussed with Geospatial team.	Within 24 hours of SOW approval (Step 22).	https://voyager/	
25	Astron Operations Officer	Conduct field team overview briefing, allocate tasks.	Within 36 hours of SOW approval (Step 22).	Briefing Template	

Step	Responsibility	Action	Timeframe[#]	Resources	Date/Time Complete
26	Field Team Leaders	Compile SMP grab packs, GIS information, field equipment, and prepare and submit HSE documentation to Santos IMT.	Within 48 hours of SOW approval (Step 22).	Information from Astron • SoW • Grab packs, SMP WMS and HSE documentation • GIS information/field maps • field equipment. Information from Santos IMT: • booking and logistics confirmations.	
27	Astron Technical Advisors	Conduct scope specific pre-mobilisation briefings.	Prior to mobilisation.	Pre-mob Briefing Template	
28	Santos ETL	Santos to approve HSE plan.	Within 24 hours of receiving HSE Plan.	Mobilisation and Logistics Form HSE plan	
29	Astron PLO	Personnel mobilised to site.	Within 72 hrs of SOW approval (Step 22) if pre-impact data is needed.**	Approved SOW	
Phase 4 – Response Operations					
30	Astron MC	Conduct Monitoring Action Plan review with MCT and Technical Advisors and communicate to Santos IMT (ETL).	Daily	Monitoring Action Plan template	
31	Astron PLO	Hold post-demobilisation debrief with field teams.	Within 3 days of demobilisation.	Demob Meeting Template	
32	Santos ETL	Santos to arrange approval of Monitoring Action Plan revisions and any additional mobilisation/logistics requirements.	Daily or as required	Monitoring Action Plan Mobilisation and Logistics Form	
33	Astron Field Team Leaders	Provide activity reports to Santos ETL.	Daily	Daily Activity Report Template	

Timeframes are indicative and may be require adjustment where activities are dependent on information availability or affected by logistical constraints

*The Scientific Monitoring Plan (EA-00-RI-10099) provides the most up to date list of SMPs and activation criteria. Refer to the OPEP for operational water quality monitoring requirements.

**If post-spill, pre-impact data is not required then timeframes will be specific to each SMP. The lead times for resourcing, preparation of SoW and mobilisation of field teams may be longer depending on the timing of the spill, likely trajectory and life stages of receptors present or likely to be impacted.

For example, in SMP4 if post-spill, pre-impact data collection is not required then mangrove decline is likely to take several weeks to occur and there is lower priority for mobilisation of field teams for this SMP within the 72 hr timeframe. In this case, mobilisation within 30 days may be more appropriate.

Abbreviations

EMBA – Environment that May Be Affected
IMT – Incident Management Team
OMP – Operational Monitoring Program
OPEP – Oil Pollution Emergency Plan
Santos – Santos Energy Australia Limited
SMP – Scientific Monitoring Plan/Program
SoW – Scope of Works
WMS – Work Method Statement

Appendix F: Scientific Monitoring Capability

Scientific Monitoring Assurance and Capability Assessment

Assurance arrangements

Astron Environmental Services (Astron) is currently Santos' primary Monitoring Service Provider for the implementation of SMPs 1-12. A contractual arrangement exists with Astron to maintain standby arrangements as per the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162) and have the resourcing capability to implement a first-strike response at all times. Astron maintains a relationship with a primary sub-contractor (BMT) for the provision of scientific monitoring for those SMPs where Astron does not have the required capability. Between Astron and BMT, capability exists to deliver first strike resourcing against SMPs 1-12.

Assurance on the continued maintenance of capability is provided through the delivery of monthly capability reports. These reports are generated by the Astron and BMT Planning and Logistics Officers and delivered to the Santos Spill Response Adviser along with a summary of any changes in resourcing or, and if required, how gaps in resourcing have been managed. Since the establishment of the scientific monitoring contract in 2015 Astron has always demonstrated through this process that it has the required capability to meet first strike resourcing as per the standby services contract.

Santos ensures that Astron/BMT standby arrangements are adequate through its exercise and auditing program. Santos regularly conducts exercises and tests with Astron and BMT to ensure that Santos IMT roles and Astron/BMT monitoring roles are familiar with the SMP activation arrangements while providing spot checks on resource availability. Santos has previously also undertaken an audit of Astron against its Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162). Assurance activities to date have demonstrated a high degree of compliance with standby service requirements.

Continuous improvement

Santos is committed to further improving its oil spill scientific monitoring capability. To that end, Santos is participating in a Joint Industry Operational and Scientific Monitoring Plans project, governed through an APPEA-Industry Steering Committee. This project, being progressed throughout 2021, is working towards a joint-industry capability for implementing a common suite of oil spill operational and scientific monitoring plans. The project aims to deliver efficiencies in implementing and testing oil spill scientific monitoring arrangements while increasing the level of resourcing and capability available to participating companies.

Baseline Data and Capability Assessment

Santos is committed to undertaking a review of the status, availability, currency and suitability of existing baseline data for oil spill scientific monitoring sources every 2 years. The latest review was undertaken in March 2019 by Astron (Baseline Data Review document QE-00-BI-20001) and looked at all high biodiversity value receptors in the Santos EMBA. Following this an additional assessment was undertaken in September 2019 (DC-40-RI-20017) to determine whether existing baseline data is sufficient and accessible for sensitive receptors that could be impacted from worst case Commonwealth waters spills scenarios associated with operational activities at or around Devil Creek pipeline/Reindeer platform, Varanus Island and Ningaloo Vision facilities.Baseline review in 2021 is ongoing as part of this review. This study concentrated on sensitive receptor areas with minimum hydrocarbon contact times of less than seven days as indicated by stochastic spill modelling; it is considered that contact within seven days would require an enhanced understanding of available baseline data to ensure a timely response.

The assessment of baseline data included:

1. A review of the following parameters for each program identified:
    - Integrated Marine and Coastal Regionalisation of Australia
    - Custodian- contact point for data
    - Spatial extent

- Variables available for monitoring
- Methods applied to monitoring
- Year of most recent data capture
- Total duration of monitoring program
- Data completeness (number of years monitored as proportion of program duration)
- How often data is captured
- Appropriateness of variables (Judgement as to whether variables are appropriate for future oil spill monitoring)
- Is there any clear indication that the monitoring will continue?

2. The quality of the following parameters was then ranked as high, medium, low or unknown:
   I. Year of most recent capture:
      - 2015-2018 (if a single data capture has occurred in the last two years, then the overall program can be considered of high quality) = high
      - 2009-2014 = medium
      - <2009 = low
   II. Duration:
      - >4 years = high
      - 2-4 years = medium
      - 1 year = low
   III. Data completeness:
      - 100% = high
      - 75-99% = medium
      - <75% = low
   IV. Frequency of capture
      - Annually = high
      - Bi-annually = medium
      - <Bi-annually = low
   V. Appropriateness of parameters
      - High/medium/low

      Appropriateness of parameters was based on reference to the Scientific Monitoring Plan's targeted states for each receptor and considering whether the monitoring parameters were sufficient to compare against these states. Parameters were considered highly appropriate if all targeted states for a receptor could be quantified, of medium appropriateness if only some states could be quantified and low if the monitored parameters had little relevance to the targeted states of an individual receptor.

3. An overall assessment of each study program was then made as follows:
   - All parameters rated high = overall 'good'
   - At least one parameter rated medium = overall 'fair'
   - At least one parameter rated low = overall 'poor'
   - Unknown = overall not enough data to rate

The above assessment process was also performed across monitoring programs which specified at least one of the priority protection areas within their monitoring sites. For Priority protection areas, the above assessment was then used to determine if 1) the baseline data available could be used to detect change in the state in the event of a significant impact - Classified as "good" in the above assessment (i.e., data was current, of reasonable duration and frequency, and employed appropriate methodologies) or 2) the existing baseline data is unlikely to be suitable to detect change in state – classified as "fair" or "poor" by the above assessment (i.e., the data was dated, infrequent, of limited duration and/or relied on inappropriate methodologies). Following this assessment, a Protection Priority Area by SMP matrix summarising recommendations on baseline data status and recommendations for further action was developed (Table 1) based on three categories:

- Not applicable – SMP is not applicable to the priority protection area as sensitive receptor does not occur.
- Survey - current monitoring/knowledge is considered sufficient (i.e., could be used to detect change in state in the event of a significant impact) and is considered a lower priority for post-spill pre-impact data collection.
- Priority survey – current monitoring is not in place or not practicable; post-spill pre-impact baseline data collection should be prioritised.

The assessment determined for the majority of sensitive receptors for Ningaloo Coast, specific post-spill pre-impact monitoring should be prioritised, noting that alternative approaches exist for detecting impacts where it is not feasible to conduct first-strike pre-impact baseline surveys, for example, impact versus multiple control sites and/or a gradient approach. These experimental design approaches are described within the Oil Spill Scientific Monitoring Plan (EA-00-RI-10099).

Based on the assessment of priority survey areas/receptors outlined in **Table 1** a capability assessment was undertaken to understand whether existing scientific monitoring capability would be sufficient to mount a first-strike monitoring program to gather baseline data within a short-timeframe (<7 days), noting that in the event of very short contact timeframes mobilisation of scientific monitoring teams to priority receptor sites may not be possible within contact timeframes and experimental designs not relying on pre-impact baseline would have to be employed.

Table 1 lists Priority Protection Areas that could be contacted within 7 days based on stochastic modelling data (i.e., the outcomes of 100s of spill modelling simulations rather than a single spill event). Ningaloo Coast would potentially require priority baseline monitoring within the seven-day time period.

Table 2 outlines the required scientific monitoring capability for rapid response for Ningaloo Coast, and Astron's actual capability. When determining actual team capability, personnel were only allocated to a single SMP team, unless otherwise stated.

The results of the Baseline Data Review document (QE-00-BI-20001) and subsequent baseline and capability assessment of protection priority areas summarised herein (but detailed further in DC-40-RI-20017 and SO-91-RI-20114) has been provided within the Environment Functional Team Folder on the Emergency Response Intranet page so that this information is accessible to guide Santos IMT Environmental roles and monitoring provider roles in the event of activating oil spill scientific monitoring.

Table 1: Summary of recommendations for further action based on review of available baseline data

SMP	Priority Protection Areas with predicted time to shoreline contact in less than 7 days
	Ningaloo
Water Quality (SMP1)	Priority survey
Sediment Quality (SMP2)	Priority survey
Sandy Beaches/Rocky Shorelines (SMP3)	Priority survey
Mangroves (SMP4)	Survey

SMP	Priority Protection Areas with predicted time to shoreline contact in less than 7 days
	Ningaloo
Intertidal Mudflats (SMP5)	Priority survey
Benthic Habitats (SMP6)	Survey
Seabirds/ shorebirds (SMP7)	Survey
Marine megafauna (SMP8)	Survey
Marine reptiles (SMP9)	Survey
Seafood Quality (SMP10)	Priority survey
Fish, Fisheries & Aquaculture (SMP11)	Priority survey
Whale sharks (SMP12)	Survey

Table 2: Capability assessment for rapid sampling of Ningaloo Coast area within seven days.

Receptors	Priority Protection Areas	Required capability for rapid response (per Priority Protection Area)	Actual Team Capability
	Ningaloo		
Water Quality (SMP1)	Priority survey	1 teams of 2 personnel 0. at least one member in each team to have experience in water sampling 1. at least one member in each team to have experience in deep sea sediment sampling	3 teams of 2 personnel
Sediment Quality (SMP2)	Priority survey		
Sandy Beaches/Rocky Shorelines (SMP3)	Priority survey	1 teams of 2 personnel 2. at least one team member with experience in shoreline macrofauna/infauna assessment	2 teams of 2 personnel
Intertidal Mudflats (SMP5)	Priority survey		
Mangroves (SMP4)	Survey	Not required[2]	Not required

Receptors	Priority Protection Areas Ningaloo	Required capability for rapid response (per Priority Protection Area)	Actual Team Capability
Benthic Habitats (SMP6)	Survey	Rapid priority response not required	2 teams of 2 personnel 3. at least one team member with experience in benthic habitat assessment 4. ROV operator or divers
Seabirds/ shorebirds (SMP7)	Survey	Rapid priority response not required	1 team of 2 personnel • at least one member in team is an experienced ornithologist
Marine megafauna (SMP8)	Survey	Rapid priority response not required	1 team of 2 personnel (aerial)[1] 5. both experienced wildlife observers 1 teams of 2 personnel (vessel)[1] 6. both experienced wildlife observers
Marine reptiles (SMP9)	Survey	Rapid priority response not required	1 team of 2 personnel (aerial)[3] 7. both experienced wildlife observers 1 team of 2 personnel available (vessel)[3] 8. both experienced wildlife observers 1 team of 2 personnel (ground-based)[4] • at least one member with experience in turtle survey techniques
Seafood Quality (SMP10)	Priority survey		2 teams of 3 personnel

Receptors	Priority Protection Areas	Required capability for rapid response (per Priority Protection Area)	Actual Team Capability
	Ningaloo		
Fish, Fisheries & Aquaculture (SMP11)	Priority survey	1 teams of 3 personnel 9. at least one member to have experience in fish identification and necropsy 10. at least one member to have BRUV experience	
Whale sharks (SMP12)	Survey	Not required due to ongoing research along the Ningaloo coast	Not required due to ongoing research along the Ningaloo coast

[1]Aerial and vessel surveys could be conducted by the same team. The aerial-based surveys would be conducted first and then this would help inform target areas for vessel-based surveys.

[2]Remote sensing data would be collected for mangroves, with no field team required to be mobilised.

[3]Two of these teams are those also assigned to SMP8.

[4]One of these teams is also assigned to vessel-based surveys for the same SMP. They can be moved according to priority for either vessel-based or ground survey.

Appendix G: Shoreline Clean-up Equipment

Equipment List for an Initial deployment of a 6 person Manual Clean Up Team

On Shore Clean-up Tools		**Quantity**
	Disposal Bag Labelled, 140 cm x50cm x 100um	1000
	Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100um	50
	Polyethylene Safety Shovel 247mm z 978mm	2
	Steel Shovel	4
	Steel Rake	2
	Landscapers Rake	2
	Barrier Tape – "Caution Spill Area"	10
	Pool scoop with extendable handle – flat solid	2
	Poly Mop Handle	2
	Safety Retractable Blade Knife	2
	Poly Rope 20m	6
	Star Pickets	24
	Star Picket driver	1
	Hand Cleaner	1
	Cable ties – general use	1000
	Wheel Barrow	2
	Galvanised Bucket	4
	Pruning secateurs	2
	Hedge Shears	1
Personal Protection Equipment (PPE) Team of 6		
	Spill Crew Hazguard water resistant coveralls (assort sizes)	36
	Respirator dust/mist/fume and valve	40
	Disposable box light nitrile gloves (100bx)	2
	Alpha Tec gloves (assort size)	24
	Ear Plugs (200bx)	1
	Safety Glasses	18
	Safety Goggles non vented	6
	Gum Boots (assort size)	18
	Rigger Gloves (assort size)	18
	Day/Night Vest	6
Storage Equipment		
	Collapsible Bund 1.6m x 1.2m	2
	Collapsible bund 4m x 2.4m	1
	Misc sizes of ground sheets/tarps	6
Absorbents		
	Absorbent Roll 'oil and fuel only' 40m x 9m	6
	Absorbent Pad "oil and fuel only" 45cm x 45cm	400
	Poly Mops (snags)	150
	Poly Absorbent Wipes	10
Additional Items		
	Folding Deck Chair	6
	Folding Table	1
	Shelter open side	1
	6 Person first aid kit	1
	Wide Brim Hat with cord	6
	Sunburn Cream 1 litre pump bottle	1
	Personal Eyewash bottle 500mls	6
	Personal Drink bottle 750mls	6
	Boxes, Bin and Lid Storage/transport assorted	
Optional Items		

	Inflatable Tent 9 square metres	1

Equipment list for a decontamination unit for Beach Clean Up Team

Shore Clean-up Tools		**Quantity**
	Inflatable Decon Tent	1
	Inflatable Tent 9 square metres – Modesty or Control tent	1
	Misc sizes of ground sheets/tarps	4
	Collapsible Bund 1.6m x 1.2m (two stages)	2
	2 stools in each bund	
	Collapsible Bund 4m x 2.4m (for used PPE and clothing into DB's)	1
	Long Handled Scrub brush	2
	Scrub Brush	2
	Simple Green 20 ltr	2
	Poly Absorbent Wipes	10
	Wet Wipe Canister	6
	Disposal Bag for Clothing, 140cm x 50cm x 100um	100
	Bath towel	6
	Liquid soap in push dispenser (citrus based)	1
	Track mat – Absorbent for Corridor/walkway	1
	Star pickets	16
	Star picket driver	1
	Barrier tape to create corridors	4
	Safety Goggles non vented (used during decon)	6
Optional Items		
	Folding Deck Chair	6
	Folding Table	1
	Shelter open side	1
	6 Person first aid kit	1
	Wide Brim Hat with cord	6
	Sunburn Cream 1 litre pump bottle	1
	Personal Eyewash bottle 500mls	6
	Personal Drink bottle 750mls	6
	Boxes, Bin and Lid Storage/transport assorted	

Equipment list for deployment of a 6-person team for flushing or recovery

Flushing Equipment		**Quantity**
	Diesel self prime semi trash pump, 25-35 psi, 4.8hp	1
	Perforated 2” lay flat hose, 20 mtr sections	2
	Section Hose 2”, 20m sections	5
	Hose End Strainer	1
Recovery Equipment		
	Tidal Boom (shoreline boom) 25m lengths	2 (50m)
	Tidal Boom Accessories pack	1
	Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	2 (50m)
	Towing Bridle	2
	Danforth Sand Anchor Kit, 30m lines, 15m trip lines	3
	Diesel Powered pump with hose	1
	Manta Ray skimmer	1
Personal Protection Equipment (PPE) Team of 6		
	Spill Crew Hazguard water resistant coveralls (assort sizes)	36
	Respirator dust/mist/fume and valve	40
	Disposable box light nitrile gloves (100bx)	2
	Ear Plugs (200bx)	1
	Safety Glasses	18
	Gum Boots (assort size)	18
	Hyflex Oil Restraint Gloves (assort size)	18
	Day/Night Vest	6
Storage Equipment		
	Collapsible Bund 1.6m x1.2m	1
	Misc sizes of ground sheets/tarps	6
	Collapsible Tank 5000 litres	2
Absorbents		
	Absorbent Boom ‘oil and fuel only’ 3 or 6m x 180mm	200mtrs
	Absorbent Roll ‘oil and fuel only’ 40m x 9m	10
	Absorbent Pad “oil and fuel only” 45cm x 45cm	1000
	Poly Absorbent Wipes	10
Additional Items		
	Folding Deck Chair	6
	Folding Table	1
	Shelter open side	1
	6 Person first aid kit	1
	Wide Brim Hat with cord	6
	Sunburn Cream 1 litre pump bottle	1
	Personal Eyewash bottle 500mls	6
	Personal Drink bottle 750mls	6
	Boxes, Bin and Lid Storage/transport assorted	
	Inflatable Tent 9 square metres	1

Equipment list for a 6 person team for near shore clean up

Absorbents		
	Absorbent Roll 'oil and fuel only' 40m x 9m	20
	Absorbent Pad "oil and fuel only" 45cm x 45cm	2000
	Absorbent Boom "oil and fuel only" 3or6m z 180mm	200mtrs
	Poly Mops (snags)	150
	Poly Absorbent Wipes	20
Recovery Equipment		
	Tidal Boom (shoreline boom) 25m lengths	4 (100m)
	Tidal Boom Accessories pack	2
	Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	8 (200m)
	Towing Bridle	2
	Danforth Sand Anchor Kit 15kg 30m lines, 15m trip lines	10
	Weir Skimmer 30T hr	1
	Trash Screen for above	1
	Diesel Powered pump with hose	1
	Manta Ray skimmer	1
Shore Clean-up Tools		**Quantity**
	Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100um	200
	Pool scoop with extendable handle – flat solid	2
	Poly Mop Handle	2
	Poly Rope 20m	10
	Star Pickets	24
	Star Picket driver	1
	Intrinsic Safe Torch	6
	Hand Cleaner	1
	Cable ties (to add extra join to absorbent booms)	150
Personal Protection Equipment (PPE) Team of 6		
	Spill Crew Hazguard water resistant coveralls (assort sizes)	36
	Disposable box light nitrile gloves (100bx)	2
	Alpha Tec gloves (assort size)	24
	Ear Plugs (200bx)	1
	Safety Glasses – with head strap	18
	Gum Boots (worn extra large or as advised by skipper)	18
	Steel cap waders	2
	Personal Flotation Device	6
	Rigger Gloves (assort size)	18
Storage Equipment		
	Collapsible Bund 1.6m x 1.2m	2
	Collapsible bund 4m x 2.4m	1
	Collapsible Tank 5000 litres	2
	Alum box, Bin & lid Storage/transport cases	10
	Misc sizes of ground sheets/tarps	6
Optional Items		
	6 Person first aid kit	1
	Wide Brim Hat with cord	6
	Sunburn Cream 1 litre pump bottle	1
	Personal Eyewash bottle 500mls	6
	Personal Drink bottle 750mls	6

Appendix H: Oil Spill Response ALARP Framework & Assessment

Oil Spill Response ALARP Framework & Assessment:

ALARP Assessment Framework

Rationale

As part regulatory approval requirements for petroleum activities, the Environment Plan (EP) and/or Oil Pollution Emergency Plan (OPEP) must demonstrate that through the implementation of all reasonable control measures, environmental risks have been reduced to a level that is As Low As Reasonably Practicable (ALARP).

With respect to hydrocarbon spill risk and response planning, this includes an assessment to demonstrate that the oil spill response control measures are reducing risk to a level that is ALARP.

This ALARP Assessment Framework provides a process to facilitate the identification of all existing and potential spill response control measures, the selection or rejection of which are supported by reasoned arguments.

1. Guidance Documents

Guidance documents used in the preparation of this framework include:

+ Oil Spill Risk Assessment and Response Planning Procedure QE-91-II-20003;
+ NOPSEMA Guidance Note ALARP N-04300-GN0166 Revision 6 June 2015;
+ NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271 Revision No 4 Last Reviewed 2020;
+ NOPSEMA Guideline Environment Plan Decision Making N-04750-GL1721 Revision 6 – November 2019;
+ NOPSEMA Guidance Note Risk Assessment GN0165 Revision 5 May 2017; and
+ NOPSEMA Oil Pollution Risk Management GN1488 Rev 2 February 2018

2. Overview

The ALARP Assessment Framework uses activity specific information to systematically assess existing and potential control measures and ensure that all practicable control measures are identified and documented.

When selecting controls to reduce risk is it good practice to apply a preferential order; elimination, substitution, prevention, reduction and mitigation. In the context of this ALARP Assessment Framework for oil spill response, all control measures are response strategies to reduce the impacts of an unplanned event that has already occurred. All source control response measures may be classed as 'reduction' in the hierarchy of controls with all other response measures classed as 'mitigation'.

The ALARP Assessment Framework is shown in **Figure 1**.

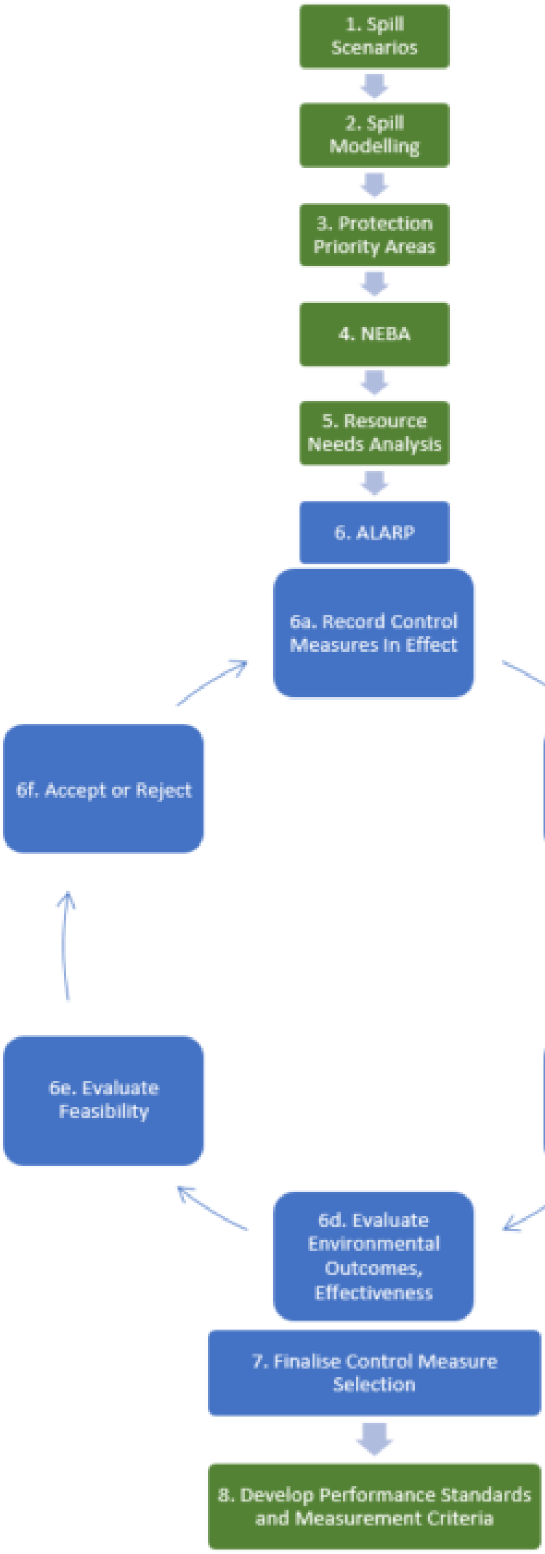


Figure 1: ALARP Assessment Framework

In **Figure 1**, Steps 1 to 5 (in GREEN) denote input information into the ALARP Assessment Framework. This information comprises:

Spill Scenarios: this step will involve assessing all possible spill scenarios from the activity and identifying the worst-case credible scenarios as a basis for pollution response planning.

Spill Modelling: a quantitative spill modelling assessment is conducted for the worst-case credible scenarios identified in Step 1.

Protection Priority Areas: the Environment that may be Affected (EMBA) is the largest area within which impacts from hydrocarbon spills associated with the activity could extend. The EMBA is predicted using spill modelling results from Step 2. Protection Priority Areas are locations of high ecological value within the EMBA that would be targeted in response. Selection of Protection Priority Areas is detailed in the Oil Spill Risk Assessment and Response Planning Procedure QE-91-II-20003

NEBA: Net Environmental Benefit Analysis (NEBA) is used to select the most effective response strategies to protect the Protection Priority Areas identified in Step 3.

Resource Needs Analysis: For the response strategies identified through NEBA, the worst-case resource, timing, and location requirements are determined, using quantitative spill modelling information where applicable. An Implementation Guidance is then developed to detail what arrangements and actions are required to be initiated by the Incident Management Team (IMT) to meet the incident requirements up to a worst-case incident.

Through the development of the Implementation Guidance, it may be possible to identify resource, timing and location requirements that could be improved. These areas of improvement should be noted in the ALARP so that additional, alternative or improved control measures can be considered in this context.

A detailed ALARP Assessment Framework for the evaluation of control measures is shown in **Figure 1**, Step 6 (in BLUE). Criteria and definitions used to evaluate control measures are shown in **Table 1**.

Record Control Measures In Effect: the spill response control measures currently in place for Santos Offshore are listed here. The environmental outcomes and effectiveness of the in-effect control measures are noted, using the Resource Needs Analysis to assess whether there are any areas of improvement. Environmental outcomes include potential harmful effects of control measures.

Identify Potential Additional Control Measures: potential control measures are identified, with a focus on any control measures that address areas of improvement identified in Step 6a.

Investigate Control Measure Categories: in-effect and potential control measures from Steps 6a and 6b are classified as either additional, alternative or improved, and as either people, system, equipment or procedures. This step serves as a prompt to ensure that potential control measures from all categories are explored.

Evaluate Environmental Outcomes, Effectiveness: the environmental outcomes and effectiveness are assessed for all control measures identified and described through Steps 6a, b and c.

Evaluate Feasibility: time, cost and effort required for implementation are assessed for all control measures identified and described through Steps 6a, b and c.

Accept or Reject: The potential control measure will be accepted or rejected on the basis of environmental outcomes and effectiveness described in Step 6d and whether cost is grossly disproportionate, as described in Step 6e.

When evaluating potential control measures, implementation plans of in-effect control measures are carefully considered to ensure that any accepted control measures will equal or improve Santos capacity to meet resource needs. Potential control measures are also considered within the context of current Santos response arrangements to determine if synergies or resource conflicts might occur.

As control measures are evaluated for selection or rejection, they can be compared with industry good practise to ensure that all practicable control measures were implemented. Where unique circumstances exist and further analysis is required, a different evaluation technique may be used, such as technical analysis, detailed cost benefit analysis or combination of approaches.

New information on risks, impacts and response strategies obtained through analysis of operations, exercises and scheduled documentation reviews can be incorporated into the ALARP Assessment Framework cycle in a process of continual improvement.

In **Figure B1**, Steps 7 and 8 show the conclusion of the ALARP Assessment Framework:

Finalised Control Measure Selection: outputs from the ALARP Assessment shown in Step 6 comprise finalised control measures (in BLUE).

Develop Performance Standards and Measurement Criteria: for each control measure finalised in Step 7, performance standards and measurement criteria are then developed and documented in the OPEP (in GREEN).

Performance standards for all accepted control measures should be written to enable the operator to measure, monitor and test effectiveness. Only the key aspects of any given control will require performance standards and these may include the various measures of effectiveness; functionality, availability, reliability, survivability, dependency and compatibility. Parameters set in the performance standard should be 'SMART'; specific, measurable, appropriate, realistic and timely.

Corrective action based on deviations or trends in performance should be taken by amending either the performance standard or the control measure, as appropriate.

3. Criteria and Definitions

Standardised criteria and definitions are used to bring consistency to the ALARP assessment across diverse activities and response strategies. Criteria and definitions are shown in Table B1.

Table 1: Criteria and Definitions of ALARP Assessment Framework

Column	Description
Strategy	Response Strategy
Control Measure	Aspect of Response Strategy being evaluated Description of the control measure that is In Effect or description of the potential control measure
In Effect, Alternative, Additional, Improved	In Effect control measures are already in place. Alternative control measures are evaluated as replacements for the control already in effect. Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures. Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures. Adapted from NOPSEMA Guideline Environment Plan Decision Making N-04750-GL1721 Revision 6 – November 2019
Control Measure Category	A range of different types of controls generally provide effective protection as they provide independence and multiple layers of protection. The OPGGS(S) regulations refer to technical and 'other' controls where technical control measures involve hardware like shutdown valves and alarms. 'Other' control measures include administrative and procedural control measures such as inductions, a drug and alcohol policy or an inspection regime. Industry practice has further developed this concept of a range of different types of controls based on a POiSTED framework to assess organisational capability: People – personnel

Column	Description
	System – organisation, information/communications, support facilities, training/ competency Equipment – equipment Procedures – doctrine Santos aims to implement a range of different types of controls where possible.
Environmental Outcomes	Assessment of environmental benefits, particularly those over and above those environmental benefits documented in the Control Measure that is in effect. Environmental impacts of the Control Measure are also considered here.
Effectiveness	The effectiveness of a Control Measure in reducing the risk to ALARP is evaluated using the following six criteria. <u>Functionality</u> The functional performance of a control measure is what it is required to do. How does the control perform in order to achieve the required risk reduction? <u>Availability</u> Probability that the control measure will be available when required and has not failed or is undergoing a maintenance or repair. <u>Reliability</u> The reliability of a control measure is the probability that at any point in time it will operate correctly for a further specified length of time. Reliability is all to do with the probability that the system will function correctly and is usually measured by the mean time between failure. <u>Survivability</u> Whether or not a control measure is able to survive a potentially damaging event such as fire or explosion is relevant for all control measures that are required to function after an incident has occurred. To achieve their purpose, oil spill response control measures should have high survivability. <u>Dependency</u> The dependency of the control measure is its degree of reliance on other systems in order for it to be able to perform its intended function. If several control measures can be disabled by one failure mechanism (common mode failure), or the failure of one control measure is likely to cause the failure of others, then the control measures are not independent and it may not be appropriate to count such measures as separate. <u>Several control measures are reliant on equipment, people and vessels, hence have high dependence.</u> <u>Compatibility</u> Whether or not a control measure is compatible takes into account how alternative control measures may interact with other controls and the rest of the facility, if introduced. Consideration should be given to whether new control measures are compatible with the facility and any other control measures already in use. Adapted from NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271 Revision No 4 Last Reviewed 2020
Feasibility	Feasibility describes the time, cost and/or effort required to implement the Control Measure.
Accept/ Reject	Outcome of assessment and key reasons for the decision

Appendix I: POLREP

Department of **Transport**

Marine Pollution Report (POLREP)

BEFORE completing this form please contact the MEER duty officer on (08) 9480 9924 (24hrs). Immediate reporting will enable a rapid response.

Return completed form to:
Maritime Environmental Emergency Response
Department of Transport
Email: marine.pollution@transport.wa.gov.au and rccaus@amsa.gov.au
Phone (08) 9480 9924
Fax: 1300 905 866

INCIDENT DETAILS

Date of Incident: ________________ Time of Incident *(24 hr format)*: ______________

Location name/description: ____

____

Incident Coordinates Latitude of spill ____________________________ Longitude of spill ____________________________

Format of coordinates used *(select one)* ☐ *Degrees & decimal degrees* ☐ *Degrees, minutes & decimal minutes* ☐ *Degrees, minutes & seconds*

Description of Incident: ____

____

____

____

____

POLLUTION SOURCE

☐ Vessel ☐ Land *(Specify)* ______________________ ☐ Other *(Specify)* ______________________ ☐ Unknown

Vessel type *(if known)* ☐ Tanker ☐ Container ☐ Bulk ☐ Cargo

☐ Fishing ☐ Defence ☐ Recreational ☐ Other *(Specify)* ______________________

Vessel name: ______________________ Flag State / Callsign: ________________ Australian vessel? ☐ Yes ☐ No

POLLUTANT

☐ **Oil** ***(type)*** ☐ Bilge ☐ Diesel ☐ HFO bunker ☐ Crude ☐ Unknown ☐ Other *(Specify)* ________________

☐ **Chemical** Name: ______________________________ MARPOL cat / UN Nos: ________________

☐ **Garbage** Details/description: ______________________________________

☐ **Packaged** Details/description: ______________________________________

☐ **Sewage** Details/description: ______________________________________

☐ **Other** Details/description: ______________________________________

EXTENT

Size of spill ***(length & width in metres):*** ______________________________________

Amount of pollutant, if known ***(litres):*** ______________________________________

Has the discharge stopped? ☐ Yes ☐ No ☐ Unknown

Weather conditions at site: ______________________________________

____

____

☐ **Photos taken** Details: ______________________________ held by: ________________

☐ **Video taken** Details: ______________________________ held by: ________________

☐ **Samples taken** Description: ______________________________ held by: ________________

☐ **Items retrieved** Description: ______________________________ held by: ________________

ADDITIONAL INFORMATION

Response action undertaken? ☐ Yes ☐ No If yes, provide details below, please include any environmental impact.

Equipment used? ☐ AMSA ☐ State / NT ☐ Industry

Is assistance for an investigation required from DoT ☐ Yes ☐ No

ORIGINAL REPORT SOURCE

Name:______________________ Position: ______________________ Phone: ______________________

Combat agency:______________________ Statutory agency: ______________________

SENDER DETAILS

Name:______________________ Agency: ______________________ Date:______________________

Phone: ______________________ Fax: ______________________ Email:______________________

PRIVACY STATEMENT

The Department of Transport is collecting the information on this form to enable it to carry out its role as Jurisdictional Authority as per WestPlan - Marine Oil Pollution.
The Department of Transport and/or AMSA may give some or all of this information to other government bodies, non-government organisations who have responsibilities under the National Plan, and law enforcement agencies.

Appendix J: SITREP

Marine Pollution Situation Report (SITREP)

Send completed form to:
Maritime Environmental Emergency Response
Department of Transport
PO Box 402 Fremantle , 6159
Email: marine.pollution@transport.wa.gov.au
and rccaus@amsa.gov.au
Fax: 1300 905 866

MARINE POLLUTION SITUATION REPORT (SITREP)

This is advice from the Control Agency of the current status of the incident and the response.

This form is transmitted to all relevant agencies including:

- Jurisdictional Authority
- Support Agencies

Incident Name: ______________________ **Ref. No.** ______________

Priority ☐ Urgent ☐ Immediate ☐ Standard

Final SITREP? ☐ Yes ☐ No Next SITREP on: ______________

Date: ______________ **Time:** ______________

POLREP Reference: ______________________

Incident location Latitude ______________ Longitude ______________

Brief description of incident and impact: ______________________

Overall weather conditions: ______________________

Summary of response actions to date: ______________________

Current Strategies:

Summary of resources available/deployed:

Expected developments:

Other Information:

SITREP Prepared By	Name:	
	Agency:	
	Role:	
	Contact	Telephone
		Fax
		Mobile
	No of Pages Attached:	

Appendix K: Vessel Surveillance Observer Log

Santos

Vessel Surveillance Observer Log – Oil Spill

Survey Details				
Date	Start time:	End Time:	Observers:	
Incident:			Area of Survey:	
Vessel:			Master:	
Weather Conditions				
Wind speed (knots):			Wind direction:	
Time high water and height (LAT):			Current direction:	
Time low water and height (LAT):			Current speed (nM):	
Tide during observations:			Sea state:	
Stage of tide during observations (incoming/falling):			Other weather observations:	

Slick Details									
Slick grid parameters by lat/long:					Slick grid parameters (vessel speed)		Slick grid dimensions: N/A		
Length Axis:		Width Axis:			Length Axis: N/A		Width Axis	Length	nm
Start Latitude		Start Latitude			Time (seconds)		Time (seconds)	Width	nm
Start Longitude		Start Longitude						Length	nm
End Latitude		End Latitude			Speed (knots)		Speed (knots)	Width	nm
End Longitude		End Longitude						Grid area	km^2
Code	Colour	%age cover observed	Total grid area		Area per oil code		Factor	Oil volume	
1	Silver			km^2		km^2	40-300 L/ km^2		L
2	Iridescent (rainbow)			km^2		km^2	300-5,000 L/ km^2		L
3	Discontinuous true oil colour (Brown to black)			km^2		km^2	5,000-50,000L/ km^2		L
4	Continuous true oil colour (Brown to black)			km^2		km^2	50,000 – 200,000 L/ km^2		L
5	Brown / orange			km^2		km^2	>200,000 L/ km^2		L

Santos

Timeline of observations:

Time	Description

Appendix L: Aerial Surveillance Observer Log

Santos

Aerial Surveillance Observer Log – Oil Spill

Survey Details				
Date:	Start time:	End Time:	Observer/s:	
Incident:			Area of Survey:	
Aircraft type:	Call sign:		Average Altitude:	Remote sensing used:

Weather Conditions	
Wind speed (knots)	Wind direction
Cloud base (feet)	Visibility
Time high water	Current direction
Time low water	Current speed (nM)

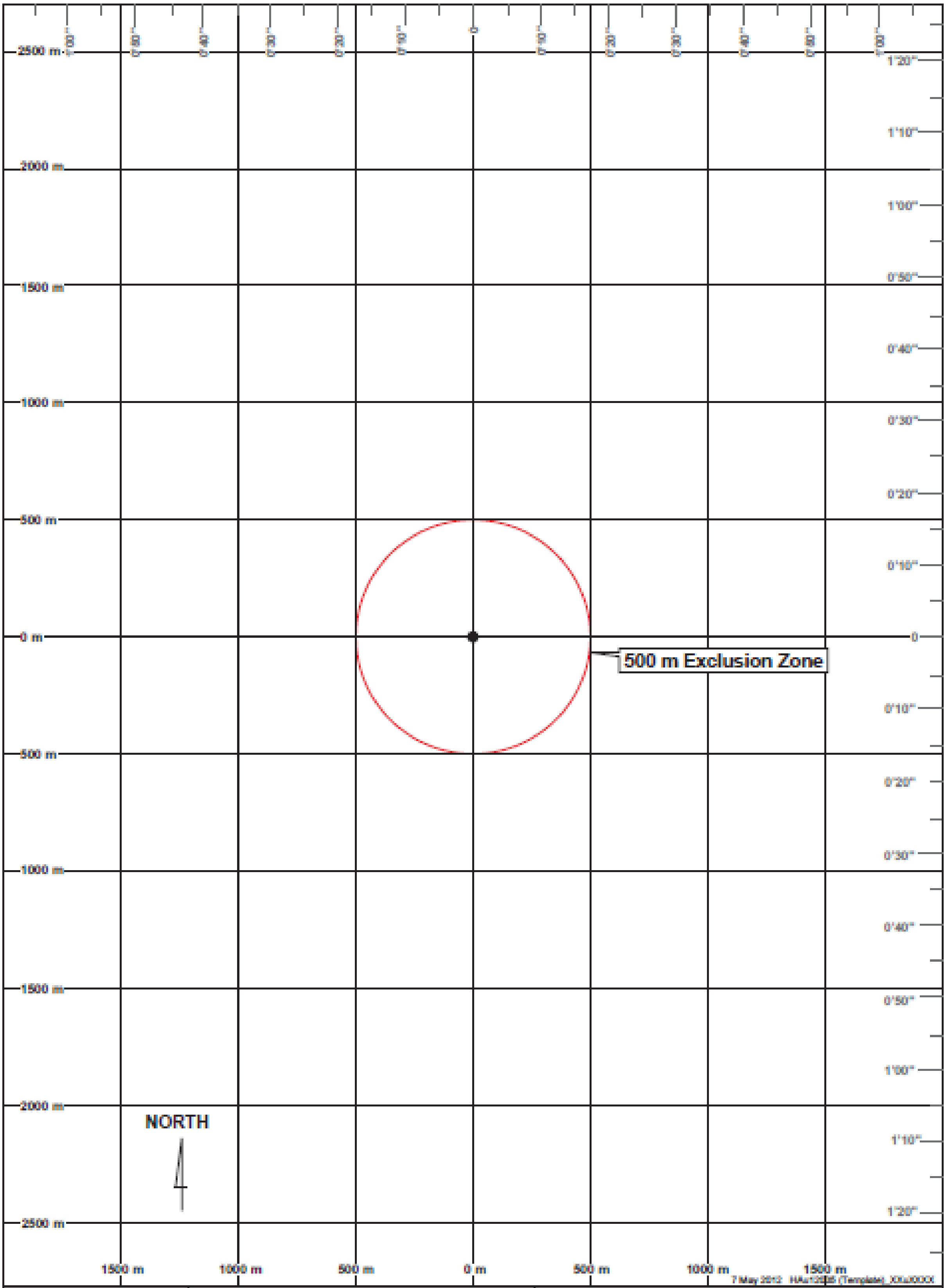
Santos

Slick Details						
Slick grid parameters (lat/long)		Slick grid parameters (air speed)		Slick grid dimensions		
Length Axis	Width Axis	Length Axis		Width Axis	Length	nm
Start Latitude	Start Latitude	Time (seconds)		Time (seconds)	Width	nm
Start Longitude	Start Longitude				Length	nm
End Latitude	End Latitude	Air Speed (knots)		Air Speed (knots)	Width	nm
End Longitude	End Longitude				Grid area	km^2

Code	**Colour**	**% cover observed**	**Total grid area**		**Area per oil code**		**Factor**	**Oil volume**	
1	Silver			km^2		km^2	40-300 L/ km^2		L
2	Iridescent (rainbow)			km^2		km^2	300-5,000 L/ km^2		L
3	Discontinuous true oil colour (Brown to black)			km^2		km^2	5,000-50,000L/ km^2		L
4	Continuous true oil colour (Brown to black)			km^2		km^2	50,000 – 200,000 L/ km^2		L
5	Brown / orange			km^2		km^2	>200,000 L/ km^2		L

Appendix M: Aerial Surveillance Surface Slick Monitoring Template

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



	NAME:	VESSEL / AIRCRAFT:
	DATE / HOUR:	OTHER REFERENCE:

Appendix N: Bonn Agreement on the Classification of Oil Thickness

Appearance Of Oil On Water

Bonn Agreement Oil Appearance Code

At the thirteenth National Plan Operations Group meeting the Bonn Agreement Oil Appearance Code was adopted as the standard method for assessing the volume of oil on water for the purposes of response and prosecution.

The Bonn Agreement Oil Appearance Code is explained in the following pages, taken from Annex A of the Bonn Agreement Aerial Surveillance Handbook, 2004. The full Handbook can be downloaded from the Bonn Agreement website:
http://www.bonnagreement.org/eng/html/welcome.html.

THE BONN AGREEMENT OIL APPEARANCE CODE

1. The Theory of Oil Slick Appearances

1. The visible spectrum ranges from 400 to 750 nm (0.40 – 0.75 μm). Any visible colour is a mixture of wavelengths within the visible spectrum. White is a mixture of all wavelengths; black is absence of all light.

2. The colour of an oil film depends on the way the light waves of different lengths are reflected off the oil surface, transmitted through the oil (and reflected off the water surface below the oil) and absorbed by the oil. The observed colour is the result of a combination of these factors; it is also dependant on the type of oil spilled.

3. An important parameter is optical density: the ability to block light. Distillate fuels and lubricant oils consist of the lighter fractions of crude oil and will form very thin layers that are almost transparent. Crude oils vary in their optical density; black oils block all the wavelengths to the same degree but even then there are different 'kinds of black', residual fuels can block all light passing through, even in thin layers.

2. The Bonn Agreement Oil Appearance Code

4. Since the colour of the oil itself as well as the optic effects is influenced by meteorological conditions, altitude, angle of observation and colour of the sea water, an appearance cannot be characterised purely in terms of apparent colour and therefore an 'appearance' code, using terms independent of specific colour names, has been developed.

5. The Bonn Agreement Oil Appearance Code has been developed as follows:
• In accordance with scientific literature and previously published scientific papers,
• Its theoretical basis is supported by small scale laboratory experiments,
• It is supported by mesoscale outdoor experiments,
• It is supported by controlled sea trials

6. Due to slow changes in the continuum of light, overlaps in the different categories were found. However, for operational reasons, the code has been designed without these overlaps.

7. Using thickness intervals provides a biased estimation of oil volumes that can be used both for legal procedures and for response.

8. Again for operational reasons grey and silver have been combined into the generic term 'sheen'.

9. Five levels of oil appearances are distinguished in code detailed in the following table:

Code Description - Appearance Layer Thickness
Interval (µm)
Litres per km2
1 Sheen (silvery/grey) 0.04 to 0.30 40 – 300
2 Rainbow 0.30 to 5.0 300 – 5000
3 Metallic 5.0 to 50 5000 – 50,000
4 Discontinuous True Oil Colour 50 to 200 50,000 – 200,000
5 Continuous True Oil Colour 200 to More than 200 200,000 - More than 200,000

10. The appearances described cannot be related to one thickness; they are optic effects (codes 1 - 3) or true colours (codes 4 - 5) that appear over a range of layer thickness. There is no sharp delineation between the different codes; one effect becomes more diffuse as the other
strengthens. A certain degree of subjective interpretation is necessary when using the code *and any choice for a specific thickness within the layer interval MUST be explained on the Standard Pollution Observation Log*.

3. Description of the Appearances

3.1 Code 1 – Sheen (0.04 µm – 0.3 µm)

11. The very thin films of oil reflect the incoming white light slightly more effectively than the surrounding water (Figure 1) and will therefore be observed as a silvery or grey sheen. The oil film is too thin for any actual colour to be observed. All oils will appear the same if they are present in these extremely thin layers.

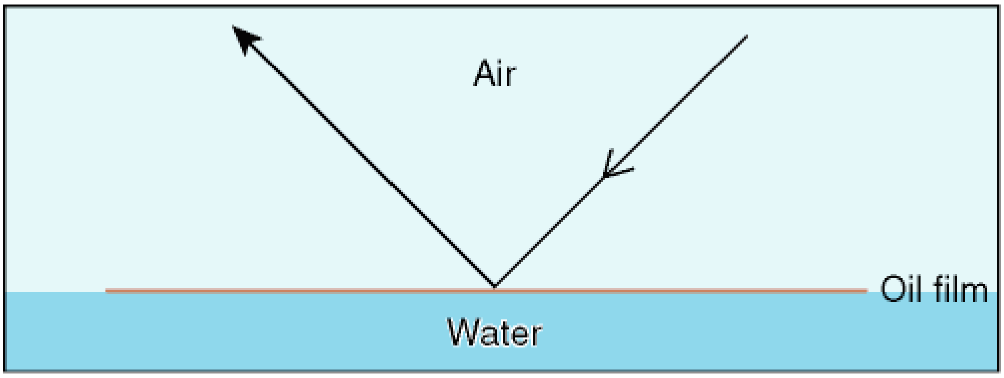


Figure 1. Light Reflecting From Very Thin Oil Films

12. Oil films below approximately 0.04-µm thickness are invisible. In poor viewing conditions even thicker films may not be observed.

13. Above a certain height or angle of view the observed film may disappear.

3.2 Code 2 – Rainbow (0.3 µm – 5.0 µm)

14. Rainbow oil appearance represents a range of colours: yellow, pink, purple, green, blue, red, copper and orange; this is caused by constructive and destructive interference between different wavelengths (colours) that make up white light. When white light illuminates a thin film of oil, it is reflected from both the surfaces of the oil and of the water (Figure 2).

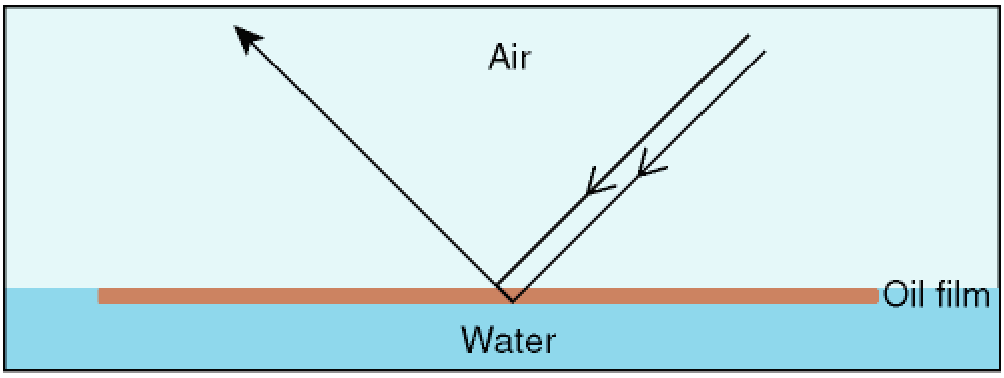


Figure 2. The Rainbow Region

Sheen and Rainbow

15. Constructive interference occurs when the light that is reflected from the lower (oil / water surface combines with the light that is reflected from the upper (oil / air) surface. If the light waves reinforce each other the colours will be present and brighter (Figure 3).

Figure 3. Constructive Interference

16. During destructive interference the light waves cancel each other out and the colour is reduced in the reflected light and appears darker (Figure 4).

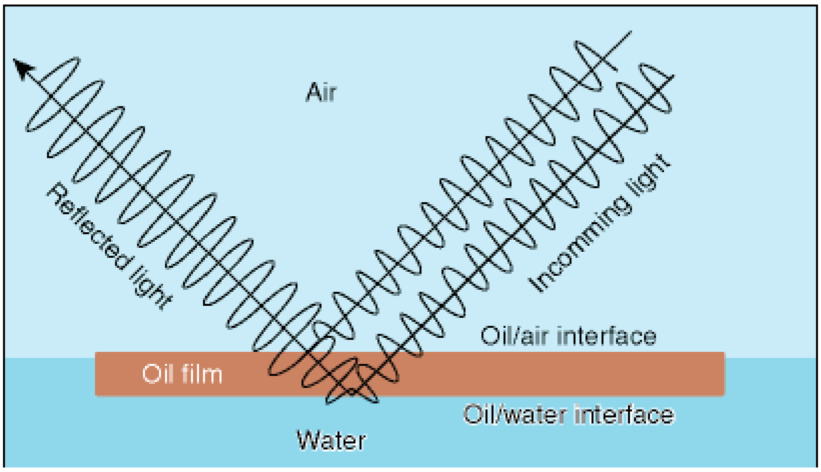


Figure 4. Destructive Interference

17. Oil films with thicknesses near the wavelength of different coloured light, 0.2 µm – 1.5 µm (blue, 400nm or 0.4 µm, through to red, 700nm or 0.7 µm) exhibit the most distinct rainbow effect. This effect will occur up to a layer thickness of 5.0 µm.

18. All oils in films of this thickness range will show a similar tendency to produce the ‘rainbow’ effect.

19. A level layer of oil in the rainbow region will show different colours through the slick because of the change in angle of view. Therefore if rainbow is present, a range of colours will be visible.

3.3 Code 3 – Metallic (5.0µm – 50 µm)

20. The appearance of the oil in this region cannot be described as a general colour. The true colour of the oil will not be present because the oil does not have sufficient optical density to block out all the light. Some of the light will pass through the oil and be reflected off the water surface. The oil will therefore act as a filter to the light
(Figure 5).

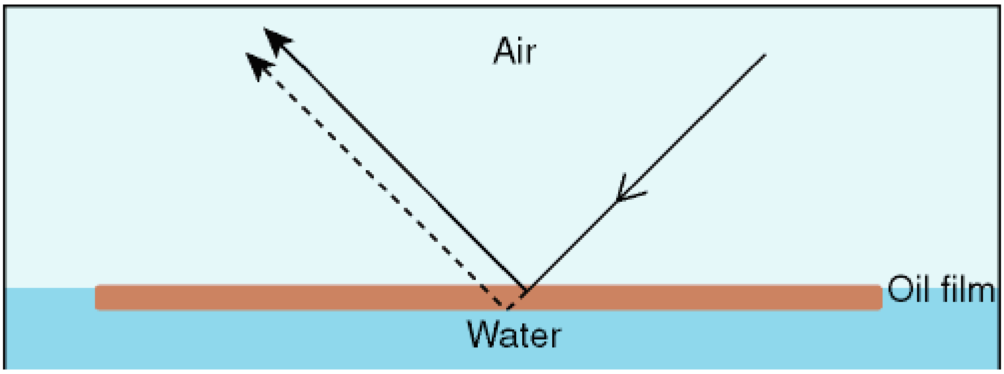


Figure 5. The Metallic Region

21. The extent of filtering will depend on the optical density of the oil and the thickness of the oil film.

22. The oil appearance in this region will depend on oil colour as well as optical density and oil film thickness. Where a range of colours can be observed within a rainbow area, metallic will appear as a quite homogeneous colour that can be blue, brown, purple or another colour. The ‘metallic’ appearance is the common factor and has been identified as a mirror effect, dependent on light and sky conditions. For example blue can be observed in blue-sky.

Metallic, with Sheen and Rainbow

3.4 Code 4 – Discontinuous True Colours (50 µm – 200 µm)

23. Code 4 is intermediate between Code 3 and Code 5, and consists of small areas, or patches, of Code 5, Continuous True Oil Colour in a background of Code 3, Metallic. This is an accurate description of the behaviour of the oil layer – it does not spread as an even thickness layer, but consists of thicker patches in a thinner layer.

Observation of Code 4

24. On a number of occasions aircrews have reported difficulty seeing DCTC both in field trials, Bonnex 2002, and operationally. The following explanation with regard to the problem is an extract from a recent report by Alun Lewis:

25. 'Code 4 is intermediate between Code 3 and Code 5; it is a hybrid of Codes 3 and 5. "Discontinuous" refers to the Code being used to describe patches of Code 5 - Continuous True Oil Colour against a background of Code 3 - Metallic. The size of the thicker oil (Code 5 – Continuous True Oil Colour) patches that can be seen will depend on the distance from which they are observed and the visual acuity of the observer.

26. Visual acuity refers to the clarity or clearness of one's vision, a measure of how well a person sees. The word "acuity" comes from the Latin "acuitas," which means sharpness. A person with normal, or average, visual acuity can correctly identify a 9 mm high black letter on a white background on a standard Snellen eye chart that subtends 5 minutes of arc (0.04167°) at a distance of 6 metres (the standard distance for eye tests). They can discriminate the shape of the letter and can therefore easily see a black line or dot that subtends half this angle, 2.5 minutes of arc (0.0208º). A person with normal visual acuity would therefore have no difficulty in seeing individual 4 mm diameter black dots on a white background from a distance of 6 metres.

27. As was demonstrated at the BONNEX 2002 and NOFO 2006 Oil on Water Exercise, observers in small boats, who looked at the spilled oil from a distance of a metre or so, were

able to easily see small patches of Code 5 in a background of Code 3 and reported this as Code 4 -
Discontinuous True Oil Colour.

28. Surveillance aircraft conducting visual observations of oil slicks on the sea surface normally operate at altitudes of approximately 500 ft, 1500 ft or 2500 ft. The equivalent sizes of a black dot that could be seen on a white background by a person with normal acuity vision would be 110 mm, 330 mm and 550 mm from these altitudes. In addition, the contrast between black and white will normally be a lot more than the contrast between the true colour of an oil (black or brown) and the metallic, almost mirror-like effect and appearance of oil of the Code 3 thickness. Observers in aircraft will not be able to see small patches of Code 5 in a background of Code 3, but should be able to see much larger patches of Code 5, perhaps 0.5 to 1 metre across, in a background of Code 3.

29. From an aircraft, the appearance of a slick containing a large area of Code 4 - Discontinuous True Oil Colour – composed of individually small areas of Code 5 - Continuous True Oil Colour against a background of Code 3 – Metallic - will therefore be a function of the concentration of the Code 5 patches. At low concentrations (5 to 10% of the total area) they will probably be invisible and the area will be observed as Code 3 – Metallic. At some increased concentration (perhaps 40 or 50% of the total area), the appearance of that area of the slick will probably 'flip' from being all Code 3 – Metallic to being all Code 5 - Continuous True Oil Colour.'

30. In addition, to the issue of visual acuity, the human brain needs sufficient time to register and interpret what the eye sees; going lower to solve the height/distance (visual acuity) difficulty will only reduce the time available due to the increase in the relative speed of the aircraft to the object.

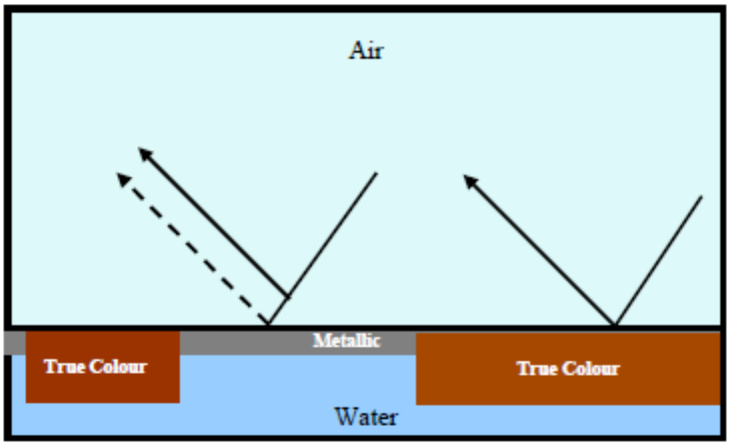


Figure 6a. The Discontinuous True Colour Region Plan (Overhead) View

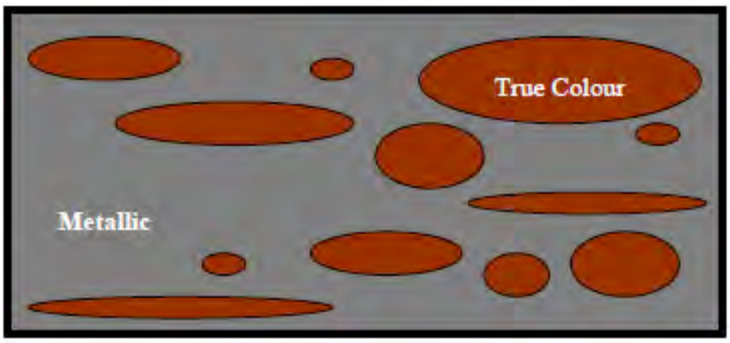


Figure 6b. The Discontinuous True Colour Region

31. For oil thicker than 50 μm the light is being reflected from the oil surface rather than the sea surface (Figure 7). The true colour of the oil will gradually dominate the colour that is observed. Brown oils will appear brown, black oils will appear black.

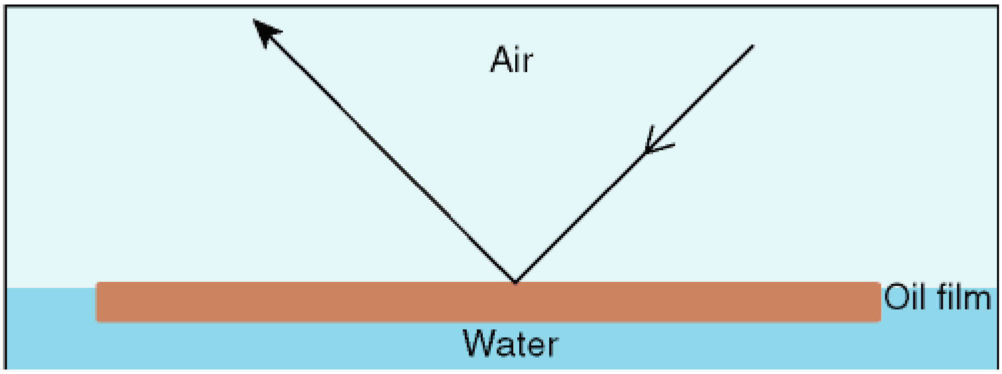


Figure 7. Thick Oil Films

3.5 Code 5 – True Colours (>200 μm)

32. The true colour of the specific oil is the dominant effect in this category and the area will be generally homogenous (continuous). It is strongly oil type dependent and colours may be more diffuse in overcast conditions.

33. There is no maximum thickness value for True Colours since it is not possible by visual observation from above to estimate the thickness of oil layers above 200 microns. A spilled oil layer on water that is 0.5 mm thick will look, from the top, exactly the same as an oil layer that is several millimetres thick. The light is reflected from the top surface of the oil; this gives information about the colour and texture of the surface of the oil, but cannot give any direct information about the thickness of the oil layer.

True colour

4. Local Variation of Oil Film Thickness at Sea

34. When observing oil in wave conditions on the sea the thickness of a layer of oil on water at a particular location will not remain constant. The sea surface is not static and is often a dynamic environment.

35. As a non-breaking wave passes underneath the oil slick, the oil layer will be:

- Stretched and thinned on the wave crest
- Compressed and thickened in the wave trough

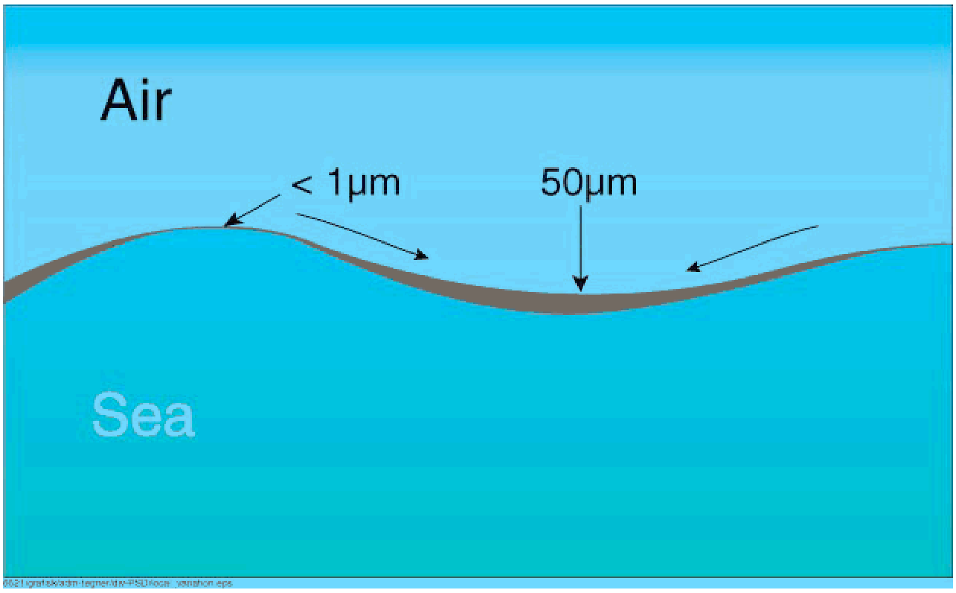


Figure 8 Local Variations of Oil Film Thickness at Sea

36. An area of oil that is of a thickness that is close to the minimum or maximum thickness of a particular BAOAC Code may therefore appear to alternate between two BAOAC Codes.

37. If there are breaking waves, the situation is more extreme. As the breaking wave passes through the oil slick, the area of oil affected by the wave will be temporarily dispersed below the surface as large oil droplets. The area of water surface will be temporarily cleared of oil. The large oil droplets will then rapidly re-surface and, as they reach the water surface, will rapidly spread out to form a layer of oil of rapidly diminishing thickness.

38. **The oil layer thickness, and the BAOAC Codes associated with the particular thickness, will therefore not be constant when waves are present.**

5. Emulsion

39. Spills of crude oil and some fuel oil are frequently attended by the rapid formation of water-in-oil emulsions (mousse) which are often characterised by a brown / orange colouration and a cohesive appearance. The Appearance Code SHOULD NOT be used to quantify areas of emulsion.

40. Reliable estimates of water content in an ‘emulsion’ are not possible with out laboratory analysis, but accepting that figures of 50% to 80% are typical, approximate calculations of oil quantity can be made, given that most floating emulsions are 1 mm or more thick.

6. Supplementary Oil Thickness Data

41. As there is no maximum thickness value for Code 5, True Colour, since it is not possible by visual observation from aircraft to estimate the thickness of oil layers above 200 µm, the overall estimated maximum oil volume will **‘always’ be prefixed as being ‘more than’ or ‘at least’ so many metric tonnes.** To improve the estimated maximum value it is recommended that ‘supplementary oil thickness data’ or ‘ground truth’ on the ‘true colour’ areas should be used to calculate volumes.

Appendix O: Aerial Surveillance Marine Fauna Sighting Record

OIL SPILL SURVIELLANCE - MARINE FAUNA SIGHTING RECORD SHEET

Date:		**Time:**	
Latitude:		**Longitude:**	

MARINE FAUNA ID GUIDE


○ Humpback whale


○ Blue whale


○ Minke whale


○ Sperm whale


○ Killer whale


○ Bryde's whale

○ Whale species unknown


○ Bottlenose dolphin


○ Spinner dolphin

○ Dolphin species unknown


○ Whale shark


○ Dugong


○ Hawksbill turtle


○ Loggerhead turtle


○ Green turtle


○ Flatback turtle


○ Leatherback turtle

○ Turtle species unknown

Santos

FAUNA DETAILS					
Category	**Type/species?** **Adult/juvenile?** **ID confidence?**	**Number**	**Date/Time**	**Photo/ video taken?** **Reference No.**	**Behaviour / Comments.** **Proximity to oil? Oiled?** **Milling? Feeding? Transiting?**
Cetaceans (Whales/ Dolphins)					
Turtles					
Birds					
Dugongs					
Sharks					
Other					

Santos

Other details for each observation location
WEATHER DETAILS
Sea State ◯ Mirror calm ◯ Small waves ◯ Slight ripples ◯ Large waves some whitecaps ◯ Large waves, many whitecaps **Visibility** ◯ Excellent ◯ Good ◯ Moderate ◯ Poor ◯ Very Poor

OBSERVER DETAILS		
Observer Name	Observer signature	**Observer** ◯ Inexperienced ◯ Experienced

Appendix P: Aerial Surveillance Shoreline Observation Log

Santos

Aerial Surveillance Reconnaissance Log – Oil Spill

Survey Details							
Incident:	Date:	Start time:	End Time:	Observer/s:			
Area of Survey							
Start GPS LATITUDE: LONGITUDE:				End GPS LATITUDE: LONGITUDE:			
Aircraft type	Call sign			Average Altitude		Remote sensing used (if any)	
Weather Conditions							
Sun/Cloud/Rain/Windy		Visibility			Tide Height L/M/H		
Time high water		Time low water			Other		
Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present							
	Rocky Cliffs		Boulder and cobble beaches		Sheltered tidal flats		
	Exposed artificial structures		Riprap		Mixed sand and gravel beaches		
	Inter-tidal platforms		Exposed tidal flats		Fine-Medium sand grained beaches		
	Mangroves		Sheltered rocky shores		Other		
	Wetlands		Sheltered artificial structures				
Operational Features (tick appropriate box)							
	Direct backshore access		Alongshore access		Suitable backshore staging		
Other							

Appendix Q: FWADC Joint Standard Operating Procedures

AMOSC
Australian Marine
Oil Spill Centre Pty Ltd

Fixed Wing Aerial Dispersant Operational Plan
FWADOps Plan

Purpose of this Document

This document provides guidance to the Petroleum Industry Titleholders regarding the aerial dispersant fixed wing operations during a marine oil spill response – based on three sectors in the South, West and Northern reaches of Australia.

Exercise and Review periods

Exercising

This plan will be exercised at least annually in accordance with petroleum titleholder oil pollution emergency plans.

Review

This plan will be reviewed and updated by AMOSC initially six months after release. Then following an incident, relevant legislation changes, or at least once every three years.

Version	Date		Reviewed by	Approved by
V1.0	10 Aug 20		PM; AFR	NQ

TABLE OF CONTENTS

ACRONYMS

AIIMS	Australasian Inter-Service Incident Management System
AMOSC	Australian Marine Oil Spill Centre
AMOSplan	Australian Marine Oil Spill Plan
AMSA	Australian Maritime Safety Authority (Commonwealth)
ADC	Aerial Dispersant Capability
AFR	Aerotech First Response
AAS	Air Attack Supervisor
AASC	Air Attack Supervisor Capability (ref AMSA Contract 13AMSA115-1)
CTAF	Common Traffic Advisory Frequencies
DoT	Department of Transport
ERSA	En Route Supplement Australia
FOB	Forward Operating Base
FWAD	Fixed Wing Aerial Dispersant
FWADC	Fixed Wing Aerial Dispersant Commander
IAP	Incident Action Plan
ICC	Incident Command Centre
IC	Incident Controller
IMT	Incident Management Team
JSOP	Joint standard Operating Procedure
MSL	Mean Sea Level
MOP	Marine Oil Pollution
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority (Commonwealth)
NEBA	Net Environmental Benefit Analysis
OPEP	Oil Pollution Emergency Plan
OSR	Oil Spill Response
OWR	Oiled Wildlife Response
PPE	Personal Protective Equipment
RCC	Rescue Co-ordinator Centre
SAR	Search and Rescue
SIMA	Spill Impact Mitigation Analysis
SIMOPS	Simultaneous Operations
TDA	Temporary Danger Area
TH	Title Holders
VLAT	Very Large Air Tanker

GLOSSARY OF TERMS

For clarity and in the context of this document:

Commonwealth Waters	Means any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia that is not State or Territory waters.
National Plan	The National Plan for Maritime Environmental Emergencies and all policy, guidance and advisory documents produced and published in support
Skill Level	Means the level of training required by personnel to fill an identified function/s
Petroleum Industry	Means the oil and gas companies operating in Commonwealth and/or State waters
Responsible Party	Means the entity that has been identified as owning or having the legal responsibility for the ship or facility that caused the incident
State Waters	Means any part of the sea, including the waters, seabed, and airspace within 3 nautical miles of the territorial sea base line

"**Activation**" means a phase of service delivery, notification of which commences a four (4) hour response time requirement.

"**Aerodrome**" means any aerodrome or aircraft landing area which is operationally suitable for use by Aircraft.

"AFR" Aerotech 1st Response

"**Aircraft**" means an aircraft that may be used by the Contractor to perform the Contract and includes the associated Flight Crew unless otherwise specified.

"**Aircraft Register**" means that document that records the details of Secondary Aircraft that may be utilised by the Contractor.

"AMOSC" Australian Marine Oil Spill Centre

"AMSA" Australian Maritime Safety Authority

"**Available**" means that an Aircraft is able to be airborne with all equipment and Flight crew required by this Contract if given notice of Activation.

"Contract Holder" means AMSA

"**Fixed Wing Aerial Dispersant Capability** (**or FWADC)"** means a system that allows chemical oil pollution dispersant to be delivered over water from fixed wing aircraft.

"**Flight Crew**" means any pilot or other person required by law to crew Aircraft so that it can legally operate.

"**Liaison Officer**" means those Personnel provided to supervise AFR Aircraft operations.

“**Loading Crew**” means those Personnel provided to assist with AFR Aircraft operations.

“**Normal Home Base**” means the usual place at which an Aircraft is located, as advised by the Contractor from time to time.

“**Operating**” means a phase of service delivery during which Aircraft are in flight, commencing from each take-off roll and concluding at the end of roll out from each landing, and including unimpeded dispersant loading operations.

"**Personnel**" means all the Contractor’s employees, sub-contractors, sub-contractor’s employees, agents or other staff by whatever means of engagement.

“**Primary Aircraft**” means those Aircraft that the Contractor nominates to be Available 24 hours a day, seven days a week.

“**Secondary** Aircraft” means those Aircraft that are listed in the Aircraft Register and are able to be made Available by the Contractor.

“**Standby**” means a phase of operation during which Primary Aircraft are required to be Available.

1. INTRODUCTION

The National Plan (NatPlan) sets out the guidance on conducting an aerial dispersant operation in Commonwealth waters. This plan sets out the management arrangements for implementing an aerial operation for Titleholders (TH) and is explicit in its appendices where 3 sub-regions are identified and receive focussed plans. These focussed plans are located in intensive petroleum offshore fields and therefore support the TH's operating in these areas – the plans are also relevant to any shipping-based requirements for an aerial operation.

This plan also supports the current (2020) Fixed Wing Aerial Dispersant (FWAD) Contract which from April 20 includes the Air Attack Supervisor service provision, held by AMSA, with 50% financial support from AMOSC.

1.1 Scope

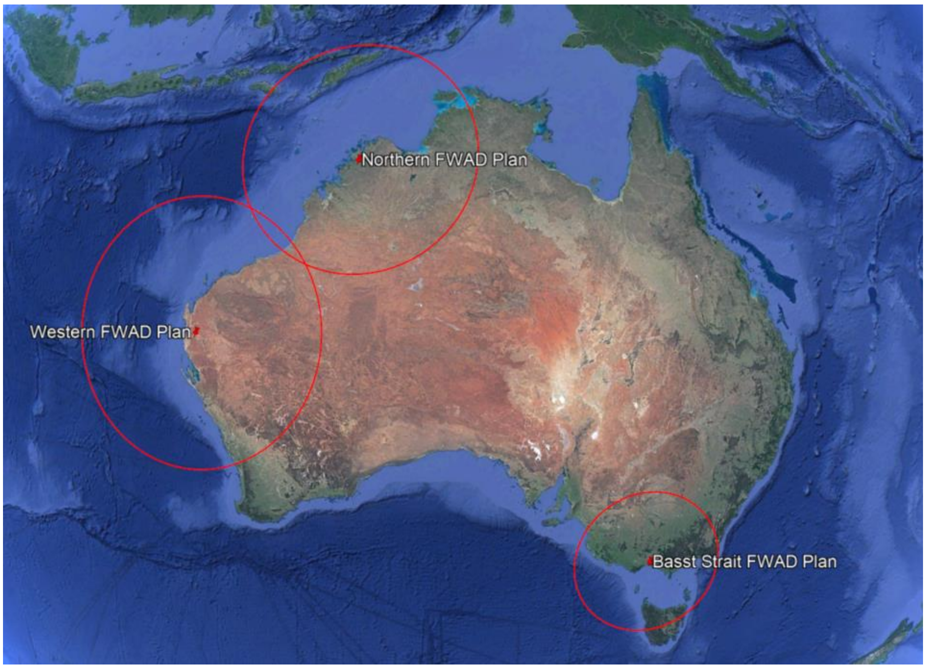
The FWADOps Plan applies to all instances of aerial dispersant operations in Commonwealth Waters where petroleum titleholders are located. The Plan details the legislative responsibilities, relationships to other plans, roles and responsibilities, air operations division structure, standards and best practice procedures for FWAD Operations. Subordinate to, and providing a regional context and detail for the FWADOps plan, are the three regional sectored operational plans:

- Bass Strait
- Western Region
- Northern Region

These three regional operational plans outline detailed 'on ground' regional information required to carry out FWAD Operation, identified facilities, equipment, resource and contact lists.

The geographical and operational areas covered by the FWADOps Plan and each of the three regional sub-plans are depicted in figure 1.

Figure 1: Regional Operational Plan Boundaries



1.2 Plan Objectives

The objectives of the FWADOps plan include:

- Provide a standardised operation for industry based FWAD operations within Australia in order to apply dispersant to marine oil spill incidents
- Develop skills and knowledge across petroleum industry members to ensure FWAD operations can be undertaken safely, effectively and efficiently
- Address community and regulatory expectations for FWAD operations during a spill
- Provide the framework to integrate FWAD operations between national and international assets during a marine oil spill Incident

This FWAD Operations plan covers the processes involved in successfully conducting an aerial dispersant operation, primarily driven by AMOSC for an industry-based spill. The fixed wing aerial dispersant capability (FWADC) is designed to utilize agricultural spray aircraft (air tractors) to deploy dispersant offshore to an oil spill with aircraft sourced by Aerotech First Response (AFR).

The FWADC contract has been developed jointly by AMSA, AFR and AMOSC to guarantee aircraft availability Australia wide, 24/7/365.

1.3 Current System

1.3.1 Background, objectives, and scope

The Australian Maritime Safety Authority (AMSA) as Manager of Australia's National Plan for Maritime Environmental Emergencies (the National Plan), in conjunction with the Australian Marine Oil Spill Centre (AMOSC), developed the Fixed Wing Aerial Dispersant Capability (FWADC) in 1996 for aerial dispersant operations conducted in the marine environment. The FWADC is jointly funded (50/50) by AMSA and AMOSC

This Operational Plan describes how an operation will be conducted; the enclosed Operational Plans describe the detail around three regional geographic scenarios particular to the offshore exploration & production industry. It is contingent to the FWAD Contract being activated but remains separate to the FWAD Contract – the Operational Plan supports the AMOSC/AFR Operational Contract.

The FWADC now incorporates (from April 2020) provision for an Air Attack Supervisor to be a part of the service delivery by Aerotech First Response (the Contractor).

The Joint standard Operating Procedure (JSOP) provides mutual guidance and understanding around key responsibilities and procedures that each of the Parties to the Contract are required to provide.

The JSOP is subordinate to the FWAD Contract.

1.3.2 Operational policies and constraints

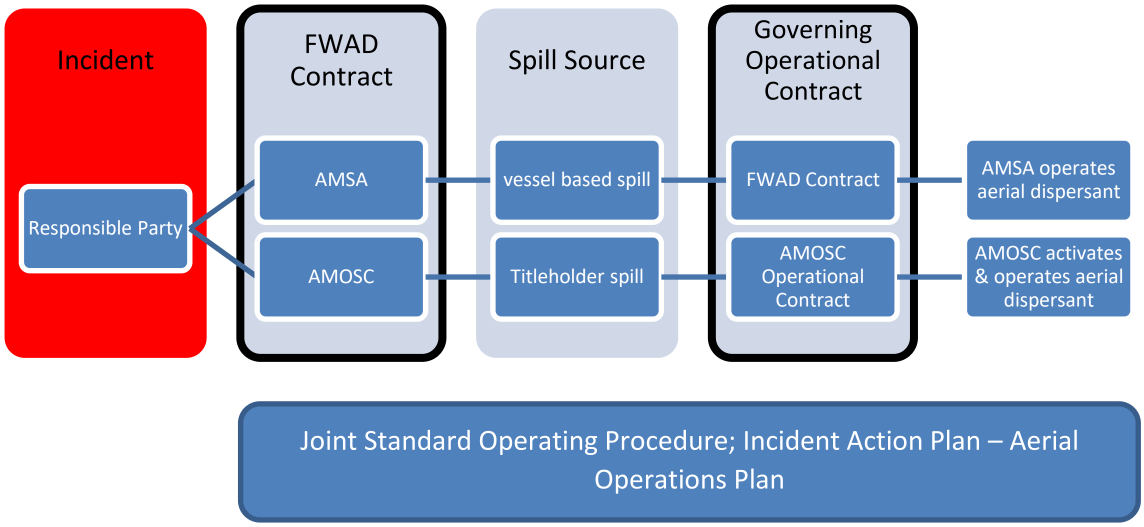
AMSA is the Contracting Entity for the FWAD Contract – AMOSC is a 50% partner in the Contract.

Activation; AMSA currently (May 20) is the only party who can activate the Contract – AMOSC is dependent on routing activation needs through the RCC.

Operation; for an industry-based spill, AMOSC will invoke an Operational Contract once the FWAD Contract has been activated and the requisite aircraft placed at the airfield. The OpCon will be established between AMOSC and AFR and allow termination of the FWAD Contract while enabling AMOSC to commence operating aircraft. This addresses a gap for industry where shipping-based spills were always addressed by AMSA, however industry spills required the Responsible Party to take up a Contract with the provider(s) to continue operating the aircraft.

The current JSOP will compliment this Operational Plan.

Figure 1



1.3.3 Description of current system or situation

The current document that describes the roles and responsibilities is the "Fixed wing aerial dispersant capability joint standard operating procedure v1.2" (FWADC JSOP v1.2). This JSOP focuses on AMSA's processes and documentation repositories, while the purpose of this Plan is to provide those processes/documentation for an industry-based spill.

Certain roles will always be the responsibility of AMSA (SAR, for example) however, the entire operational component from the front line through to the IMT can be performed by AMOSC sourced capacity.

1.3.3.1 Current FWAD Contract

The FWAD Contract makes provisions for the sourcing of Air Tractor 502 (Victoria) and 802, or Thrush models from six independent airfields around Australia. The Contract is a call-off Contract to have all aspects of preparedness and initial response on a 4-hour standby notice 24/7/365. Specifically, the aircraft Contractors are required to undertake the following functions to ensure Contract fidelity – this is annually audited by AMSA & AMOSC;

NOTE; the current Contract ensures that at each airfield, the competencies are maintained to ensure 24/7/365 coverage for each of the six designated aircraft – therefore any extra aircraft required to support an offshore operation, each of the following functions will be required to be satisfied prior to use i.e. pilot competencies flying over water.

The following table summarises key aspects of the FWAD Contract.

Table xx – Summary of the FWAD Contract Key Performance Indicators

i. Operations

FWADC Availability	Ensure that nominated aircraft/s have 100% availability to respond to any Marine Incident on a 24 hours per day / 7 days a week basis as directed by AMSA
Response Times	Meet or exceed the emergency response times. The response times are: (a) available to fly within 4 hours. (b) advise within 30 minutes what time the nominated aircraft will be able to commence operations at the nominated airfield and any limitations. (c) advise within 60 minutes advise a time at which all other primary aircraft will be able to commence operations at the nominated airfield and what time the relevant ground crew will be on site and the nominated airfield; and (d) advise within 90 minutes what time the relevant ground crew will be on site and the nominated airfield.
Safety Equipment	Aircraft survival equipment maintained and held in readiness for activation
Communication/ Guidance and positioning equipment	Aircraft communication, guidance and positioning equipment is fitted to Aircraft and functional in accordance with Contract requirements.
Flight personnel	Flight personnel to maintain endorsements and training qualifications as required by CASA and contract conditions.
Ground Personnel	Flight personnel to maintain endorsements and training qualifications as required under the contract conditions.
Certification of Aircraft	Certificates, exemptions, supplements, flight manuals, endorsements and approvals readily accessible to all aircraft.

ii. Safety & Environment

Quality Management Accreditations and Systems	Maintain accreditation in: • ISO 9001:2008 - Quality Management Systems • AS/NZS 4801:2001 - Occupational Health & Safety Management Systems • ISO 14001:2004 - Environmental Management Systems

WHS & Environment Incident Reporting	Provide WHS & environmental incident and near miss reporting in the specified timeframes (will be specifies within the Joint Standard Operating Procedures (to be developed and agreed by both parties once contract has been appointed.

iii. Training

Training Management Plan	Provide an updated Training Management Plan as part of the Annual Review process
Training Program	Review and revise the Training Program on a twice annual basis to ensure its continuing currency and suitability.
Skills, Training and Competence Matrix	Maintain an accurate Skills, Training and Competence Matrix for the flight and ground crew.
Crew Training	Ensure all flight and ground crews have been trained in accordance with the approved Training Program and Skills, Training and Competence Matrix
Activation Drills	Plan and deliver two activation drills annually

iv. Corporate Performance

Contract Management Plan	Undertake Contract Management in accordance with the approved Contract Management Plan. Provide an updated Contract Management Plan as part of the Annual Review process,
Risk Management Plan	Undertake Risk Management in accordance with the approved Risk Management Plan. Provide an updated Risk Management Plan as part of the Annual Review process,

1.4 Agency Roles during FWAD Operations

1.4.1 FWAD Operations in Commonwealth Waters

For oil spills emanating from offshore petroleum operations within Commonwealth waters, the Jurisdictional Authority for responses using dispersant is either AMSA (for shipping-based spills) or NOPSEMA (for exploration/production-based spills). The acceptance methodology for dispersant use is either by AMSA, or by NOPSEMA via Titleholder OPEP's. This means that a TH may use dispersant in accordance with an accepted OPEP that stipulates dispersant use. The operational aspects of deploying dispersant then becomes to responsibility of the 'spiller' or the Responsible Party. In the case of shipping AMSA will undertake the FWAD operation. In the case of a Titleholder, AMOSC will undertake the FWAD operation. This plan can be used as guidance in either case. The designated Control Agency remains the lead agency for oil spill response and therefore for OWR.

1.4.2 FWAD Operations in State Waters

For oil spills emanating from shipping incidents and petroleum operations in State waters, State Transport Departments are the Jurisdictional Authorities. For shipping spills, DoT or the relevant port authority is the Control Agency. For petroleum operation spills, the petroleum titleholder is the Control Agency up to the 3 nautical mile State maritime boundary, and then the TH becomes the Support Agency to the State led response. The approval regime generally within State waters depends largely on the Incident Action Plan (IAP) developed by the State) which should balance SIMA/NEBA trade-off's with dispersant use. Again generally, dispersant use is not supported in State waters.

1.5 Relationships to Other Plans

1.5.1 National Plan

The Australian Maritime Safety Authority (AMSA) manages the National Plan for Maritime Environmental Emergencies (the National Plan). The National Plan enables effective response to marine pollution events in Commonwealth waters through an integrated arrangement between the Federal, State and Northern Territory and the petroleum industry.

This FWAD Operations plan is subordinate to the National Plan.

1.5.2 Titleholder Oil Pollution Emergency Plans

Each explorer/producer who operates in the maritime domain, must submit an Environment Plan containing an OPEP to the Jurisdictional Authority. As a part of the OPEP process, the aerial operations should be described – where aerial surveillance, aerial transportation, and aerial dispersant operations occur. In some cases, the TH will look to 'in-house' an aerial operation. In the majority of cases, the aerial operation is described in general terms.

This FWAD Operations Plan can be used by TH's as the descriptive plan for aerially laid dispersant operations – in this case, the OPEP would bridge into this plan-set and in the event of a marine oil spill, be used by the Air Branch Director in the IAP.

1.6 Financial Arrangements

For details on Cost recovery in Commonwealth and State waters see the National Plan document; NP-GUI-008 Claims Guidance.

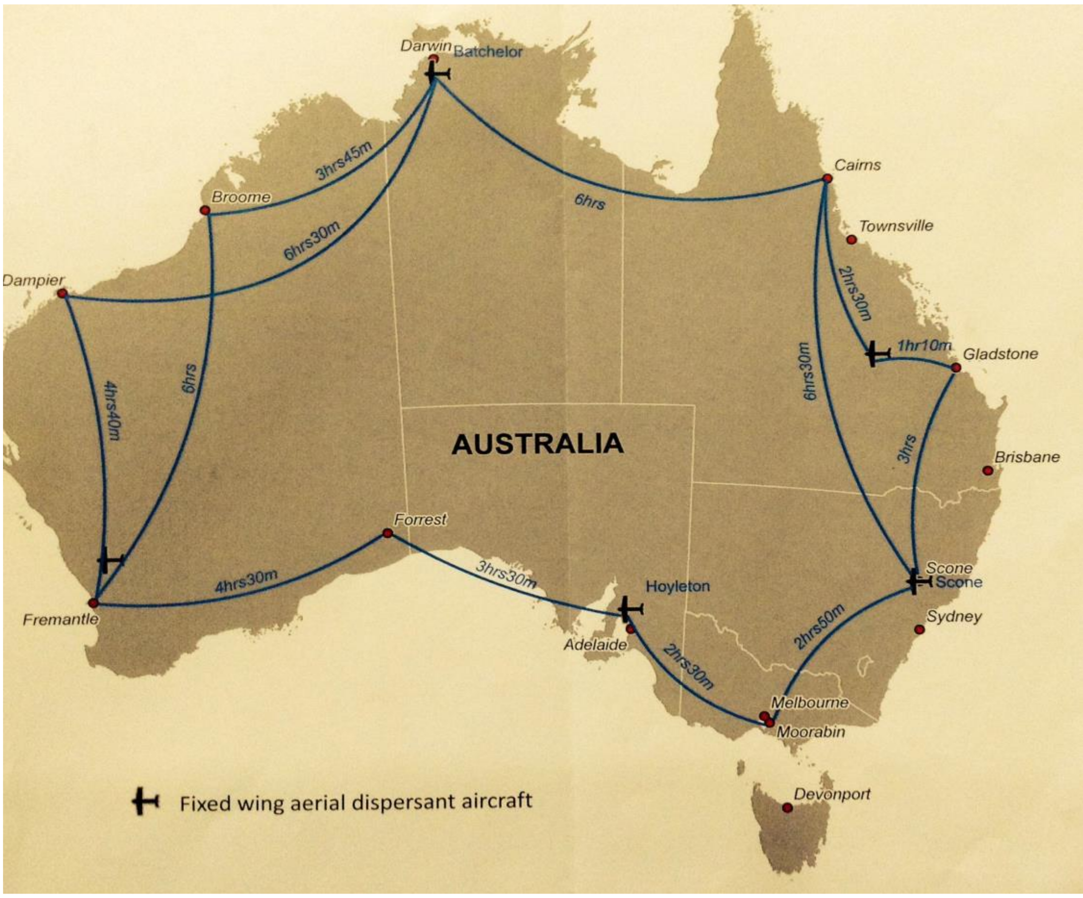
Where AMOSC is undertaking the operation for its members, the Responsible Party (Titleholder) will be financially responsible for all aspects of the FWAD Operation;

- AMOSC will invoice for the services AMOSC and Core Group provide to the FWAD operations;
- AFR will invoice for the services AFR/Air Attack/aerial support provides for the FWAD operations;

1.7 Operational Details – FWAD Contract

1.7.1 Airbase positions

Fig 1.2; Disposition of 6 FWAD Contracted airfield bases



NSW; Scone

VIC; Ballarat

SA; Hoyleton

WA; Jandakot

NT; Batchelor

QLD; Emerald

Once the aircraft types and suppliers have been identified, consult with AFR to discuss number of planes required, estimated flight times and the established FOB location (from the 6 identified suitable airfields).

1.7.2 Aircraft Types

The FWADC accounts for the following aircraft that can be activated during a response;

Aircraft Type	Endurance (minutes)	Capacity (Litres)	Category Type	Air Speed (Knots)	Range (nm)
AT-502/504	210	1900	B	180	455
S2RT-66	190	2700	A	180	500
AT-802	240	3000	A	180	640

1.7.3 Airfield Considerations

Liaise with Airport Operations Manager or the Aerodrome Reporting Officer to arrange access to the airfield. Refer to the "Selected Airbase Configurations" within each regional plan to highlight the following information about the airbase:

- Operations/coordination room
- Office facilities – internet, fax, telephone
- Catering facilities / Amenities – toilets, kitchen, eating room
- Access arrangements – 24/7
- Security arrangements – equipment, operations room, airfield
- Availability of bulk water
- Vehicle access – truck, 4wd, car, bus
- Storage for equipment

Confirm with the Airport Operations Manager or Aerodrome Reporting Officer the following information detailed in the regional plan:

- Refuelling facilities and arrangements – bulk, drums, truck
- Identify fuel requirements of aircraft – JET A1/AVGAS
- Identify availability and transfer arrangements for refuelling
- Emergency Service arrangements – fire, ambulance, rescue, hospital
- Transport arrangements for airbase personnel – distance from town

The refuelling information can also be sources by referring to the latest ERSA information, or by referring to the "Selected Airbase Configurations" from the regional plans.

Once the airbase has been selected, and the preliminary information has been collected, a number of tasks need to be completed at the physical airbase.

- Establish an operations room. Ensure this room has sufficient space to seat at least 10 people, and has access to power, internet and communications.
- Identify the staging area. Pick an area that can accommodate a good loading/unloading area, designate an area where aircraft will be parked and assign an equipment laydown/storage area. Ensure all areas are clearly documented, and signed/segregated at the physical airbase.
- Develop an aviation traffic plan. Working with the airbase operations manager or Aerodrome reporting officer, AFR, the AAS and all pilots of AAS platform and aerial observation platform aircraft, develop a plan for all transiting aircraft and loading aircraft. An example aviation traffic plan for each airfield is located in the applicable regional plan.
- Develop an airbase vehicle traffic plan. Ensure all routes and vehicle directions are clearly marked on the traffic plan. Entry and Exits need to be clearly marked, as well as a heavy vehicle plan for loading and unloading of equipment. Ensure parking areas are clearly defined for all types of vehicles. An example airbase vehicle traffic plan for each airfield is located in the applicable regional plan.
- Verify the "Points of Contact" list for the below contractors/suppliers:
    - Aviation providers
    - Pilot's
    - Aircrew
    - Airport Operations
    - Ground Crew

  - Emergency Services
  - Fuel Provider
  - Taxi and local services/business

  Refer to the regional plan for the most up to date list of service providers.
- Verify the “Airbase Communications for Operations” list for the below communications linked directly to the operational base (if applicable):
  - Mobile Phone
  - Marine radio
  - Aviation radio
  - Satellite telephone
  - Internet
  - Landline

  Refer to the regional plan for the most up to date numbers.
- Evaluate the need for signage such as restricted areas, designated walkway’s, parking, traffic flow direction, entry, exit, operations centre, etc.
- Evaluate the need for external lighting. Even though the operations are only during daylight hours, loading and unloading may potentially occur at night, therefore, if not already in place, organise night lighting around the loading area and any other operational area. To aid in security, it is worth having all equipment, aircraft and dispersant stockpiles lit up at night.
- Generate the reporting structure for all airbase personnel.
- Ensure a sign in/out book is available and being used for all airbase personnel. This will aid in security and also helps keep a record of personnel at the airbase.
- Develop a site safety / induction briefing (airbase manager). In conjunctions with the airbase staff, work through and develop a site safety briefing / induction package to induct all new airbase personnel onto the airbase. Include emergency procedures (alarms, muster points), risk assessments, traffic management plans, parking, loading area, locations of key airbase features (Food, drink, toilets, showers, etc), entry and exit protocols and anything else pertinent to the particular airbase.
- Identify local flight schedules to ensure that all local activities are not affected by the dispersant operations. Ensure all local flight schedules are considered when planning daily flight plans.

1.7.4 Pilot Flight & Duty Times/Restrictions

The FWADC is consistent with AFR operating under “CASR Part 137 – Aerial Operations” guidelines below. The dispersant pilot operational flight and duty times that form a part of the FWAD operations equates to approximately 14 hours of duty per day for 13 days, prior to crew changeover requirements;

On duty	Not more than 14 hours	24-hour period
On duty	Not more than 44 hours	72-hour period (3 days)
On duty	Not more than 98 hours	7 days consecutive
Free time	Minimum 36 hours	After 13 days consecutive duty
Fly time	Not more than 170 hours	After 28 days consecutive flying
Fly time	Not more than 1200 hours	After 365 consecutive days
Rest time	Minimum 9 hours rest	After 1800 daily

- Personnel must not be on duty for more than 14 hours in a single day period.
- Personnel must not be on duty for more than 44 hours in 3 consecutive days.

- Personnel must not be on duty for more than 98 hours in 7 consecutive days.
- Time free of duty – 1 period of a minimum 36 hours after 13 days of consecutive duty is mandatory.
- Personnel must not fly more than 170 hours in 28 consecutive days.
- Personnel must not fly more than 1200 hours in 365 consecutive days
- A minimum of 9 hours rest proceeding duty is required from 1800.

1.7.5 Dispersant Considerations

When determining a dispersant loading area, consider the following things:

  - Heavy vehicle access. Ensure it is possible for a B-Double to enter and exit.
  - The safety of airbase personnel is first and foremost the highest priority so ensure the location of the dispersant and loading area, including traffic management does not put airbase personnel in danger.
  - Does not interfere with airport operations. To the best of our ability, we are not trying to "Take Over" the airbase. Normal airbase operations will still occur, so keep in that in mind when selecting a loading area.
  - Ensure there is sufficient parking for vehicles & equipment.
  - If possible, ensure the area is Secure. Limit the access and visibility of the loading area to prevent media and members of the public from interfering with operations.

Refer to the regional plan for an example aircraft loading area for each nominated airfield.

Dispersants locations and equipment needs to be identified. Refer to **Appendix 5** (in each regional plan) for a list of dispersant available in Australia along with type, locations and owners. Identify where dispersant and dispersant transfer equipment will be coming from and inform the IMT logistics department to start transporting it to the airbase. Ensure a current MSDS is available for the selected dispersant type. Ensure to have a secure area for the dispersant to be stored inside the airbase, preferably indoors. Request the use of a forklift to transport IBC's around the airbase. If an inside area cannot be sourced, ensure the dispersant storage area is close to the aircraft loading area and secured from the flow of general traffic. Ensure bunding is in place around the dispersant and sufficient spill clean-up kit resources are available in the event of an IBC leak.
Each regional plan contains a list of suitable dispersant, dispersant transfer equipment, and storage locations.

1.7.6 Communications Plan

Develop a communications plan. A protocol for communicating with the aircraft, vessels, airbase personnel, pilots and the ICC needs to be developed. This will include the CTAF for the airbase, main contacts in the IMT, VHF, UHF and Airband radio frequencies, mobile phone numbers of everyone at the airbase, Satellite phone numbers, email addresses and fax numbers.

A Sample communications plan can be found in each regional plan, which covers off on frequencies used at each airfield, as well as communications infrastructure being used.

Obtain local Maps including street maps of nearest town, obtain a local business directory to help with logistics/contractors and services. Establish a list of local contractors that could potentially help with repair, maintenance, supply and replacement of equipment.

Refer to each regional plan for a list of potential contractors and equipment suppliers. Local knowledge should also be ascertained to compliment the regional plans.

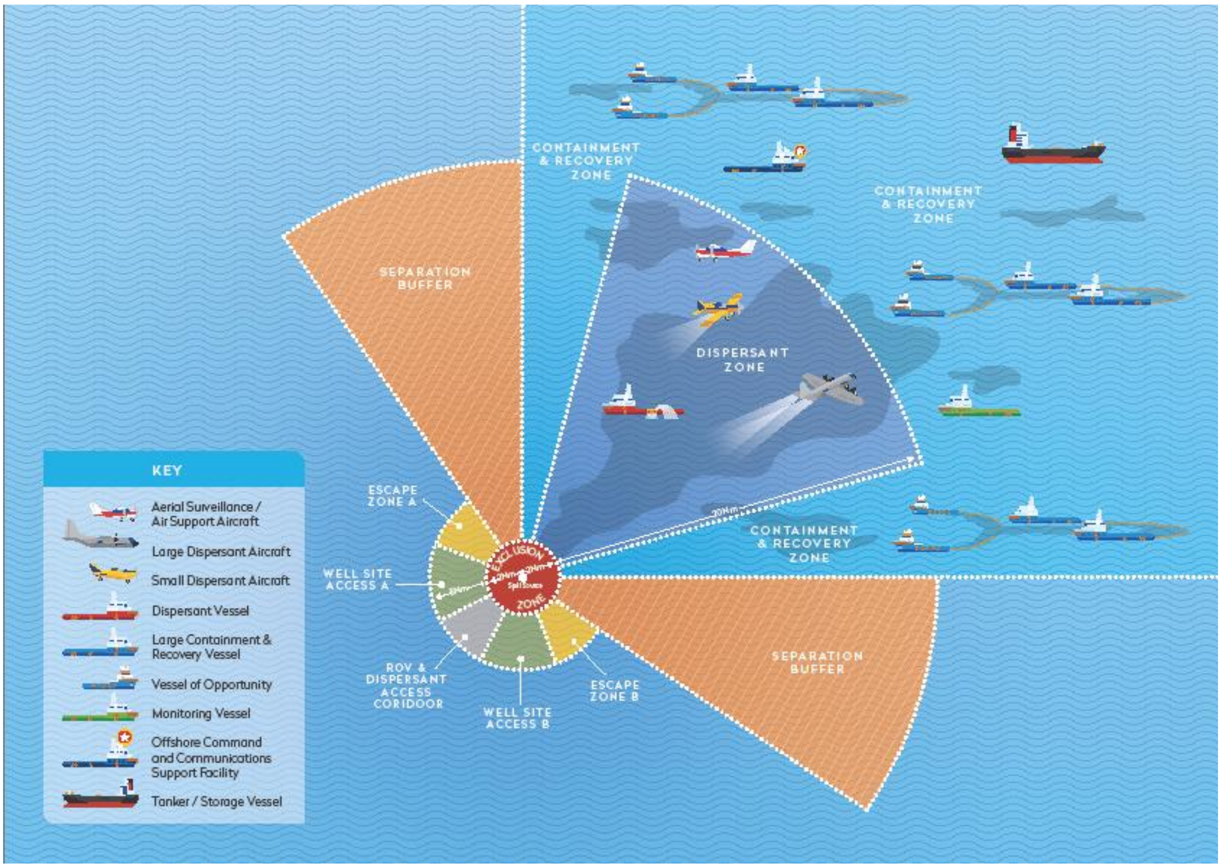
Once operations have started, ensure the following information is recorded and supplied to the IMT:

- Recording of aircraft flight details and crew.
- Recording of dispersant usage – quantities, aircraft, time, date.

This information needs to be recorded in the template "Daily Record Form" located in each regional plan.

2.0 Concept of FWAD Operations

2.1 Simultaneous [spill response] Operations Fig 2.0



The aerial dispersant plan is a subset of the general marine spill response plan. The petroleum industry generally will commence operations using the Responsible Party's Oil Pollution Emergency Plan (OPEP) and then move into a dynamic planning process known as the Incident Action Plan (IAP).

Within either plan, there should be a sectored approach used to designate where aerial and surface laid dispersant needs to occur. This maintains separation between other spill response activities and thence maintains safety operation zones.

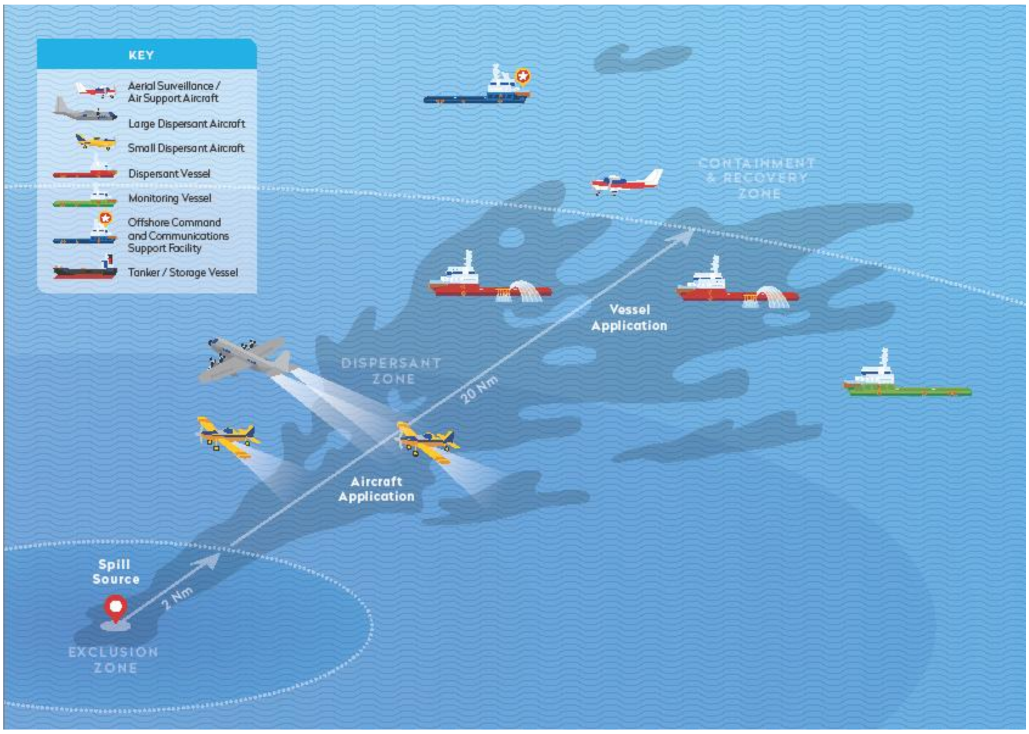
2.1.1 Dispersant Response Strategy – Concept of operations

This response strategy is based on the deployment of dispersant as close to the well head as possible by aircraft (for 10 hours a day) and surface vessels (daylight hours). The vessels will be limited by sea state and safe effective operational limits while the aircraft are restricted to good visibility and airspace control around the wellhead.

This concept is based on the philosophy that the closer dispersant is aerially and vessel laid to the wellhead, the less surface spill impact will be experienced by the response teams offshore/onshore;

- the application of dispersant on fresh oil has greater success treating the spilled oil
- application as close to the source as possible will limit the spread of oil
- application close to the source will reduce the spill effects on wildlife and sensitive resources – either shoreline or offshore (reefs)

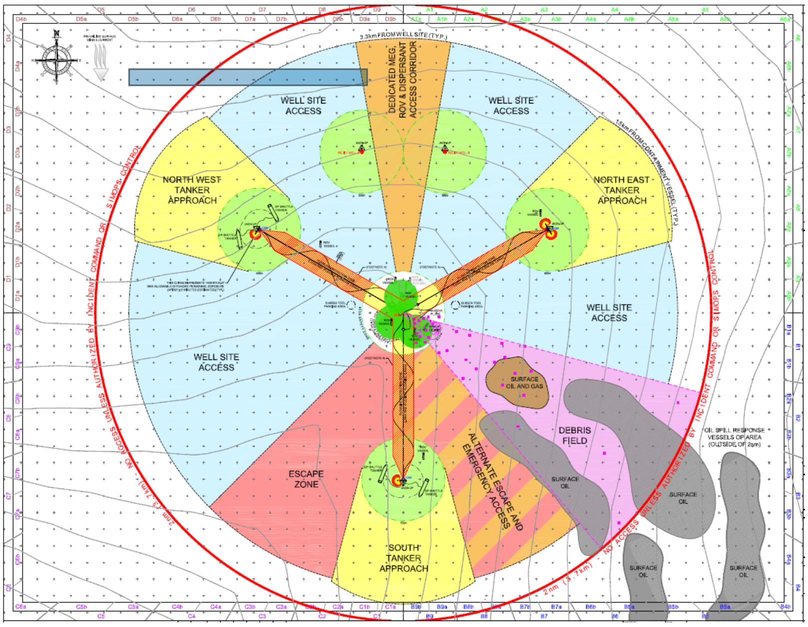
FIG 2.1 – IDEAL FWAD SIMULTANEOUS OPERATION



This strategy can be used in combination with;

- wellhead operations including SIMOPS;
    - seabed and debris field mapping
    - wellhead clearance
    - subsurface dispersant injection
- offshore containment & recovery
- nearshore containment & recovery

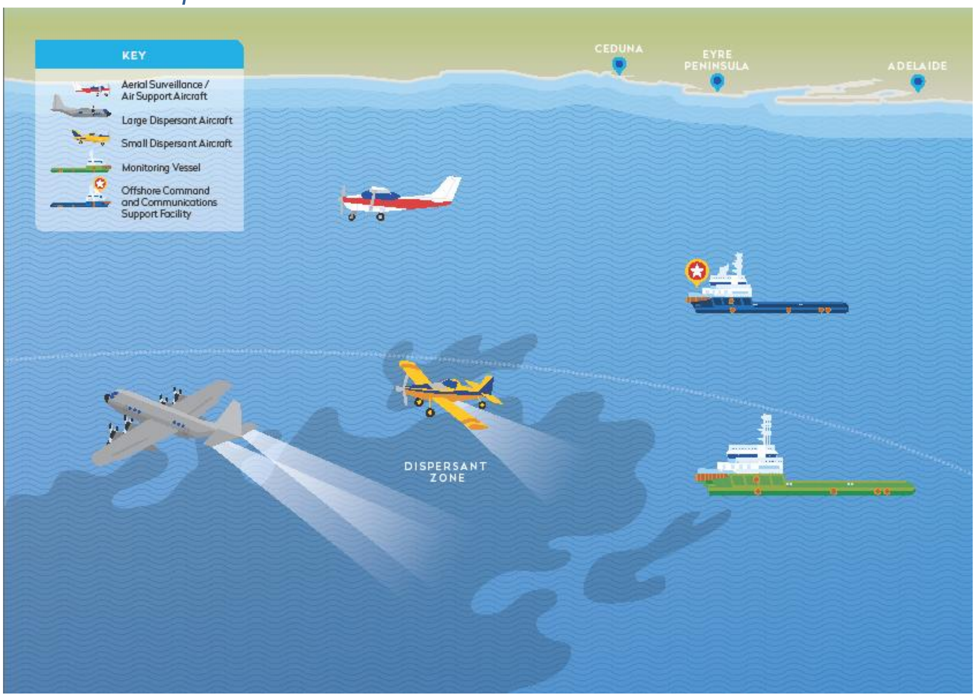
Fig 2.2; SIMOPS around wellhead



2.1.2 Aircraft Dispersant Task Force

Aircraft operations will take place during daylight hours only. Dispersant spray aircraft will be supported by way of (1) top cover to direct application, and (2) vessel platforms to monitor effectiveness and SAR support by way of vessel (when in field) or aircraft (when transiting access corridors from airports to spray sites).

Figure 2.3 - Aircraft dispersant task force



2.1.3 Operational Task Support Units

The Marine FOB Commander and Airbase FOB Commander will report into the Operations Section Chief. Both FOB Commanders will need to agree a general dispersant plan where;

i. Marine vessel dispersant occurs outside of aerially laid dispersant operations – marine spill response sectors are created

ii. The marine FOB supports aerial dispersant by;

   a. SAR vessel support

   b. operational monitoring of laid dispersant

iii. Aerial dispersant has clearly defined zones for application – sectors created

As part of the two FOB's, the logistical and support element will be part of each operational base.

2.1.4 Aerial Surveillance and Air Support

Aerial surveillance shall be conducted throughout the response and forms a critical component required to maintain situational awareness. Aerial surveillance aircraft will comprise a part of the aerial dispersant task force an require to be accounted for in the daily air taskings/air operations plan(s). Aerial surveillance can be conducted as part of the FWAD operations or as a separate operation if aerial dispersant is not in use.

There are several different roles that aerial assets can be utilised for:

1. General aerial surveillance operations – to locate, identify and quantify hydrocarbons. Information to be reported back to ICC and used to maintain situational awareness.

2. Direction to vessels undertaking dispersant application – As part of a dispersant vessel task force. Aviation asset to identify areas of highest concentration and communicate with dispersant vessels to direct them. Role best suited to but not essentially rotary wing.

3. Direction to aircraft undertaking dispersant application – due to the low level required to apply dispersants from an aircraft, top cover is required to guide the application aircraft over the highest concentrations and direct the spraying operation.

Surveillance aircraft are required to have to following attributes to undertake the function of surveillance activities:

- The capacity to carry at least one aerial surveillance person;
- Large windows to give clear, unobstructed view (under wing if possible).
- Range and duration to undertake tasking (greater than four hours).
- Meet aviation requirements for operation over water.
- Have suitable communications equipment for air to air and air to marine UHF and VHF respectively (see regional aerial operations annexes).
- (Advantageous) Fitted with suitable oil recognition equipment. See below for common equipment types.

Table 2.0 – Surveillance Sensors

Sensor types	Application	Limitations
UV	For detecting and mapping of thin oils	Daylight only and requires clear atmospheric conditions.
Passive Microwave	For mapping most oil thicknesses in all but extreme sea states and weather conditions. Suitable during day and night through cloud and mist.	Does not detect oil at < 50 microns thick in high wind and sea states.
Active Radar • SAR • SLAR	For detecting and mapping extent of most oil types. Suitable during day and night through cloud and mist.	Not suitable for use in high winds or sea states. Does not provide estimates on oil thickness.

2.1.5 Search and Rescue (SAR)

During aerial dispersant operations there will be standard and low level flying of aircraft over water. For this reason, advanced preparation and planning of Search and Rescue (SAR) assets needs to be undertaken, with daily preparation and execution of the SAR plan by the AirOPs element of the IMT. The following criteria need to be met.

1. For standard flying operations from air field out to the operational application area SAR coverage is usually undertaken by a rotary wing aircraft located at the same airfield as the FWAD aircraft and on permanent standby.
2. For SAR coverage of operations and low level flying within the application zone, suitable vessels shall be used. Vessels undertaking other duties in the area may be utilised for this purpose.

The below criteria are required functions necessary to perform the described activities. These assets may be utilised to conduct multiple functions. For instance, a single aircraft dependant on type and kind may undertake either a single function or combination of dispersant application, monitoring and search and rescue activities. These are described as either single or multifunction platforms

To undertake the function of search and rescue (SAR) aircraft will need to have the ability to:

- Have sufficient range and duration to respond to operational area and perform response
- Meet aviation requirements for operation over water
- Have suitable communications equipment for air to air and air to marine UHF and VHF respectively
- Direct vessels to recovery location or recover personnel directly (winching capable)

Aircraft suitable for surveillance and guidance roles have been identified along with a list of providers who operate these aircraft in their fleets. This information can be sourced from AMOSC on a monthly basis and at the AMOSC website for members.

2.1.6 Marine and Aviation Operations Control and De-confliction

De-confliction and control of aviation and vessel assets are necessary for safety reasons and to maximise operational effectiveness. The use of different dispersant spray zones, access and egress corridors, and aircraft stacking coupled with a robust in-field communications plan will assist to achieve a successful and safe outcome.

Once aerial and aviation assets arrive are at the designated airfield, the FOB Commander through the Operations Section Chief will assume responsibility for the Air Operations Plan (Appendix) for the assets directly under the FWAD Contract/Operational Contract task force. This will not include any additional aircraft contracted into Australia by the Responsible Party – although liaison between air operations is vital and will occur with the FWAD Air Operations Plan being included in the Incident Action Plan.

2.1.7 Aviation control and operations

The AirOps plan sanctioned by the Incident Controller will detail the flight plans required by all AFR Contracted aircraft to undertake the offshore dispersant operation. If larger aircraft are also involved, the Air Operations Plan will need to account for these aircraft and potential coordination factors where AAS are required to coordinate several types of dispersant mission.

After departing the airport, large dispersant aircraft will follow a defined corridor to the dispersant spray zone but act under 'freelance control' (ie. not directed by any control authority). Once on target, they will be 'controlled' with path correction issued and directions to spray by a secondary overhead aircraft which will contain an air attack supervisor.

After departing the airport, small dispersant aircraft will follow a defined corridor to the dispersant spray zone but act under 'freelance control'. Once on target, they will be 'controlled' with path correction issued and directions to spray by a secondary overhead aircraft which will contain an air attack supervisor. Overall field coordination will be undertaken by the dispersant aircraft and then the Air Attack Supervisor once at the spill site.

The air attack supervisor will direct the tactical operation of aircraft onto a particular spraying area and shall maintain radio contact with the large and small dispersant aircraft as they approach the spray zones. Aircraft will be queued up on approach and directed to spray one after another. Aircraft will then use separate site egress back to their respective airports under 'freelance' control.

Both the Aviation Operations Plan (template), and the FWADC JSOP are to be used to achieve this goal. Daily flight planning undertaken by the pilots and crews of the small and large dispersant aircraft are to follow these principles and templates in these documents.

2.1.8 Aircraft Nav & Planning Systems

Fig 2.3

The Air Tractor aircraft carry an electronic mission tasking and tracking suite that is capable of being pre-programmed with datums and target details, pre-set dispersant deployment rates and tracking memory to record all flight details. TRACPlus.

During a marine spill response where aerial dispersant is deployed, this data will be available to the airbase FOB Commander for daily compilation and onward forwarding to the IMT

Tasking; subject to daily confirmation of where the spill is located, a datum can be established and programmed into the system. This system is the pilot's responsibility

2.1.9 Decontamination of liquid cargo holds

Within the FWAD Contract, and prior to embarking dispersant, the AT dispersant tanks are routinely decontaminated to avoid any cross contamination of agricultural products with dispersant. This is a procedure conducted by the pilot and loading crew or is conducted by the Contractor prior to deploying the aircraft for dispersant operations.

3.0 Detailed Operational Plans

3.1 Aerial Dispersant Operational Airspace

3.1.1 Temporary Danger Area (TDA)

The aerial dispersant zone should be assigned a Danger area designator, and activated by NOTAM with the Aviation Unit Coordinator who is the designated point of contact for any enquiries on entering the area or activation periods. Operations within the TDA with be conducted as per a Common Traffic Advisory Frequency (CTAF).

3.1.2 Establishing a TDA

The CASA Office of Airspace Regulation will need to be consulted prior to the start of the aerial dispersant operation and consulted about the establishment of a temporary danger area and activation procedures. Enquiries during business hours can be made on +61 2 6217 1410 or +61 2 6217 1419 or by email at oar@casa.gov.au

3.1.3 Transit Corridors

On departure aircraft will fly to the TDA entry points via the most direct route, subject to flight planning requirements, air traffic control. This will generally be undertaken under 'freelance' control by the pilot.

3.1.4 Airspace stack/assignment of height zones

Airspace allocations will be stacked to assist in procedural de-confliction during tasking. The Air Attack Supervisor will be the controlling authority clearing aircraft from their assigned levels in the stack to descent to drop as required.

Figure 2.4

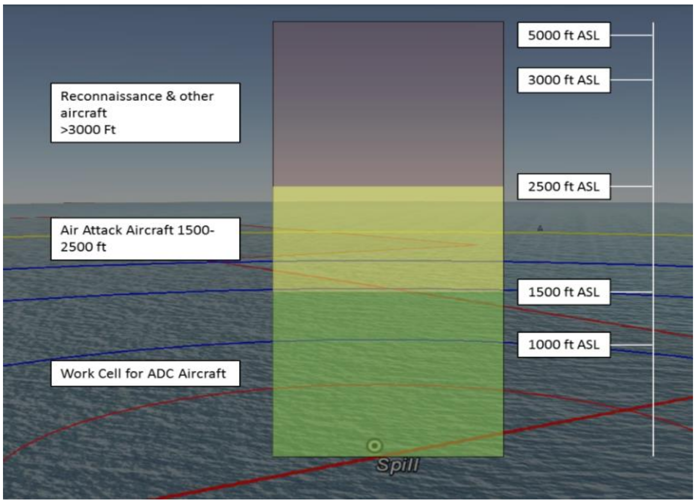


Table 2.1

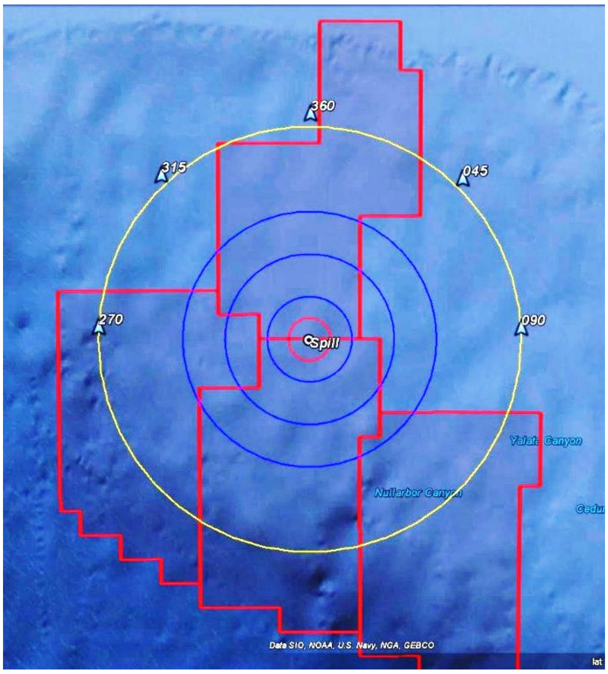
Level	**Role**
SFC-1000	ADC Application (AFR)
1000-1500	AAS
1500-2500	SAR
2500-3000	Surveillance
3000-5000	Media
2500-5000	VLAT ADC Holding SAR AMC

Note: The use of drones in the TDA will be prohibited, unless under the command and control of the Airbase FOB Commander; if vessels are utilising drones, then their use needs to be deconflicted with aerial dispersant sortie times. Drones should be grounded from 10 minutes prior to AT arrival on site and 10 minutes post dispersant deployment. Drones could be utilised to provide some imagery and post-mission analysis of aerially laid dispersant effectiveness.

3.1.5 TDA Entry/Exit Procedures

As the centre position of the TDA has not yet been defined, reporting points on the radials of the 40nm ring shall be used as entry and exits points to be reported to the Air Attack Supervisor or Ground Controller as appropriate. The points shall be positioned at radials of 45° on the northern hemisphere of the TDA i.e. on the 270, 315, 360, 045 and 090 radial.

Fig 2.5



To separate inbound and outbound aircraft entry should be made on the 315 and 045 radials, and exit from the TDA be made on the 270, 360 and 090 radials.

On entering the TDA contact must be made with the Air Attack Supervisor with an ETA to the operating area assigned at Tasking. Frequency will be as per the Communications Plan in each regional plan annex.

When the ADC Aircraft are established at the assigned altitude and position of the holding area of the stack and maintaining separation with other aircraft the pilot will announce arrival and altitude (Bomber 604 in company with Bomber 605 is over head at 1,500 feet) and establish an orbit to observe activity and listen to any instructions given by the air attack supervisor.

3.1.6 Common Traffic Advisory Frequencies (CTAF)

The CTAF Frequency is used by the pilots involved in the aerial operation or pilot of non-operational aircraft such as media or crew transfer flights. The communications frequencies are primarily used to maintain separation. The CTAF is for pilot information to be broadcast to provide a heightened situational awareness of aircraft movement and positional information over the operation at all times. All aircraft pilots involved in the aerial dispersant operation must maintain a listening watch on the designated CTAF.

The CTAF may also be used by agency personnel for operational communication in particular the air attack supervisors will need to provide instructions on tasking, direct the dispersant aircraft, provide feedback on the effectiveness of the application and communicate with ground personnel. Strong radio discipline is required and communications must be kept brief and to essential information relevant to the assigned task.

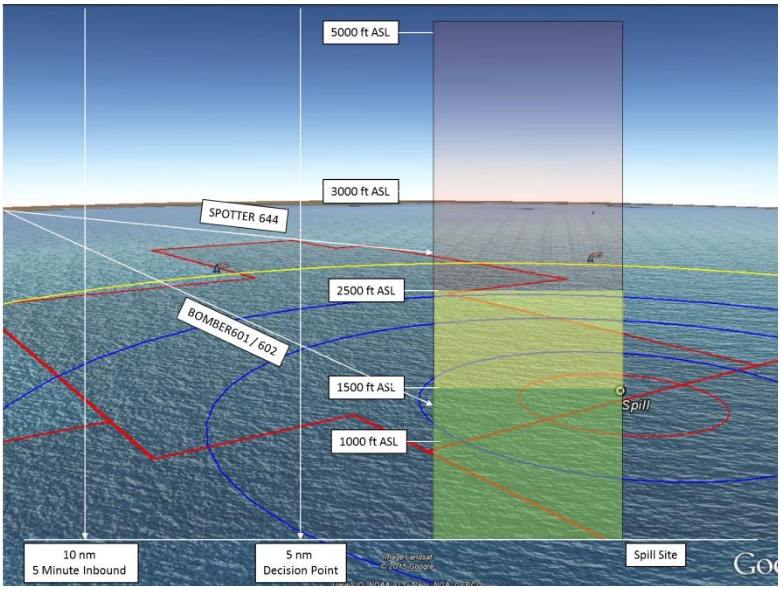
While transiting to and from the operational area aircraft must maintain a listening watch on the relevant local area frequency unless other procedures are explicitly agreed and notified.

Pilots should obtain the QNH (atmospheric pressure to MSL) in use before entering the area.

Pilots must make a broadcast on the CTAF frequency set in the communications plan (otherwise on the ASA designated area frequency applicable to the location) inbound to the area at the boundary on the TDA detailing:

Aircraft Call sign	E.g.:	Bomber 604 in company with Bomber 605	Sealion 20
Position and height		Entering the area on the 045 radial at 5000 ft	Entering the area on the 045 radial at 9000 feet
Intentions		Inbound	Inbound

Subsequent reporting calls must be provided at 10nm inbound and an entry call at 5nm to the spill area.



Where more than one aircraft is deployed at the spill, the pilots must communicate with other aircraft to ensure safe separation.

In some circumstances additional CTAF frequencies may be allocated where frequency congestion requires. Pilots concerned that frequency clutter is creating a situation where the CTAF is compromised for maintain separation should immediately report this to the relevant company liaison to report to the Aviation unit of the incident management team so that an alternative frequency may be allocated and notified.

During an emergency a pilot may require all other communication to cease to reduce congestion while dealing with the emergency. During an emergency the normal communications priority prefixes Mayday and Pan Pan apply.

When returning to an airbase pilots must make an outbound radio call on departing the TDA on the CTAF frequency. When approaching an airbase, the pilot must make a 5nm inbound call on the CTAF as well as all standard calls on appropriate frequencies applicable to that location.

3.1.7 Transition within the Stack

When the confirmation is received that the active dispersant aircraft is departing the working area, the other ADC aircraft in the stack, under direction of the AAS, shall descend 500 ft to their new lower position within the holding area while maintaining separation from other aircraft.

3.1.8 Circuits

Air Attack aircraft generally maintain right hand orbits or circuits with breaks to the right after a show me or observation run where possible.

The aerial dispersant aircraft will initiate a left-hand orbit and maintain a left-hand circuit when cleared to conduct dispersant runs, and will exit as briefed by the AAS.

3.1.9 Larger aerial dispersant Aircraft – C130/Boeing 727

If larger dispersant aircraft are also in use, the AAS is to establish flight paths to avoid creating hazards to other aircraft within the working area with consideration to potential wake turbulence created by the larger aircraft (C130 / 727).

If there is a restriction on vertical separation the stack when the Air Tractors and the larger aerial dispersant aircraft are onsite there may be a requirement to place them in geographically separated circuits. If geographically separation is not possible it may be possible to place the Air Tractors in an orbit with reduced vertical separation within the stack.

It is recommended to wait 5 minutes, but no less than 3 minutes, after the larger aircraft has dropped to resume conventional aerial resource operations. Non-essential aerial resources should be moved to an area to avoid any turbulence created by larger aircraft. It is recommended that these same resources do not return until the 5-minute wait period.

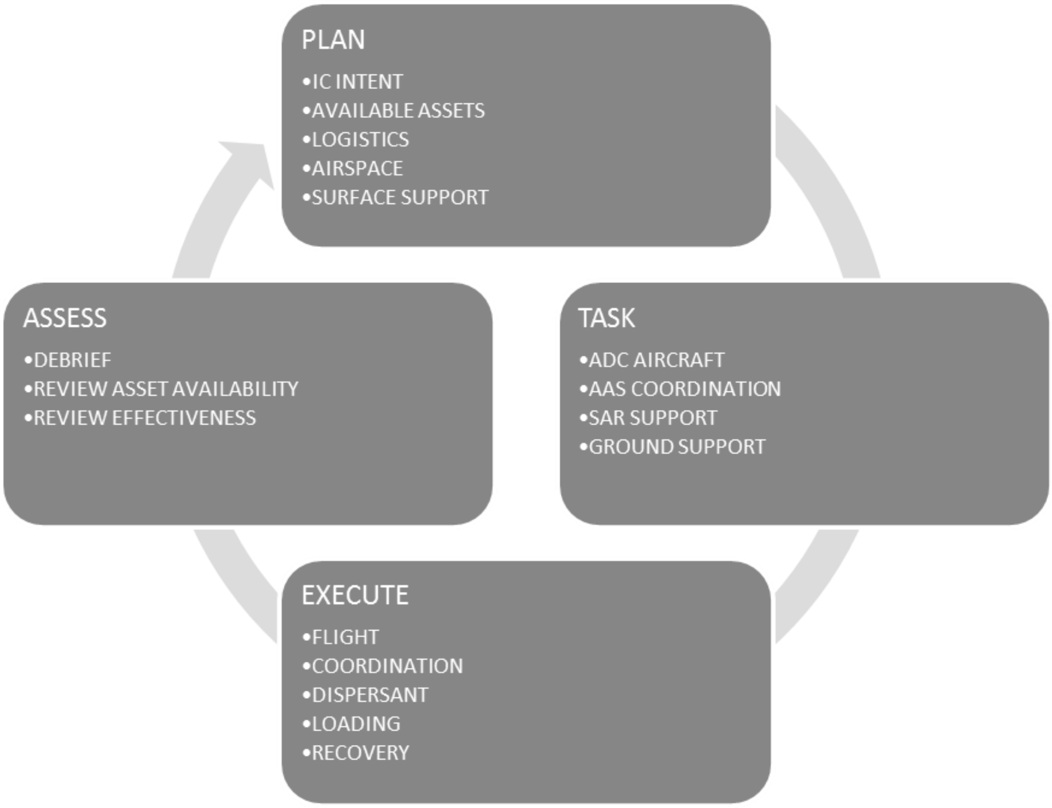
3.1.10 Tasking process

The tasking cycle encompasses the process of taking the Incident Controllers aim/objectives and directing where to apply the aviation assets to fulfil the aerial dispersant objective(s).

It accounts for the available aviation assets and capabilities, matches them to the tasks required and synchronises and coordinates them to provide a tasking order that is distributed to individual assets to execute to fulfil the missions required.

The process plans, tasks monitors the execution of and assesses the effectiveness of the operation in a continuous cycle throughout the operation.

Fig 2.6 Operational Cycle



The Tasking Cycle and its processes control the Daily Aviation Units operational rhythm and assists in determining deadlines and milestones for information to fit into the tasking process. An example of the Daily Aviation Units Operations rhythm is attached in the Annexes.

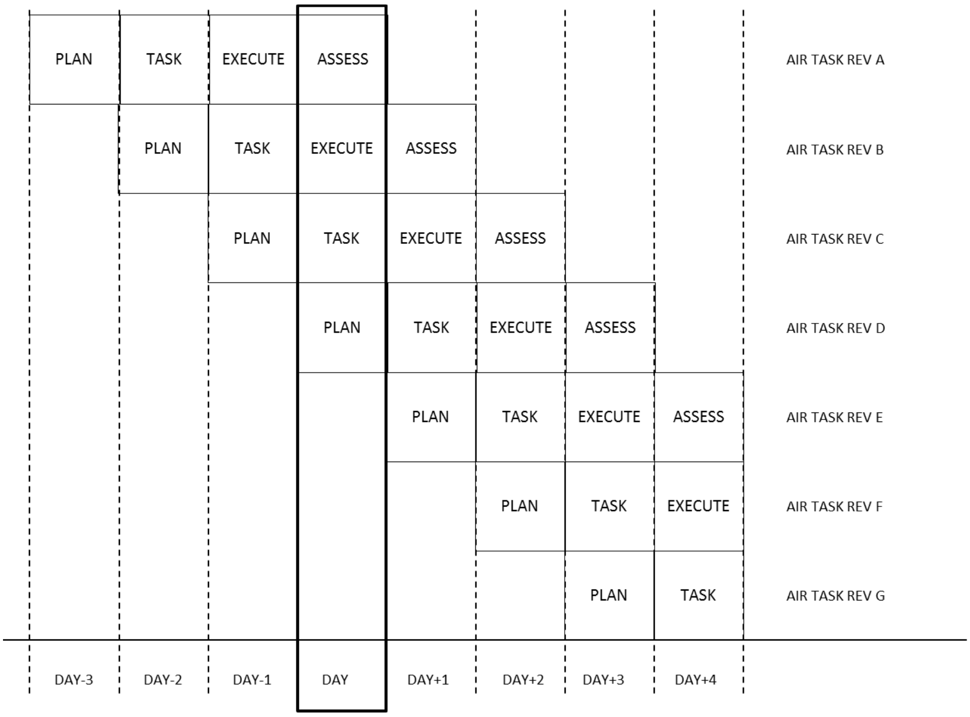
A principle process of the tasking cycle is to produce tasking orders and supporting documentation, and is primarily affected by time and distance factors such as:

i. Time for ground crew to prepare aircraft
ii. Aircrew flight planning
iii. Transit time to the task area

The Air tasking order period is 24 hours to match the IAP Operational Period, however the result of the cycle generally results in 4 Air task Orders in various stages of progress at any one time for example:

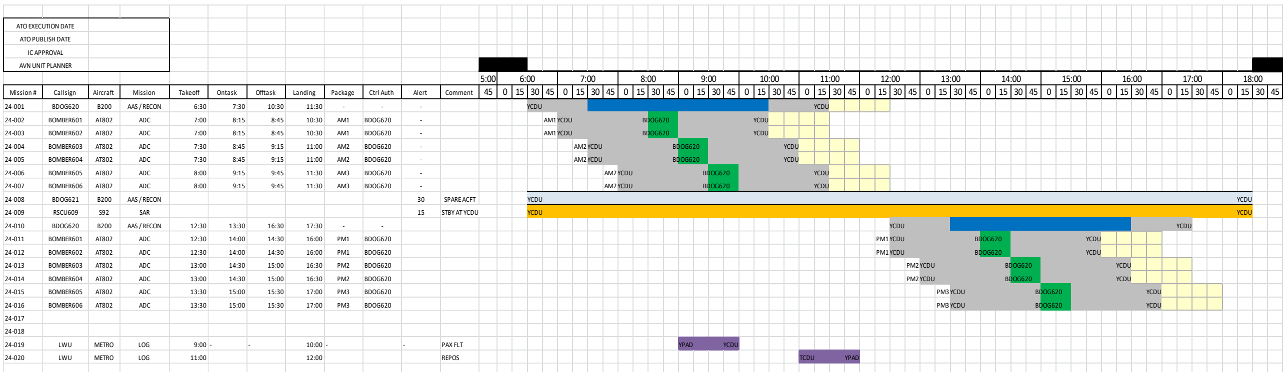
i. 1 ATO in execution
ii. 1 ATO in Production / Tasking
iii. 1 ATO in Initial Planning
iv. 1 ATO in Assessment & Debriefing

Fig 2.7 Daily Air Task Order



3.1.11 Flying Program

The daily flying program produces a graphical representation of the flying activity for the day, displaying that the flights take place within daylight periods, that they are paired with supporting capabilities (i.e. dispersant and AAS aircraft) and that single engine aircraft are paired together to comply with SAR requirements.



Logistics aircraft are also included, that allows the Aviation Unit to plan flights and reduce any congestion at airports. The flying program also details to ground crew when loading and refuelling is to take place throughout the day.

A template of the Daily Operations Schedule is included at Annex C.

3.1.12 Aircraft Tasking

Once the flying program and timings have been decided, the Aviation Unit coordinator can generate individual aircraft tasking sheet that can be forwarded to the relevant liaison office as part of the tasking dissemination process.

Fig 2.8 Aircraft tasking

Aircraft tasking

ATO EXECUTION DATE	
ATO PUBLISH DATE	
REVISION	
IC APPROVAL	
AVN UNIT PLANNER	

Distribution	
Conatct	
Number	
Email	

Company	

Callsign	Aircraft	Mission	Takeoff	Ontask	Offtask	Landing	PRI COM	SEC COM

Package

Callsign	Aircraft	Mission	Takeoff	Ontask	Offtask	Landing	PRI COM	SEC COM

Ctrl Auth

Callsign	Aircraft	Mission	Takeoff	Ontask	Offtask	Landing	PRI COM	SEC COM

Alert	Comment

Post Flight reporting

	NAME	STATUS
Crew		DUTY / REST / INJURED
Crew		DUTY / REST / INJURED
Crew		DUTY / REST / INJURED
Crew		DUTY / REST / INJURED

Mission Times	Takeoff	Ontask	Offtask	Landing	Total	Fuel Used

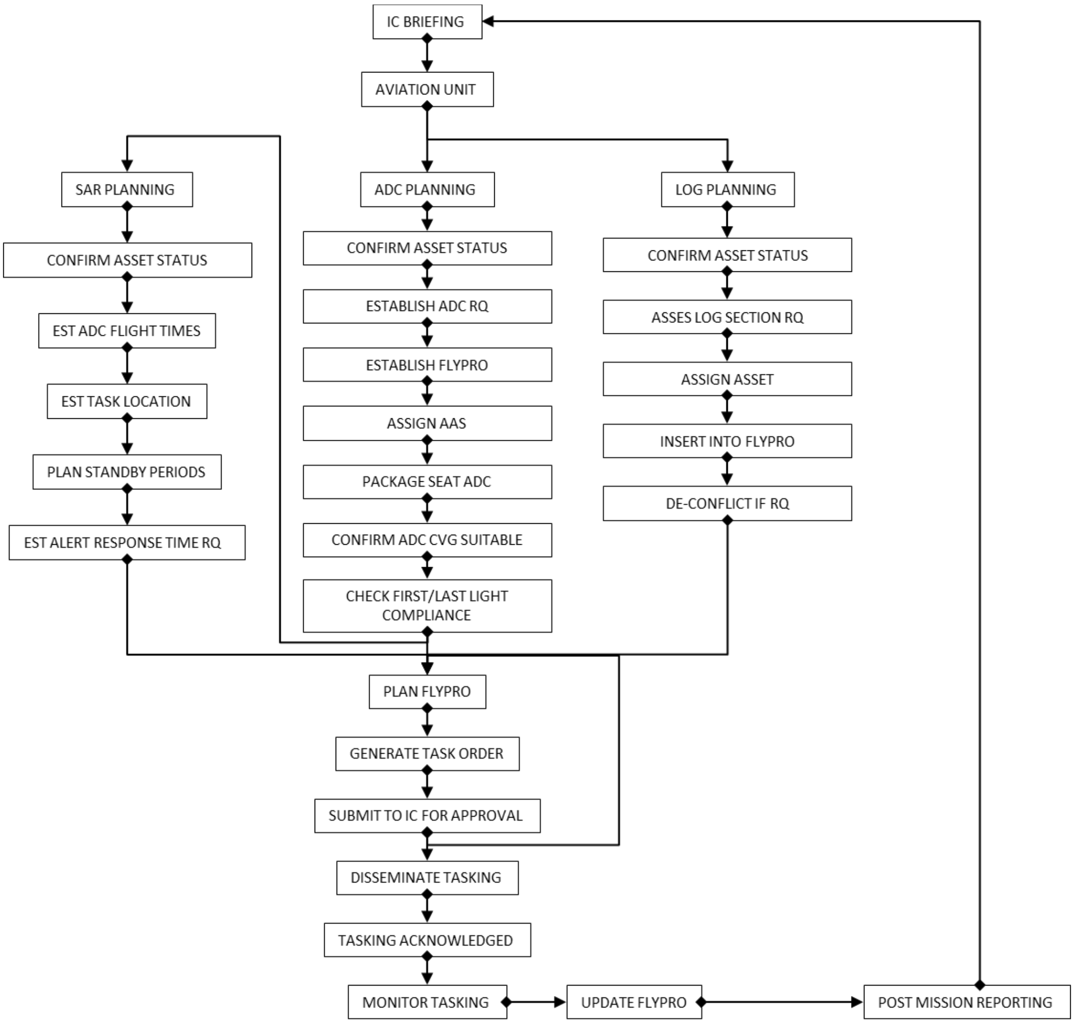
Aircraft Servicable	Yes	No
Hours to mainteannce		

Comments

3.1.13 Planning Workflows

Due to the specialist nature of ADC operations, SAR operations and general logistics support operations, there are essentially 3 air task order planning activities being conducted alongside each other, before being coordinated into a single air task order for approval.

Fig 2.9 Air Planning



Aerial dispersant operations (ADC Planning) focuses on the Aerial Dispersant operation and coordinating aircraft for maximum utilisation in the area, ground loading and refuelling and co-ordination with air attack supervisor aircraft and is the most complex part of the operation due to its co-ordination requirements.

SAR Planning focuses on the Search and Rescue support required for the ADC operation, and will involve a helicopter on standby with required alert response periods, and a SAR vessel positioned along the transit corridor.

LOG Planning is a support function to the overall incident and may require support flights for material and personnel moving throughout the response area.

3.1.14 Estimating dispersant application rates

3.1.14.1 Baseline Settings for Dispersant

Each of the AFR pilots has a device onboard that allows them to adjust the rate at which the apply dispersant to an oil slick. This value needs to be given to them in "Litres per Hectare" so as that the pilot can adjust the automated flow controllers onboard. Once the pilot has entered the information, the onboard computer can then automatically regulate the flow of dispersant through the system according to the ground speed. The pilot can adjust this rate of dispersant application between spray runs as required. Information communicated to the pilot from the observation teams on the water can be relayed as things like "Double it", "Halve it" or "add 10%".

Generally, the swath width is about 30m with a maximum output of 80lts per hectare (normal) – if a greater litre per hectare amount is required, the pilot would need to look at overlapping the swath run to double up on the application.

As a general rule, a good starting point is 30lts per hectare for the first run. This can be adjusted by the pilot between runs depending on how the effectiveness is being reported by the ground crew.

The aircraft is capable of dispersing variable rates up to 100+ litres per hectare with adjustable droplet sizes between 350 – 1000 microns.

3.1.14.2 Dispersant Dosage Calculations

For typical slicks, an application rate for dispersant concentrates of between 19 and 94 litres per hectare can be used. On a volume-of-dispersant to volume-of-oil basis, these application rates range from less than 1:100 to more than 1:10, depending on the thickness of the slick. Two guidelines should then be followed:

- High application rates; e.g. 94 litres/hectare and/or multiple pass application are used for thicker layers of viscous oil.
- Lower rates are more applicable to thinner layers of lighter oils.

The following formula can help estimate the quantity of dispersant to apply:

D (dispersant dosage in Litres/Hectare) = [27,200 x (t/25400) x R] x 9.353

"*(t/25400) converts thickness of oil from inches to microns"*
" x 9.353 converts gal/acre to litres/hectare"

P (pump rate in litres/second) = [63.2 x N x (S / 0.305) x (t/25400) x R] x 0.063

"(S / 0.305) converts meters to feet"
" x 0.063 converts gal/min to litres/sec"

Where: T = average thickness of oil in microns
R = desired dispersant-to-oil volume ratio
N = speed of aircraft in knots
S = swath width on the water surface in meters

For example, at a:

Speed = **N** = 140 knots
Swath width = **S** = 30m
Average oil thickness = **t** = 400 microns
Dispersant-to-Oil ratio = **R** = 1:40

D (dispersant dosage) = [27,200 x (S/25400) x R] x 9.353
= [27,200 x (400/25400) x (1/40)] x 9.353
= [27,200 x 0.015 x 0.025] x 9.353
= 10.2 x 9.353
= **95.4 litres per hectare**

P (pump application rate) = [63.2 x N x (S / 0.305) x (t/25400) x R] x 0.063
= [63.2 x 140 x (30 / 0.305) x (400/25400) x (1/40)] x 0.063
= [63.2 x 140 x 98.36 x 0.015 x 0.025] x 0.063
= 326.36 x 0.063
= **20.56 litres/sec**

Swath width can be measures over land during tests, but a good starting point is 30m. To estimate the swath width of an aircraft, measure the distance between the terminal nozzles (end) assuming the aircraft will be spraying at an altitude of 10m. If the aircraft is spraying at 15m, multiply this measurement by 1.5. Altitude and winds affect swath width and spotter aircraft guiding spraying operations should check these parameters.

3.1.14.3 Aircraft Nozzle requirements/Mechanical Shear Rates/Dispersant Viscosity

Without going into the mathematics to calculate the number of nozzles required per plane, and mechanical shear rates of nozzles, a general rule should be that all AFR aircraft are fitted with around 35 nozzles per aircraft. Any higher and the nozzles tend to form small droplets affecting the application of dispersant spraying.

The viscosity of the dispersant can greatly affect the application to the slick by air. Not all dispersants are suitable for aerial dispersant applications.

- Dispersants with a viscosity >= 60 cSt are best for aerial application.
- Dispersants with a viscosity 30-60 cSt are adequate if the aircrafts ground speed is less than 160 knots and altitude is less than 10m.
- Dispersants with viscosity < 30 cSt are not satisfactory for aerial applications since a fluid stream is easily shattered by the air stream. This produces extremely small size droplets, which are subject to excessive drift.

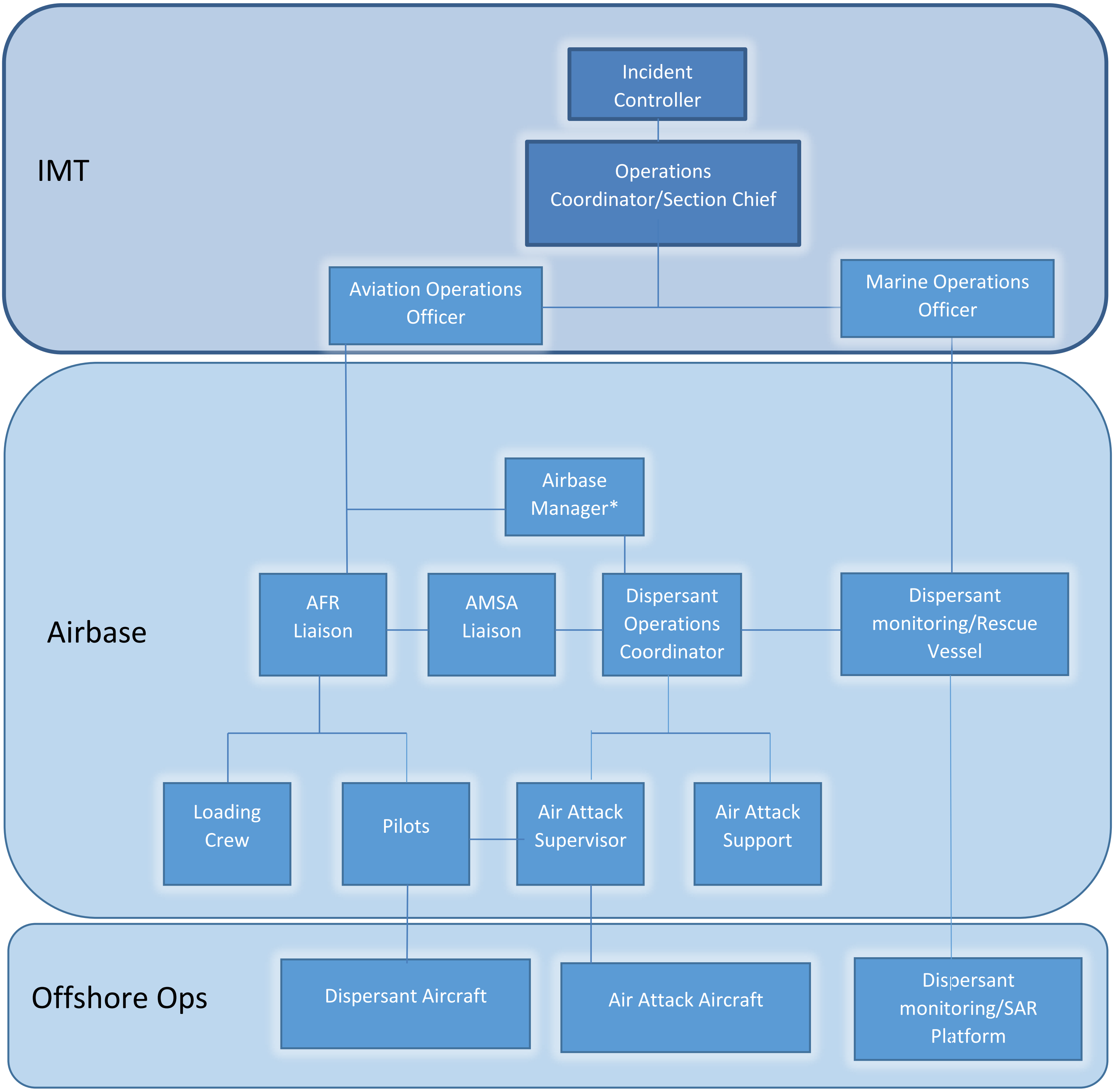
4. AERIAL OPERATIONS PLANNING INCIDENT MANAGEMENT STRUCTURE

The FWAD incident management structure will be consistent with the Australasian Inter-Service Incident Management System (AIIMS). However, it is acknowledged that the petroleum industry operates under a variety of incident response frameworks and this section details the FWAD Ops division structure only.

4.1 For an aerial dispersant operation

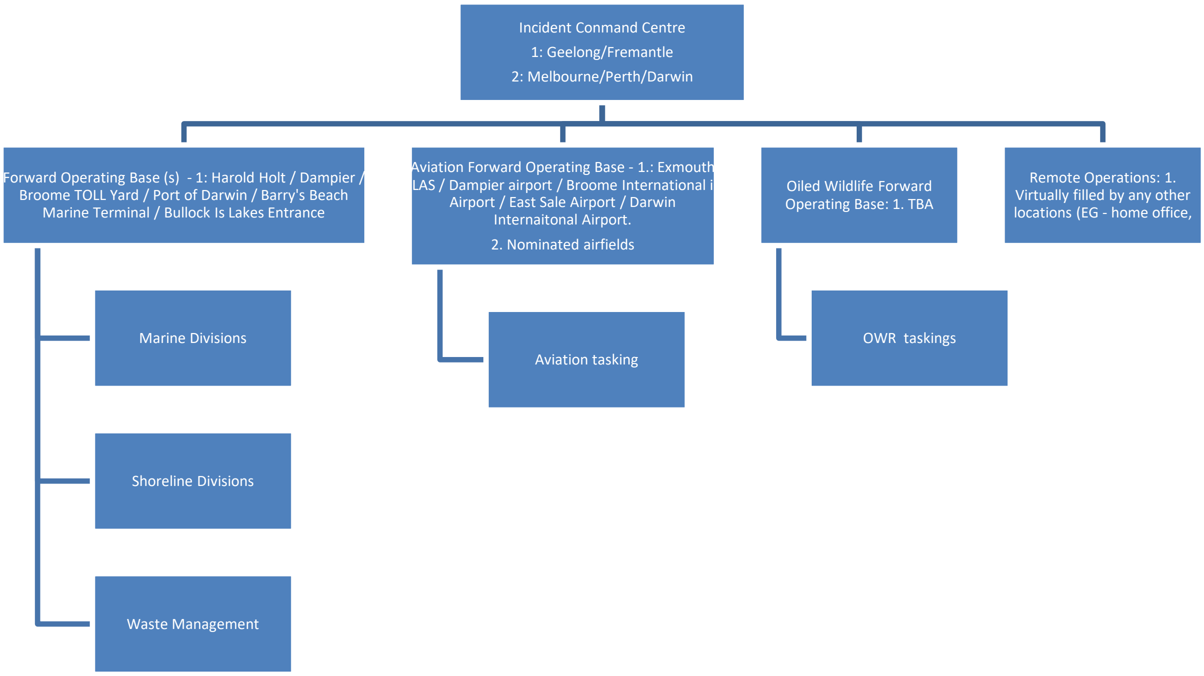
The following positions have been identified. The positions will be filled by AMSA, AMOSC and AFR (Contractor) personnel.

Fig 4.1; Common IMT/airbase organisation structure

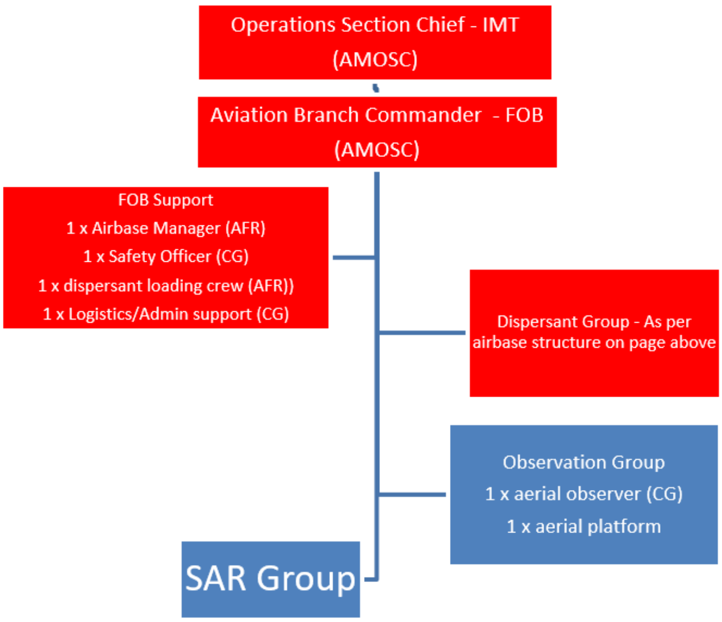


4.2 For a Titleholder spill

AMOSC will form the following organisation to support FWAD operations;



Further, and based on-site at the Forward Operating Base;



5. Plan Activation

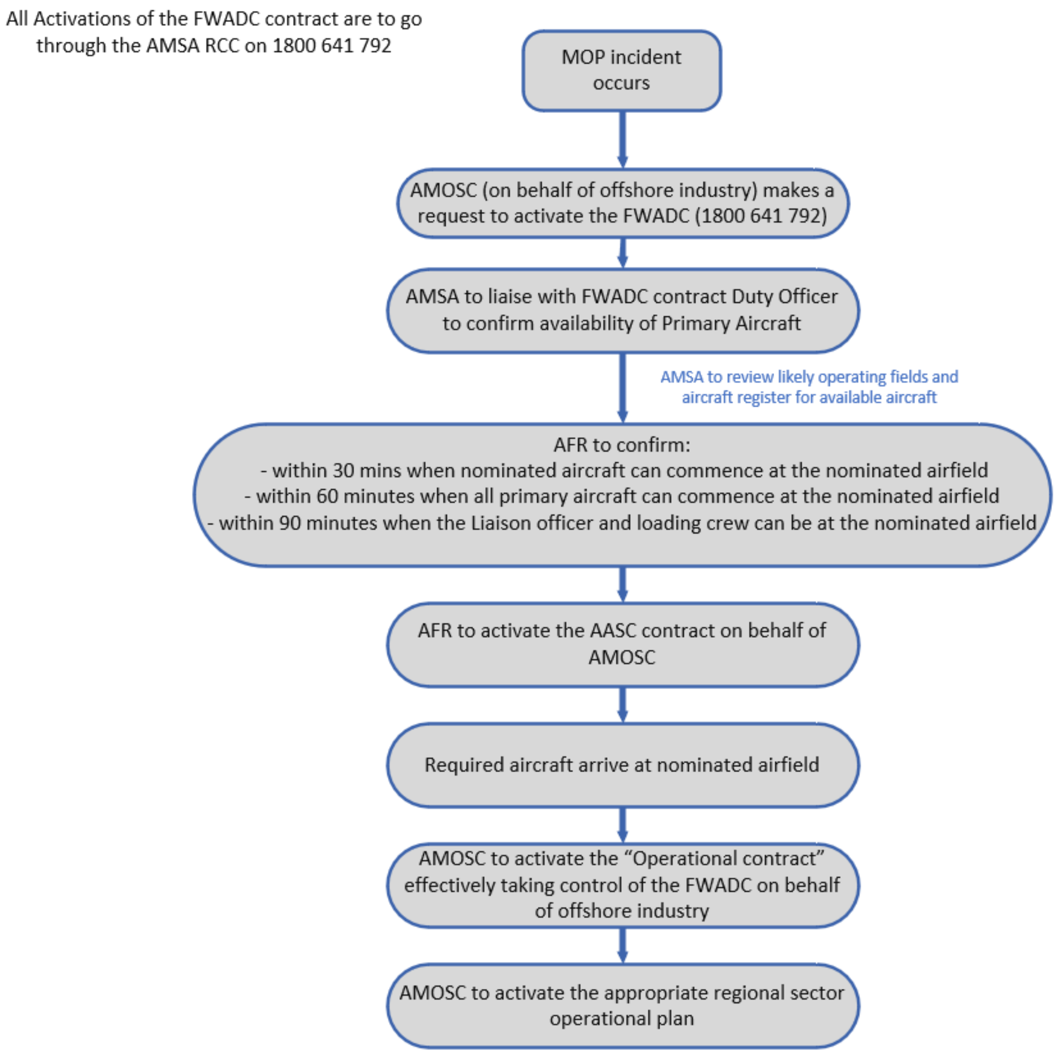
5.1 Titleholder Spill

The petroleum Control Agency may activate this plan following:

- activation of their Oil Pollution Emergency Plan (OPEP)
- a request from an Incident Controller managing a MOP incident.

See figure 4.2 below for the FWADOps activation process. If the FWADOps plan is activated for a MOP incident, the relevant regional sector operational plan should also be activated which provides on ground information specific to the region such as facilities, equipment locations and local resources.

Fig 4.2 Activation process



5.2 Personnel Required for Each Level

The table below provides an indication only of the number of personnel required to fill positions relative to the scale of the response. The number of personal may change depending on the complexity response. The skill level required is indicated as Table 4.1, these correspond to CASA and Fire & Emergency Services advice and are competency-based levels to ensure personnel have adequate knowledge to effectively perform the indicated roles / functions. To give an indication in terms of International Maritime Organisation (IMO) skill levels. The role definitions can be found in Appendix A.

Table 4.1: AFR/AMOSC/Core Group fixed wing aerial Response Personnel Resourcing

Response Position	Role	Skillset required	Knowledge required	Courses required	Qualifications
Airbase FOB	FOB Commander	Organisation & planning	Marine oil spill response	IMO II Equivalent or AIIMS L2 PUAFIR408	
	Airbase manager	Planning	Air operations	PUAFIR408	
	Safety Officer	HSE experience		IMO II Equivalent PUAFIR209A	
	Dispersant Loading crew	mechanical	Fuel transfer technicians	PUAFIR209A	
	Log/admin	logistical	Log systems	IMO II Equivalent or AIIMS L2	
Dispersant Group	Pilot	As per CASA requirements			
	Air Attack Supervisor	Tactical air operations	Aircraft direction	PUAFIR209A PUAFIR315A PUAFIR408 UAFIR409A	HUET
Observation Group	Pilot	As per CASA requirements			
	Aircrew				
	Aerial Observer		BAOAC quantification	Marine oil spill air observers' course IMO I Equivalent PUAFIR401A	HUET

Notes;

1. IMO I Equivalent; Field Operations – IMO II Equivalent; Management in an IMT
2. PUAFIR209A Work Safely around aircraft
   PUAFIR315A Navigate from an aircraft
   PUAOPE013A Operate communications systems and equipment
   PUAFIR401A Obtain incident intelligence
   PUAFIR408 Plan aircraft operation
   UAFIR409A Developed air attack strategies
3. MROVCP Marine radio operator's VHF Certificate of proficiency
   HUET Helicopter Underwater Escape Training.

8. APPENDICES

Appendix A - Roles and Responsibilities

OPERATIONAL ROLES

During a response each position involved specifically in the FWAD operation has specifics roles and tasks to undertake to ensure the operation is undertaken in a safe and efficient manner. The following describe the roles of each of the positions.

Aviation Operations Cell

The Air Operations Cell within the IMT is responsible for;

- Production of the "*Aerial Operations Plan"* within the IAP,
- De-confliction of air operations for the airspace through planning,
- Air tasking orders for aerial dispersant operations,
- Any other air tasking orders i.e. for shoreline clean-up assessment Team, logistical 'in-theatre' moves where other aircraft are being utilised,
- Management of dispersant logistics into airfield,
- Rotation management of aviation operations cell,
- Rotation management of air attack supervisor in conjunction with AFR,
- Organisation & tasking of SAR aircraft.

Dispersant Operations Coordinator (DOC)

In the event of an AMOSC / industry response AMOSC will be responsible for the appointment of the DOC.

The DOC is responsible for establishing the airbase in accordance with the Fixed Wing Dispersant Operations Checklist provided in **Appendix 10.**

They are responsible for developing the systems and procedures for the effective day to day management of the fixed wing dispersant operations. These will include:

- Sourcing the equipment required to set up the airbase See **Appendix 11;**
- Being the single point of contact for the AFR Liaison officer and the Aviation Section of the IMT only where the airbase manager's role is also being undertaken by the DOC;
- Arranging the logistics around getting dispersant to the nominated airfield;
- Arranging a dispersant transfer capability including equipment required to load the aircraft;
- Meeting all safety requirements;
- Conducting daily briefings for airbase personnel covering off on daily flight plans, HSSE and the IAP;
- Managing and coordinating *"National Plan"* equipment and resources;
- Managing the welfare of all airbase personnel involved in the aerial dispersant operation;

- Developing the concept of operation for dispersant operations in conjunction with the AFR liaison officer;

AMOSC Liaison Officer

In an AMOSC or Industry led response this role can be filled by the *"Dispersant Operations Coordinator"*. The AMOSC liaison officer must assist with:

- FWADC contractual matters
- All safety matters in liaison with AFR and incident control.
- Liaison with AMSA and AFR
- Ensuring all resources and PPE to undertake are on site. I list of resources can be found **Appendix 11.**

AFR Liaison Officer

The AFR liaison officer is responsible for supervising AFR equipment and personnel. The liaison officer has the authority to make decisions on behalf of AFR.

Liaison officer duties include:

- Providing specialists advise in regards to aircraft and loading operations;
- Onsite monitoring ensuring compliance(s) with contract requirements;
- Coordinating and gathering information for aircraft operations including flight plans and post flight reporting;
- Completing the daily and weekly report forms provided in **Appendix 7 and 8** respectively**;**
- Managing AFR equipment and personnel;
- Liaising with the DOC and AMOSC liaison officer;
- Assisting with the development of the fixed wing dispersant operations plan in conjunction with the DOC.

Air Attack Supervisor

AMSA & AMOSC have extended the current FWADC contract to include the retainer of an AAS 24/7/365. The AASC will be managed by AFR, and activated in accordance with the activation of the FWADC contract. AFR will be responsible for providing appropriately qualified air attack personnel. The Air Attack Supervisor will be responsible for coordinating dispersant operations at the incident site (offshore operations). They, along with the pilots are also responsible for developing flight plans for each dispersant sortie.

Aerial Observer

The Aerial Observer will form part of the Air Operations FOB and conduct daily overflights of the oil noting the size, shape, coordinates and quantities of oil on the maritime domain. This reporting is important for the IMT to understand the developing nature of the marine oil spill and for the IMT to assess priorities and assign response strategies according to the oil movement direction and receptors that may be encountered. The reporting will need to be timely and accurate and define the boundaries of the oil spill. The Aerial Observer will be responsible for rendering the data to the IMT as early as possible and then at the end of the day's overflight(s).

Loading Crew

AFR is required to provide a Loading Crew of 2 people on site within 24 hours. AFR must ensure that Loading Crew maintain accurate records of activities, including but not limited to:

- Hours worked;
- Duties performed;
- Dispersant type loaded; and
- Aircraft loaded.

Pilots

All operational decisions will be made in consultation with the AFR Liaison Officer, the AFR pilots and AMOSC. The final decision as to whether an aircraft will undertake a given task lies with the pilot. The pilot is responsible for:

Developing flight plans

Application of dispersant consistent with the concept of operations and at the direction of the Air Attack Supervisor.

Post flight reporting.

Appendix B – Aircraft Characteristics

Aircraft Type	Dispersant Tank Capacity		Transit Speed	Minimum Runway Length	
	gal	liters	knots	ft	m
Fixed-Wing					
Beech Varon	120	450	200	1345	410
BN Islander	125	480	140	560	170
BN Trislander	330	1250	145	1295	395
Canadair CL 215	1400	5300	160	3000	915
DC-3	1215	4600	130	3280	1000
DC-4	2500	9460	190	5000	1525
DC-6	3500	13250	210	5000	1525
Fokker F-27	1000	3780	260	3250	990
Grumman Avenger	530	2000	200	3000	915
Lockheed L-100/C-130	5500	20820	300	5170	1575
Piper Aztec	150	570	175	985	300
Shorts Sky Van	315	1200	170	1675	510
Twin Otter	555	2100	170	1050	320
Volpar Turbo Beech 18	290	1100	220	1675	510

Conversions: 1 liter = 0.264 gallons (US)
1 knot = 1.85 km per hour
1 foot = 0.3048 meters

Aircraft Type	Dispersant Tank Capacity		Transit Speed	Minimum Runway Length	
	gal	liters	knots	ft	m
Purpose-built Single-engine Agricultural Aircraft					
Aerospace Fletcher Cresco	405	1530	140	985	300
Aerospace Fletcher	275	1045	115	805	245
Air Tractor 502	500	1890	180	900	275
Air Tractor 602	630	2390	180	900	275
Air Tractor 802	800	3030	180	900	275
Antanov An 2 R	370	1400	100	490	150
Basant	240	900	100	705	215
Cessna Agtruck	280	1060	100	1310	400
Desmond Norman Fieldmaster	695	2640	145	575	175
EBM 701 Ipanema	180	680	105	1525	465
IAR-822	160	600	80	985	300
Pilatus Porter PC-6	250	950	110	590	180
Piper Brave 300	225	850	125	970	295
Piper Pawnee D	150	570	90	805	245
PZL Dromader M18	660	2500	100	820	250
PZL 106A Kruk	370	1400	90	720	220
Super AgCat B	300	1135	100	590	180
Thrush Commander	360	1365	100	985	300
Turbo Thrush	600	2275	125	820	250
Transavia Air Truk	215	820	95	1100	335
Converted Single and Multi-engine Aircraft					
Helicopters (fuselage mounted)					
Aerospatiale Lama	300	1140	80	—	—
Aerospatiale AS 350	290	1100	120	—	—
Bell 47	105	400	75	—	—
Bell 206	180	680	115	—	—
Bell 212	400	1515	125	—	—
Hiller UH-12E	132	500	80	—	—
Hughes 500	180	680	115	—	—
Enstrom F-28C	105	400	70	—	—

Appendix C - Example of Daily operations schedule

Daily Aviation Unit Operations Rhythm

ROLE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Comment
AVIATION OPERATIONS OFFICER							BRIEF		DAY RPT	IMT BRIEF	DOC BRIEF						IC BRIEF		BRIEF							
											LOG OPS	PLN OPS	SAR RQ						ATO +1 PUB							
													+1 ATO REV		+2 ATO PLN		ATO+1 APP									
DISPERSION OPERATIONS COORDINATOR							BRIEF	SUP LOAD	DAY RPT										BRIEF							
										+1 LOG PLN +2 LOG PLN																
													LOAD	RPT IMT												
												DE-BRIEF AM WAVE								RPT IMT						
AIR BASE MANAGER							BRIEF		DAY RPT										BRIEF							
										+1 LOG PLN +2 LOG PLN																
																BRF AFLD OP										
LIAISON OFFICER							BRIEF		DAY RPT										BRIEF							
AIR ATTACK SUPERVISOR							BRIEF	WAVE 1					RE SUP	WAVE 2					BRIEF	RPT IMT						
PILOT							BRIEF	WAVE 1					RE SUP	WAVE 2					BRIEF							
LOADER							BRIEF					LOAD							BRIEF	LOAD						

Appendix R: OSRL Hercules and B727 Mobilisation and Logistics Plans

IAR Hercules C-130

Mobilisation and Logistics Plan

REVISION HISTORY

Revision	Date	Description	Author	Reviewer	Approval
0	June 2016	Creation of document	Andy Lee	Tang Sze Wei	Jeremi Ong
1	February 2017	Document Update	Andy Lee	Tang Sze Wei	Jeremi Ong
2	February 2020	Document Update	Adrian Tan	Shane Jacobs	Shane Jacobs
3	December 2020	Document Update	Adrian Tan	Shane Jacobs	Shane Jacobs

Table of Contents

1. Introduction

International Air Response (IAR) has been contracted by Oil Spill Response Limited (OSRL) to provide global aerial dispersant delivery capability.

IAR will maintain a 24-hour operational capability to respond to mobilisation calls within 10 minutes. Additionally IAR will aim to provide exercise response details within 6 hours.

The Hercules C-130A aircraft consists of 1 Rapid Installation and Deployment Spray System (RIDSS) with a maximum allowable capacity of 12,000 litres. The aircraft has been based at Senai International Airport (WMKJ), Malaysia with an onsite stockpile of dispersant (Finasol OSR 52, Dasic Slickgone NS, Corexit 9527 and Corexit 9500).

OSRL maintains a response ready state for all aerial dispersant operations.

Purpose

This mobilisation and logistics planning guide is an aid to assist in the planning and understanding of the processes for the mobilisation and initial deployment phases of the IAR Hercules C-130A dispersant system. This helps to ensure that operational capability is delivered on time, as efficiently as possible to arrive at the spill site during the window of opportunity for dispersant application. This guide covers the following:

- Technical specifications of the aircraft
- Mobilisation instructions
- Flight times to various destinations
- Flight clearances
- Responsibility matrix
- Dispersant information

2. Technical Specifications

Type of Aircraft	• 1x Hercules C-130A aircraft • Maximum allowable capacity of RIDSS tank: 12,000 litres • Transit speed: 300 knots at 10,000 ft altitude • Spray speed: 130 - 170 knots at 75 – 100 ft altitude • Approximate flight range and endurance (One way): ▪ Fully loaded with dispersant – 780nm in 3 hours ▪ Empty tank – 2080nm in 8 hours
Operator	• International Air Response (IAR) Inc, United States • Flight crews comprising of Captain, First Officer, Flight Engineer • No third-party work but Global Humanitarian support on behalf of OSRL
Location	• Senai International Airport (WMKJ), Malaysia
Response Pre-requisites	Ensure low level flying and spraying permission are granted: • Obtain permission to use dispersant from appropriate regulatory agency • OSRL is able to provide the template that contains all the information with regards to the aerial mission to be submitted to the leading government agency for approval
Aircraft Communications	• 2 x VHF Radios • 1 x Marine Band for Air to Sea communications • 1 x SATCOM for voice and text messages • 1 x Sky Connect for 'live' position GPS Tracker • 1 x SATLOC for dispersant spray application and monitoring system
Dispersant Operations Specifications	• RIDSS internal dispersant system permanently fitted • Controlled from flight deck by Flight Engineer • 3 x AC centrifugal pumps with maximum 2 in operation

(range where appropriate)	<u>Dispersant Operation</u> • Dose rate: 1 – 8 gal/acre; Flow rates: 45 – 360 gal/min • Swath width: 152 ft (at nominal spray configuration of 5 gal/acre and 265 gal/min; at 75 ft altitude) <u>Dispersant loading</u> • 2 x spate pumps** (1 x spare) • 20 m rigid suction/discharge hoses, IBC couplings • 1m x 1m collapsible bund • PPE *** <u>Selwood Spate 75C Specifications</u>* *Capacity: 8,400 gal/h (31,800 litres/h)* *Total Head: 130 ft (40 m), Delivery Head- 100 ft (30.5 m)* *Pump ends: 2” Camlock suction discharge*
Airport Requirements	• Max all-up take off weight is 124,200 lbs • Required runway length 4,900 ft (at 124,000 lbs, 1000 ft field elevation and 20 ^{o}C) • Pavement Classification Number (PCN) must be greater than 23 in order to accommodate C-130A

Table 1: Technical Specification

3. Mobilisation

OSRL Members may mobilise the Aerial Dispersant Service by calling ***OSRL*** at the number provided.

Notify ***OSRL*** Duty Manager:
+ 65 6266 1566

The Duty Manager (DM) will call back to the number(s) provided, and will request all relevant information plus the Mobilisation Authorisation Form **signed by Nominated Authority**. A delay in providing these forms may possibly delay the response.

The DM will contact IAR to notify and/ or mobilise the aircraft. The DM will promptly follow up the call to mobilise with an email detailing location and type of mobilisation.

Mobilisation Type

In the case of a potential incident, OSRL DM will contact IAR and give them prior notice. The DM has two options with regards to the aircraft.

Pro-active mobilisation: Notification to all parties to begin preparing the aircraft for possible flight mission ie. refuelling but no actual take-off – block flight hours do not start counting down

Mobilisation: Same as above but involves the actual take-off of the aircraft

The IAR Hercules is response ready in 6 hours which includes fuelling and if required, dispersant loading. This is not inclusive of time taken for flight plan approval and airspace clearance.

Aircraft Location

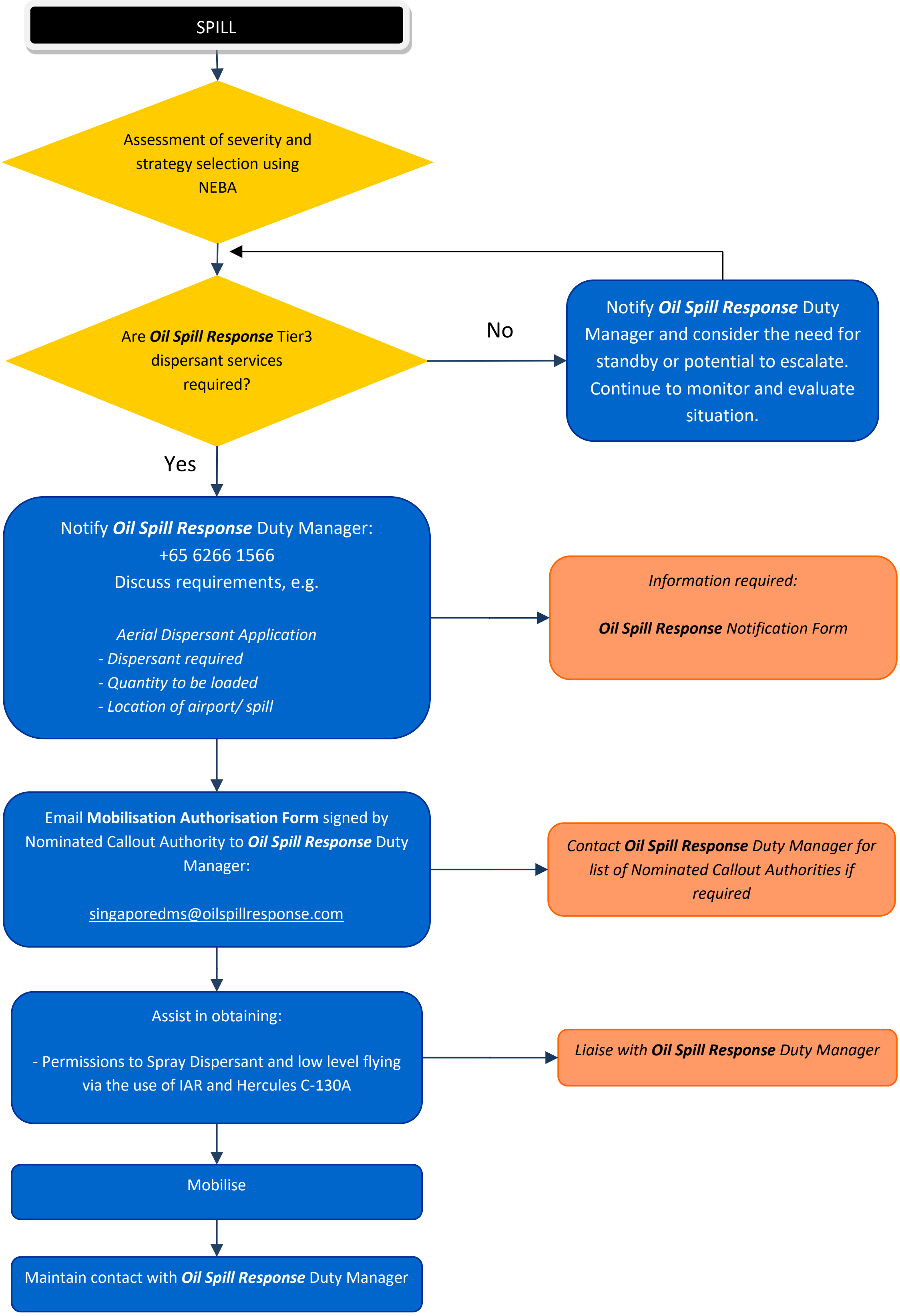
The aircraft is located at Executive Jets Asia (EJA), Senai Airport Cargo Terminal (WMKJ):

Senai Aviation Park, Senai International Airport,

81250 Johor Bahru, Malaysia

EJA is located within Senai Airport Cargo Terminal which is operated and handled by Senai Airport Terminal Services Sdn. Bhd.

OSRL Client



SPILL
Assessment of severity and strategy selection using NEBA
Are **_Oil Spill Response_** Tier3 dispersant services required?
No
Notify **_Oil Spill Response_** Duty Manager and consider the need for standby or potential to escalate. Continue to monitor and evaluate situation.
Yes
Notify **_Oil Spill Response_** Duty Manager:
+65 6266 1566
Discuss requirements, e.g.
Aerial Dispersant Application
- Dispersant required
- Quantity to be loaded
- Location of airport/ spill
Information required:
Oil Spill Response *Notification Form*
Email **Mobilisation Authorisation Form** signed by Nominated Callout Authority to **_Oil Spill Response_** Duty Manager:
singaporedms@oilspillresponse.com
Contact ***Oil Spill Response*** *Duty Manager for list of Nominated Callout Authorities if required*
Assist in obtaining:
- Permissions to Spray Dispersant and low level flying via the use of IAR and Hercules C-130A
Liaise with ***Oil Spill Response*** *Duty Manager*
Mobilise
Maintain contact with **_Oil Spill Response_** Duty Manager

4. Indicative Flight Times

Country	City / Town	Airport of Destination	ICAO	Direct Flight Time (hr)	# Stops	Stop #1	Stop #2	Total Mission Time (hr)
Australia	Perth	Perth International Airport	YPPH	9.0	1	Bali	-	11.0
Bahrain	Bahrain	Bahrain International Airport	OBBI	14.2	1	Male, Maldives	-	16.2
Brunei	Brunei	Brunei International Airport	WBSB	2.7	0	-	-	2.7
Cambodia	Phnom Penh	Phnom Penh International Airport	VDPP	2.3	0	-	-	2.3
China	Beijing	Beijing Capitol International Airport	ZBAA	9.5	1	Hong Kong	-	11.5
China	Hong Kong	Hong Kong International Airport	VHHH	5.3	0	-	-	5.3
Fiji	Nadi	Nadi International Airport	NFFN	17.6	2	Makassar, ID	Port Moresby	29.6
India	Chennai	Chennai International Airport	VOMM	6.0	0	-	-	6.0
Indonesia	Jakarta	Jakarta Soekarno-Hatta International Airport	WIII	2.0	0	-	-	2.0
Indonesia	Surabaya	Surabaya Juanda International Airport	WARR	3.0	0	-	-	3.0
Japan	Haneda	Haneda Airport	RJTT	11.3	1	Manila, PH	-	13.3
Korea	Busan	Gimhae International Airport	RKPK	10.1	1	Manila, PH	-	12.1
Korea	Seoul	Incheon International Airport	RKSI	10.4	1	Manila, PH	-	12.4
Malaysia	Bintulu	Bintulu Airport	WBGB	2.2	0	-	-	2.2
Malaysia	Kerteh	Kerteh Airport	WMKE	0.7	0	-	-	0.7
Malaysia	Labuan	Labuan Airport	WBKL	2.8	0	-	-	2.8
Myanmar	Yangon	Yangon International Airport	VYYY	3.9	0	-	-	3.9
New Zealand	Christchurch	Christchurch International Airport	NZCH	19.0	2	Darwin, AU	Adelaide, AU	31.0
Northern Mariana Islands	Saipan	Saipan International Airport	PGSN	10.1	1	Zamboanga, PH	-	12.1
Pakistan	Karachi	Jinnah International Airport	OPKC	11.5	1	Colombo, Sri Lanka	-	21.5
Papua New Guinea	Port Moresby	Jacksons International Airport	AYPY	10.5	1	Makassar, ID	-	12.5
Philippines	Manila	Manila Ninoy Aquino International Airport	RPLL	5.0	0	-	-	5.0
Russia	Sakhalin	Yuzhno-Sakhalinsk Airport	UHSS	14.8	2	Manila, PH	Okinawa, JP	18.8
Taiwan	Songshan	Taipei Songshan Airport	RCSS	6.7	0	-	-	6.7
Thailand	Rayong	U-Tapao International Airport	VTBU	2.6	0	-	-	2.6
Vietnam	Da Nang	Da Nang International Airport	VVDN	3.5	0	-	-	3.5

Table 2: Indicative C-130A flight times without dispersant loaded

Note: Please contact IAR for accurate mobilisation times. The indicative flight times should be used for guidance purposes only and are subjected to obtaining flight clearances, landing permits, ground handling time, adverse weather conditions or any other unforeseen circumstances which could delay the flight. As with any response, there will be factors outside of OSRL's control which could affect the response times and every endeavour will be taken to ensure a timely mobilisation.

5. Flight Clearances

Over flight clearances and technical stop clearances (for aircraft servicing, routine/ non-routine maintenance, crew rest, general declaration, customs and immigration clearances) which are valid for a few days to a week, will be obtained by IAR. These clearances, however do not allow any commercial activities to be carried out during the technical stop. In addition, the general declaration document (which allows the crew to stay in country temporarily without visas) will also be filled in by IAR.

Should there be a need for the use of Hercules C-130A to respond to the emergency oil spill incident, permission must be granted from the leading government agency before IAR is able perform the necessary aerial missions to respond to the oil spill. OSRL is able to provide the template which contains the details for the aerial mission (e.g. Hercules C-130A operated by IAR, mission types such as Low level flying, Aerial dispersant application and Aerial Surveillance and type of dispersant to be used, etc). The client should assist in obtaining such permissions from the leading government agency, ideally during peace times.

Permission must be obtained from the leading government agency by the client, should they require the use of aerial dispersant services. Such permission should be sought for as soon as possible during an oil spill incident. IAR will be able to fly to the required staging airports*. However, without the permission from the government, IAR will not be able to perform any aerial works pertaining to the oil spill incident. The process of obtaining such permission should be done during peace times in the form of exercises or drills.

* Subject to overflight and technical stop clearances

6. Crew

IAR air crews are on standby 24 hours a day, all year round. In a mobilisation, the air crew will transit to the designated staging airport and do not require in country visas for the first 72 hours (varies between countries). They will not be allowed to engage in any commercial activities. After this period, the aircrew will need visas to remain in the country to perform the required aerial works.

> To ensure a timely response, support will be expected from the client/ OSRL to expedite the visa process where possible for the aircrews as this is critical in getting the crew and dispersant in country and ready to respond, especially for prolonged response periods.

A second set of aircrew is available so that the crews can be rotated and not delay the response as far as reasonably practicable. Minimum of one set of crew is required to operate the aircraft which consists of a pilot, one first officer and one flight engineer.

Crew hours

As a basic rule, Federal Aviation Administration (FAA) stipulates that the aircrew must have 8 hours of rest time in between flight time.

The most taxing period of an operation is the initial phase when the crew is required to prepare the aircraft, relocate to the required staging airport and to perform the spraying operation. This taxing period is however limited to day time operations where it shall end by sunset of each day.

Crew Minimum 1 set to operate: (1 captain, 1 first officer and 1 flight engineer)	**Duty period** (Inclusive of flight and working on the ground)	**Flight time in a single duty period**
1 set	16	10
2 sets	19	No stated limits

Table 3: Flight and rest time of IAR crew

7. Responsibility Matrix

Assistance may be required to complete the task	Has full responsibility / is the only party who can complete the task
√	√√

Task	OSRL	Aircraft Operator	Service Subscriber
Notification of Incident			√√
Notification form & signed Mobilisation form	√		√√
Modelling support for tracking spilled oil	√√		√
Generate aircraft work order	√√		
Booking of any commercial flights and accommodation for air crew and observers	√√	√	√
Over flight clearances/ landing permits	√	√√	√
To obtain permission from leading government agency for aerial operations via the use of IAR and Hercules C-130A	√		√√
Applying for necessary visas and work permits for aircrew and personnel	√√	√	√
Chartering aircraft for dispersant (top-up)	√√		√
In country logistical support	√		√√
Aircraft handling, customs clearance, refuelling, dispersant loading/unloading (in country)	√	√√	√

Task	OSRL	Aircraft Operator	Service Subscriber
Request of spotter aircraft in country			√√
Aircraft flight path and spray path coverage of sorties (Sky Connect)	√√	√	
Formal Reporting	√√	√	
Supply of daily cost sheets and invoicing	√√	√	
Demobilisation from the incident including signed demobilisation form	√		√√
Provide Purchase Order Number	√		√√
Paying the operator	√√		√
No Notice drills	√√		√

Table 4: Responsibility Matrix

8. Sky Connect

Sky Connect is a program that OSRL/ IAR uses to track the IAR aircraft when it is on a flight sortie.

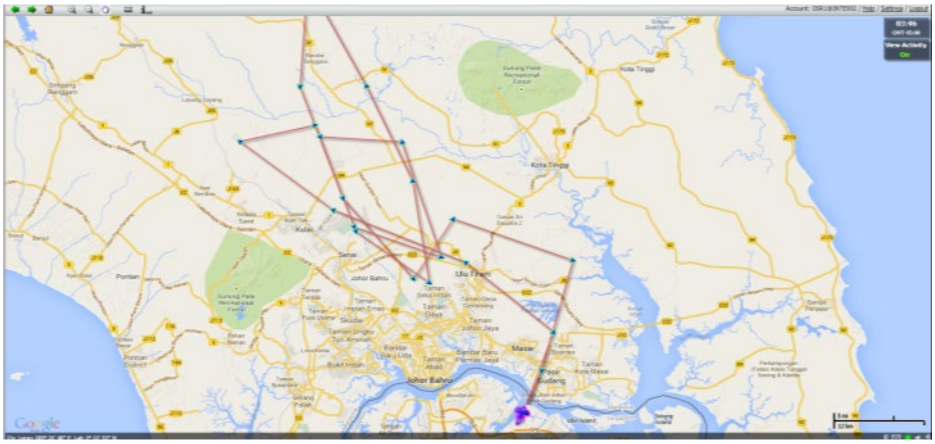


Figure 1: Example of a tracklog of an aircraft on a sortie using Sky Connect

9. Dispersant

The Hercules C-130A with RIDSS can fly fully laden to any spill location. The payload of dispersant does not affect the air speed of the aircraft but the overall range is reduced before needing to refuel, hence multiple stopovers will be required. During a mobilisation, the OSRL Duty Manager will advise whether it is more efficient to fly fully laden or to send dispersant as cargo on a chartered aircraft, in which several variables need to be taken into account including:

- Reduced coverage of the aircraft with full payload and its effect on response times
- Scale and duration of the response
- Availability of dispersant in country
- Availability of charter aircraft
- Dispersant type required and the approval for use
- Flight times for chartered aircraft transporting dispersant

12,000 m^3 of Corexit 9500, Corexit 9527, Slickgone NS and Finasol OSR52 each are stationed at Senai Airport Cargo Terminal for immediate loading if required.

Aerial dispersant Authorisation

OSRL can provide as much assistance as possible with aerial dispersant operations pre-approval through logistics and technical support. Technical liaison support can be provided to assist with pre-approval with the regulator. Aerial dispersant operation enabling key considerations include but not limited to the low level over water flight approval, dispersant spraying permission from local leading government agency, crew working hours, operational day light hours and adequate dispersant supply.

Supply Chain

For an extended response and to ensure the availability of dispersant for ongoing aerial dispersant spraying operations, a continual supply of dispersant will be required either from in-country or through OSRL Service Level Agreement (SLA) stockpiles. This can be organised through OSRL but needs to take into account the limitations of flying liquid cargo on commercial aircraft.

Due to a Service Letter from Boeing Commercial Aviation Services, there is a current advisory on all Boeing aircraft for a limit on liquid cargo to 42% of the total cargo. This may reduce the availability of aircraft and result in higher chartering costs to move the same amount of cargo on alternative air platforms i.e. Airbus, Antonov, Ilyushin, etc.

OSRL works closely with our air charter broker to ensure that equipment can be mobilised around the world as quickly as possible. This is regularly tested through exercises and spills. We have a global contract signed with our charter brokers and agreed aircraft charter terms which means that we can normally respond as soon as an aircraft is available and the mobilising member has given written authorisation for the costs. The maximum time for OSRL to receive flight options in a spill is six hours.

Although it is subjected to fluctuating aviation markets and aircraft availability, OSRL expects to have an aircraft available and loaded with dispersant within 24 - 48 hours. During this time, OSRL will also have all import paperwork completed including, Commercial Invoices and Airway Bills. If any extra paperwork is required (such as Certified Certificates of Origin or translations), it will increase the mobilisation time.

Air cargo carrier global availability indicative estimates

Aircraft type	Estimated number globally for cargo	Estimated short notice spill availability	Cargo capacity (tonnes)	Capacity following Service Letter (tonnes)	World coverage (potential)
Boeing 747 / 777	150	10	100-130	42-50	Global
Antonov 124	24	2-3	100	100*	Global
Antonov 225	1	1	250	250*	Global
Ilyushin IL 76	7 (that can land in the UK)	1-2	45	45	Global – shorter journeys
MD11	9	1-2	85	85	Africa centric with some USA

*These figures may reduce due to volume constraints and are subject to an ongoing investigation into pressurisation of holds

Table 5: Air cargo carrier global availability indicative estimates

Dispersant Spraying and Refuelling

For repeated sorties, if there is dispersant available at the airport, the aircraft can be reloaded in 120 minutes if being filled by individual IBCs, but this will depend on the location of the dispersant stockpile and available ground handling assistance. The IAR crew together with OSRL task specialists will load the dispersant. The aircraft will be refuelled between each sortie. It is expected that IAR will normally achieve three sorties a day but this is dependent upon dispersant supply, ground handling facilities, distance of the spill site from the staging airport, airport traffic, weather etc.

In the event that all the dispersant has not been used in a spray sortie, it is possible for the aircraft to land with the remaining dispersant on board.

Spotter Aircraft

In order to maximise the operational effectiveness and increase encounter rate, it is recommended that a spotter aircraft is also mobilised to provide top-cover support.

The use of a light aircraft will be the primary option for use. The main requirements of the spotter aircraft are, sufficient communication between the two aircraft so they can be directed towards any spill, enough endurance for a single spray operation before needing to refuel and space onboard for an OSRL trained observer. The aircraft will communicate on normal Aviation Band VHF.

> If available, a spotter aircraft can be used to direct the aircraft into position which will increase the effectiveness of the dispersant runs and ensure the Hercules C-130A is on target. The client will have to provide this in country where possible.

10. Costs

In the event of a mobilisation, the below fees will be applied for OSRL members for the conduct of aerial dispersant operations or be made available on standby in country:

- Daily standby fee US$9,250* per day (applicable on days where flights are not carried out and charged on a daily basis)
- Response flights US$8,500* per hour (subject to a minimum charge of the daily stand by fee)

The above rates apply in respect of 'normal' response operations where the aircraft is deployed and utilised for up to a maximum of 10 days. Daily charges for non flying standby periods of greater than 10 days duration where the aircraft flies on average for less than 2 hours per day during that period will be charged at US$17,000* per day and will require special consideration.

Direct operating costs will be charged as incurred to Members, including but not limited to fuel and handling charges. Non-members will be charged an additional 15% administration fee to these direct operating costs – Response for non-members is not guaranteed and subject to approval by OSRL Board of Director; the aircraft may be recalled in the event of mobilisation by OSRL members.

The estimated costs for each sortie with dispersant (loaded with 12,000 litres of dispersant), the client will be charged:

- Corexit 9500 – US$ 142,653*
- Corexit 9527 – US$ 148,933*
- Slickgone NS – US$ 34,324*
- Finasol OSR 52 – US$ 143,748*

**Subject to changes. Please refer to OSRL Scale of Fees for latest information*

11. Additional Information

Table Top Exercises

Service subscribers are encouraged to exercise the mobilisation of the service during any table top exercise. By calling the duty manager, real time flight information to any location can be provided free of charge. OSRL can also arrange actual participation of IAR and the C-130 aircraft in a client exercise at published response rates.

Training

OSRL are responsible for the training of their contractors and OSRL conduct operational training sessions each year to simulate aerial dispersant spraying operations. The training includes:

- Aerial dispersant spraying (using fresh water)
- Use of surveillance equipment
- Coordination with vessel operations (if any)
- Production of reports
- Data management

The training is supported by 6-monthly scheduled exercises and no notice drills to ensure the appropriate level of competence is maintained and to ensure that OSRL fulfils the mobilisation times and standards expected from our members. In addition to the scheduled training, the IAR crews complete a minimum of one spray experience flights each quarter and one training flight each month to retain route flying proficiency.

Oil Spill Response

B727 Mobilisation and Logistics Plan

REVISION HISTORY

Revision	Date	Description	Author	Reviewer	Approval
0	February 2017	Creation of document	Matt Jeans	Lee Prendergast	Dan White
1	November 2018	Document Update	Matt Jeans	Ajibola Fashola / Fiona Carson	Shane Jacobs
2	January 2019	Document Update	Matt Jeans	Ajibola Fashola	Shane Jacobs

Contents

1. Introduction

Oil Spill Response Limited (OSRL) provide one Boeing 727 Aircraft (G-OSRA or G-OSRB) equipped with a TERSUS dispersant spray system. The aircraft is based at Robin Hood Airport – Doncaster, Sheffield, UK and is ready to be 'wheels up' 4 hours from mobilisation. The TERSUS system consists of 7 dispersant tanks, 1 pump module and 1 service pallet, with ancillaries and dispersant ground loading equipment. A stockpile of dispersant (Dasic Slickgone NS) is stored adjacent to the aircraft and can be loaded within the 4-hour mobilisation time.

Purpose

This document is a guide to assist the planning and understanding of the processes for the mobilisation and operation of the Boeing 727 TERSUS dispersant delivery system.

2. Technical Specification

Aircraft Type	 B727-2S2F(RE)
Tail Number	G-OSRA and G-OSRB
Operator	2Excel Aviation Ltd
Base	Doncaster Sheffield Airport (DSA) EGCN
Call Sign	Broadsword 27A or 27B
Crew	2 pilots, 1 flight engineer and 1 task specialist
Range	Approximately 2500nm unladen.
Communication	Aviation VHF (OSRB also has HF[1]), satellite phone

[1] G-OSRA does not have an HF radio and the aircraft maybe subject to some flight restrictions. (See Section 5 for more information).

Other Information	Length 153ft Wingspan 108ft Height (fin) 34 Empty weight 97,471lbs Max payload 56,672lbs Max fuel load 54, 304lbs Max Take-off weight 203,100lbs
Max payload	56672 (lbs) 25,707kg
Cargo Hold	Main deck volume 4667 ft^3 Lower deck volume 1466 ft^3
Useable volume	Main deck consists of 12 freight bays: 11 fitted for 88"x125" pallets, and 1 for a 60.4" x 125" pallet
System installed	TERSUS 15000 litres
Airport requirements	6000ft 1,828m Concrete/Asphalt For Aircraft Classification Number (ACN) and Pavement Classification Number (PCN) please contact OSRL. Smaller airfields to be used will need to confirm the strength of the runway, associated taxiways and parking areas before operational spill use. The B727 requires Fire Category Cover Category 7 from the operational airport.

Table 1: Technical Specification

	Empty	Full	Dispersant configuration
Maximum Range	2500Nm	2250Nm	1400Nm with spray booms fitted
Transit speed	480kts TAS	480kts TAS	250kts
			Spray speed ~150kts

Table 2: B727 Range

Note: Table 2 is indicative only, all ranges and speeds depend upon several variables including location, Forward Operating Base location, temperature, altitude, weather, payload etc. Contact the OSRL Duty Manager for precise timings if required. The spray booms will be fitted upon arrival in country before first spray operations.

3. Mobilisation

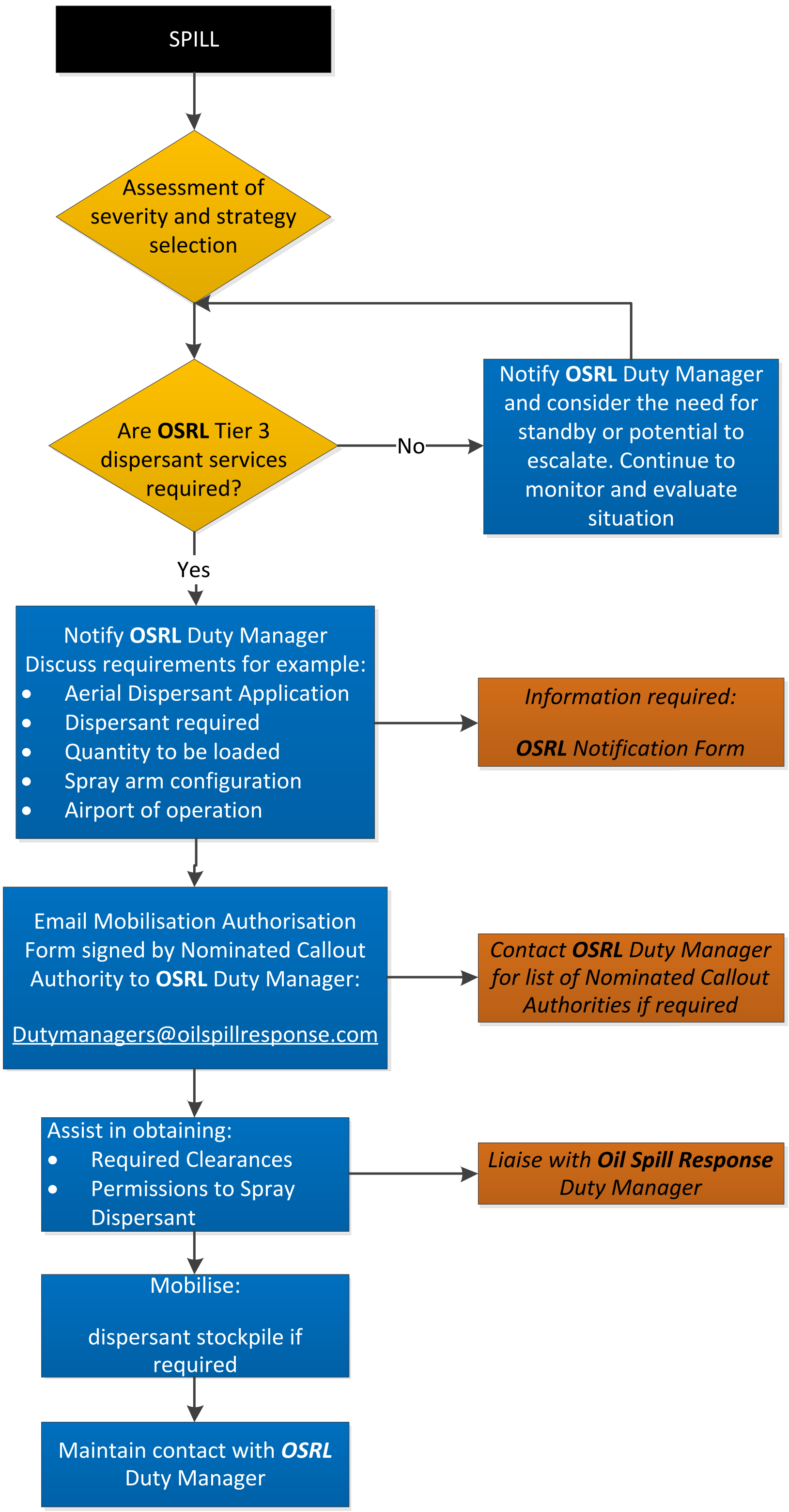


Figure 1 Mobilisation Flowchart

OSRL Members mobilise the aerial dispersant Service by calling ***Oil Spill Response***

Emergency Contact Numbers

Europe, Middle East & Africa

+44 (0)23 8033 1551

Asia Pacific

+65 6266 1566

Americas

+1 954 983 9880

The OSRL Duty Manager (DM) will request all relevant information plus the 'Mobilisation Authorisation Form' **signed by a nominated authority.** A delay in providing these forms may delay the response.

Upon receipt of the signed mobilisation form, the DM will notify and/or mobilise the aircraft. An email will be sent to the member, confirming mobilisation of the aircraft and the aircrafts Estimated Time of Arrival (ETA).

Mobilisation Type

In the case of a potential incident the OSRL Duty Manager has two options regarding the aircraft.

Notify: Mobilise all resources and apply for over flight clearances but does not call the crew (crew hours do not start counting down)

Scramble: Mobilise all resources (including air crew) – immediate mobilisation where over flight and landing permits are unlikely to cause a delay.

The B727 is ready to be wheels up within 4 hours of mobilisation which includes fuelling and if required, dispersant loading. [2]

[2] Slickgone NS is the only dispersant held at Doncaster, any other dispersant would need to be freighted to the to the aircraft in Doncaster or Forward Operating Base

Flight Clearances

Before leaving the UK, OSRL will produce the flight tasking for the aircraft from the information gathered by the client and mission parameters. The aircraft has permissions for low level flying to enable spraying operations. The aircraft operator or its nominated agent will file flight plans and request necessary permits by liaising with the appropriate aviation authorities.

Overflight permits will be required for the B727 which will be attained by the aircraft operator/ nominated agents, for transit to the spill location.

> Landing permits and authorisation to operate in-country will be required upon arrival and it is expected that the client/local subsidiary will liaise with the relevant authorities to assist with the necessary permits where possible.

Crew

The Aircraft crews are on standby 24-hours a day. In a mobilisation, the primary aircrew would transit to the spill location with the B727 without the requirement for a visa initially under a General Declaration which lasts for 72 hours from the time of arrival. After this period the aircrew may require visas to remain in-country, support may be requested from the client to expedite the visa process. All crew members possess two passports to expedite visa applications.

The EASA Flight Time Limitations stipulate that aircrew can work 12 hours and then must have 12 hours rest before re-commencing work. The crew can work this pattern for a maximum of seven days before they are required to have one day rest. Having a second crew available will allow for unbroken service to continue. The second aircrew could be mobilised and travel on a commercial flight to the designated location.

> There is no charge for the mobilisation of a second crew. However, a Member requiring a second crew will be charged for their travel, accommodation and subsistence.

4. Indicative Flight Times

GOSRA		Sector 1 ADEP	Sector 1 ADEST	Sector 1 Time	Sector 2 ADEP	Sector 2 ADEST	Sector 2 Time	Sector 3 ADEP	Sector 3 ADEST	Sector 3 Time	Sector 4 ADEP	Sector 4 ADEST	Sector 4 Time	Total Time, mobilisation call to arrival at ADEST
Bahrain	**Bahrain**	Doncaster	Heraklion	03:40:00	Heraklion	Bahrain	03:40:00							12:20:00
Nigeria	**Lagos**	Doncaster	Fuerteventura	04:20:00	Fuerteventura	Lagos	05:00:00							14:20:00
Tanzania	**Dar es Salaam**	Doncaster	Hurghada	05:00:00	Hurghada	Dar es Salaam	05:20:00							15:20:00
South Africa	**Johannesburg**	Doncaster	Hurghada	05:00:00	Hurghada	Dar es Salaam	05:20:00	Dar es Salaam	Johannesburg	03:00:00				19:20:00
Kazakhstan	**Atyrau**	Doncaster	Atyrau	04:55:00										08:55:00
Sakhalin	**Sakhalinsk**	Doncaster	USNN	05:30:00	USNN	Sakhalinsk	05:30:00							16:00:00
USA	**Miami**	Doncaster	Goose Bay	05:10:00	Goose Bay	Miami	04:20:00							14:30:00
Canada	**Vancouver**	Doncaster	Iqaluit	04:40:00	Iqaluit	Vancouver	05:10:00							14:50:00
Brazil	**Rio de Janeiro**	Doncaster	Goose Bay	05:10:00	Goose Bay	Miami	04:20:00	Miami	Manaus	04:40:00	Manaus	Rio de Janiero	03:30:00	36:40:00
Republic of Congo	**Point Noire**	Doncaster	Fuerteventura	04:20:00	Fuerteventura	Point Noire	05:30:00							14:50:00
Angola	**Luanda**	Doncaster	Casablanca	03:05:00	Casablanca	Lagos	04:00:00	Lagos	Luanda	02:35:00				15:35:00

Table 3: B727 Example Flight times

The flight times detailed in Table 3 are for **<u>guidance purposes only</u>** and are subject to obtaining flight clearances, landing permits, ground handling time, local security situation, adverse weather conditions or any other unforeseen circumstance which could delay the flight. As with any response there will be factors outside of our control which could affect the response times and every endeavour will be taken to ensure a timely mobilisation.

5. Dispersant

TERSUS has a capacity of 15m^3 and can fly fully laden to the spill location. The weight of the dispersant reduces the overall range from 2500nm to 2250nm, transit air speed is not affected.

To ascertain whether it is more efficient to fly with dispersant or to send dispersant as cargo on a chartered aircraft will depend upon several variables, during a mobilisation the OSRL Duty Manager will advise the most appropriate means of mobilising dispersant to the spill location.

Dispersant Approval List

TERSUS is approved to spray 9 types of dispersant. Any dispersants other than those listed will **not be permitted** to be loaded into the TERSUS system.

Agma DR379	Slickgone LTSW
Corexit EC9527A	Slickgone NS
Corexit EC9500A	Superdispersant 25
Finasol OSR 51	Inipol IP80
Finasol OSR 52	

Table 4 Dispersant approved for use with TERSUS

Aerial dispersant Authorisation

OSRL will endeavour to provide assistance with regulatory approval for dispersant operations by providing technical support, documentation and logistics.

Dispersant Supply Chain (Logistics)

For an extended response and to ensure the availability of dispersant for ongoing aerial spraying operations, a continual supply of dispersant will be required to be sourced in-country or through OSRL SLA stockpiles (additional OSRL stockpiles are available for subscribers i.e. GDS). This can be organised by OSRL through the charter of a cargo aircraft.

OSRL work closely with our air charter broker to ensure that equipment can be mobilised around the world as quickly as possible, this is regularly tested through drills, exercises and spills. OSRL have a global contract with an aircraft charter broker with agreed charter terms, this means that OSRL can respond when an aircraft is available, and the client has given written authorisation for the aircraft. The broker would be expected to deliver flight options in a spill in six hours.

Although it is subject to fluctuating aviation markets and aircraft availability, we would expect to have an aircraft available and loaded with dispersant within 24-48 hours of approval. During this time, all necessary freight documentation would be completed. Support maybe required for some locations where supplementary documents are required such as translated documents and certified certificates of origin, this could potentially impact the mobilisation time.

There is an advisory on all Boeing aircraft for a limit of 42% of total cargo on liquid cargo. Not all operators are adhering to this advisory and OSRL will identify the most appropriate aircraft to freight dispersant. If the available aircraft are only capable of a 42% liquid cargo and the member requires additional response equipment, OSRL will utilise the remaining space with equipment.

Table 5 below gives an indication of dispersant quantities that can be carried in various cargo aircraft:

Aircraft Type	Estimated Number globally for Cargo	Estimated short notice spill availability	Cargo Capacity (Tons)	Capacity following Service Letter (Tons)	World Coverage (Potential)
Boeing 747 / 777	150	10	100-130	42-50	Global
Antonov 124	24	2-3	100	100*	Global
Antonov 225	1	1	250	250*	Global
Ilyushin IL 76	7**	1-2	45	45	Global – Shorter Transit Distance
MD11	9	1-2	85	85	Africa centric – some US based

Table 5: Air cargo carrier global availability indicative estimates

* Figures may reduce sue to volume constraints and are subject to an ongoing investigation into pressurisation of holds

** Number that can land in the UK

6. Operations

Upon arrival at the nominated forward operating base, an area of the airfield will be requested from the ground agent(s)/airfield operator for the storage and subsequent loading of dispersant. The area and facilities required for the 727 to operate will vary on a number of factors, predominantly the intended time spent at the FOB.

Once the aircraft and dispersant have arrived in country, the aircraft will be configured for spray operations by the flight crew, supported by additional OSRL responders if required. If the spray arms have been removed for transit, they will be re-fitted on arrival in country upon landing by a member of the flight crew, connection takes approximately 1 hour. A tasking document will be issued by the DM to the flight crew for the spray mission.

The TERSUS system must not be modified or operated by anybody except the flight crew or a qualified engineer.

> Support may be requested from the client to expedite the visa process where possible for aircrews, as this a determining factor in getting the crew and aerial dispersant in-country and ready to respond.

There is no provision for passengers to travel onboard the aircraft, CAA licensing prevents carriage of any personnel not acting as a member of the aircrew. The aircrew consists of two pilots, one flight engineer and a Task Specialist.

The Task Specialist is to assist with dispersant loading, point of contact for the OSRL EOC (Emergency Operations Centre) team and to produce the Dispersant Application Report.

Spotter Aircraft

The B727 can complete spray sorties without a spotter aircraft, but as the spray runs need to be conducted at 150ft it is challenging for the crew to judge the point to commence spraying. A spotter aircraft will increase the efficiency of the spray runs as it will assist in reducing overspray.

The use of a light aircraft is the primary option for use as a spotter due to the difficulties with vessels observing oil on the water. The main requirements for a spotter aircraft is that there are sufficient communications between the two aircraft. Spotter aircraft will require enough endurance for a single spray operation before needing to refuel and space onboard for an OSRL trained observer. The aircraft will communicate on normal Aviation Band VHF 118.0-136.975 MHz. Both aircraft will operate in accordance with the B727 Spray/Spotter Mission Operating Procedures.

> If available a spotter aircraft could be used to direct the B727 into location which would increase the effectiveness of the dispersant runs and ensure the B727 is on target. The client would need to provide this in country were possible. Unless they are a subscriber to the WACAF or UKCS service. Before conducting any joint operations, the B727 crew would complete a face-to-face briefing with the spotter aircraft crew

Dispersant reload and aircraft Refuelling

Upon conducting a spray run if there is dispersant available at the airport the aircraft can be reloaded in 40-60 minutes if being filled by individual IBCs, but this will depend on the location of the dispersant stockpile and ground handling assistance. The B727 crew with support from the Task Specialist will reload the dispersant and refuel the aircraft if necessary. It is expected that the B727 would normally achieve three sorties a day, but this is dependent upon dispersant supply, ground handling facilities, distance to the spill site from the runway, airport traffic, weather etc.

In the event that all the dispersant has not been used in a spray sortie it is possible for the B727 to land with the remaining dispersant without contravening its operating licence and permits.

Aircraft Tracking

OSRL utilise the programme 'Spidertrack' to track the B727 aircraft(s). The OSRL Duty Manager will issue a link to the client enabling the client to observe the aircraft's flight path.

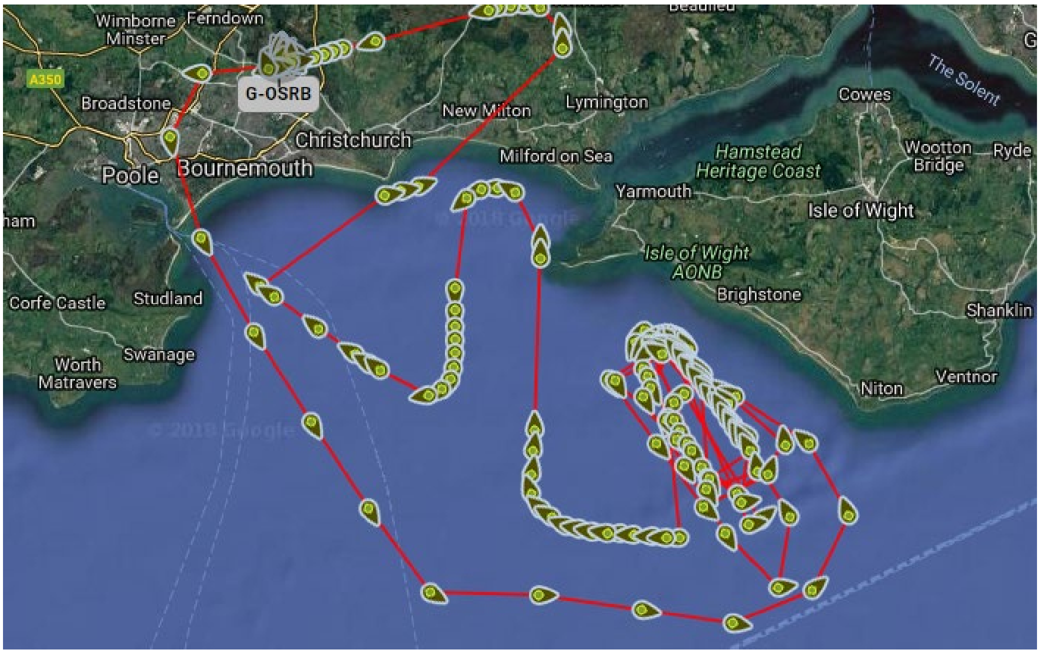


Figure 2: Example spider track of an aircraft on a sortie

7. Responsibility Matrix

Has no responsibility	Assistance may be required	Has full responsibility

Task	OSRL	Subscriber
Completion of Notification & Signed mobilisation form		
Generate flight tasking and aircraft work order		
Over flight clearances/landing permits		
Issuing of Letters of Invitation (LOI)		
Applying for necessary visas and work permits		
Assistance with expediting visa applications		
Airport handling & refuelling		
Chartering aircraft for dispersant resupply		
Maintenance of aircraft		
Formal Reporting		
Air crew accommodation / travel booking		
Spotter aircraft		
Authorisation to operate in country		
Demobilisation from the incident including signed demobilisation form		

Table 6: Responsibility Matrix

8. Costs

In the event of a mobilisation fees will be charged in accordance with the OSRL Scale of Fees, these costs are:

- Response flights - applicable on days where flights are carried out - charged on an hourly basis (excluding fuel). Subject to a minimum charge of the daily standby fee
- Standby fee - applicable on days where flights are not carried out - charged on a daily basis (cost increases after 10 days)

The above fees apply in respect of 'normal' response operations where the aircraft is deployed and utilised for up to a maximum of 10 days. Daily charges for non-flying standby periods of greater than 10 days duration where the aircraft flies on average for less than 2 hours per day during that period will require special consideration. Additional requirements may be placed on users in these cases. This option is only available to Members.

Direct operating costs will be charged as incurred to Members, including but not limited to fuel and handling charges. Non-members will be charged an additional 15% administration fee to these direct operating costs.

To give indicative costs for each sortie with dispersant, September 2018 prices, the client would be charged approximately:

Corexit 9500 - US$ 177,000

Slickgone NS - US$ 47,500

9. Additional Information

Table Top Exercises

Service Subscribers are encouraged to exercise the mobilisation of the service during any table top exercise. By calling the duty manager, real time mobilisation and flight times can be obtained to any location free of charge. OSRL can also arrange for actual participation of the B727 in a client exercise at published response rates.

Training

OSRL are responsible for the training of their contractors and OSRL conduct operational training sessions each year to simulate aerial dispersant spraying. The training includes:

- Aerial dispersant spraying (using fresh water)
- Use of surveillance equipment
- Coordination with spotter aircraft(s)
- Coordination with vessel operations
- Production of reports
- Data management

The training is supported by 6 monthly scheduled exercises and no notice drills to ensure the appropriate level of competence is maintained and to ensure that OSRL fulfils the mobilisation times and standards expected from our members.

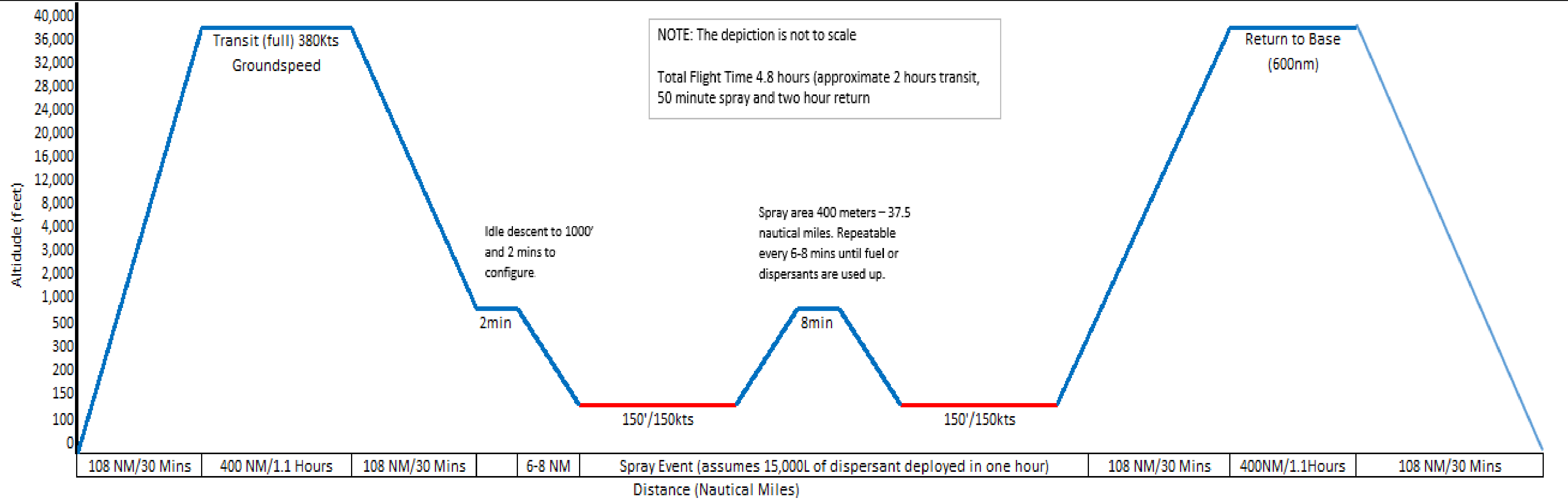
In addition to the scheduled training, the B727 crews complete a minimum of one spray experience flights each month and three annual overseas training flights to retain route flying proficiency. Twice a year the spray experience flights are replaced by 16 hours of simulator training to ensure crews are proficient in handling in-flight emergencies and the contingency procedures surrounding spray operations.

10. Example 727 Operations

The OSRL SLA dispersant stockpile contains 700m^3 of dispersant. Under the Service Level Agreement, the client has access to 50% of this stock. The B727 system is able to hold 15m^3 of dispersant per sortie and the table below shows an example mobilisation of dispersant to the Republic of Congo and availability of SLA dispersant.

Day	Operation (subject to timings)	Dispersant used	Dispersant available
1	Notify OSRL of spill, Client signs charter agreement B727 mobilised to Congo		
2	Mobilisation and loading of cargo aircraft (B727 arrives in Congo)		
3	Arrival of 42 m^3 of dispersant in Congo, 1 x spray sortie with B727 and mobilisation of a second aircraft for transport	1 sortie - 15m^3	27 m^3
4	Mobilisation of third aircraft for dispersant transport	2 sorties - 27m^3	0
5	Second aircraft arrives in Congo with 42 m^3 of dispersant	2 sorties - 30m^3	12 m^3
6	Third aircraft arrives in Congo with 42 m^3 of dispersant. Mobilisation of fourth aircraft.	2 sorties - 30m^3	24 m^3
7	Mobilisation of fifth aircraft	2 sorties - 24m^3	0
8	Fourth aircraft arrives in Congo with 42 m^3 of dispersant. Mobilisation of sixth aircraft.	2 sorties - 30m^3	12 m^3
9	Fifth aircraft arrives in Congo with 42 m^3 of dispersant	2 sorties - 30m^3	12
10	Sixth aircraft arrives in Congo with 42 m^3 of dispersant. Mobilisation of seventh and eighth aircraft	2 sorties - 30m^3	24

Table 7: Example mobilisation of dispersant to the Republic of Congo



Assumptions for this profile:

1. Full Load of Dispersant
2. Full Load of fuel available at DSA or Forward Operating Base once Fly Away Kit is offloaded.
3. Still wind for flight planning purposes
4. Spray polygon allows all dispersantto be deployed in 4 passes (approximate length of spill 8.5nm) . Smaller polygon requires more passes
5. Repositioning approximately 8 minutes between runs.
6. Fuel burn figures in accordance with Aircraft Flight Manuals

OSRL / Client Questions / Advice to allow personalised profile:

1. Distance from Spill to nearest suitable airfield to determine transit time
2. Size of spill polygon determines number of spray runs required to cover the spill
3. Fly away kit reduces the fuel load by approximately 4000lbs (25 minutes flight time)
4. 12 hours usable Flight Duty Period can offer up to three rotations per day if the spill polygon is large enough to allow rapid deployment of dispersant
5. Low level deployment due to airspace will limit endurance

Figure 3 – Example Spray Mission from a Forward Operating Base

Appendix S: OSRL Global Dispersant Stockpile Logistics Plan and CH Robinson Logistics Oil Spill Response Logistics Plan

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Santos Australia Limited

OSRL Global Dispersant Stockpile Logistics
Planning Guide

PERTH BRANCH

1.0 C. H. Robinson – Capability Statement

INTRODUCTION

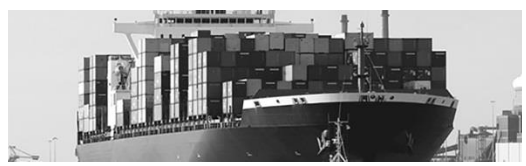
Santos Australia Limited (SANTOS) engages the services of C. H. Robinson to provide Freight Forwarding capability to the company. C. H. Robinson was selected as the preferred supplier of services based on its global reach, diversity, experience and knowledge of their work force in meeting crucial time constrained demands. C. H. Robinson's global network provides SANTOS with the confidence they can and will meet any demand / request and this capability statement sets out how C. H. Robinson will execute and mobilise its global reach in a defined planning requirement.

OVERVIEW

C. H. Robinson offers highly specialised international freight forwarding and border clearance services to SANTOS, executing practical and efficient solutions to the movement and information gathering of their oil and gas equipment and related cargoes. C. H. Robinson has a proven track record of high level performance with offices throughout Australia and a network of offices and partners in over 100 countries.

CORE COMPETENCIES

- Ocean Forwarding

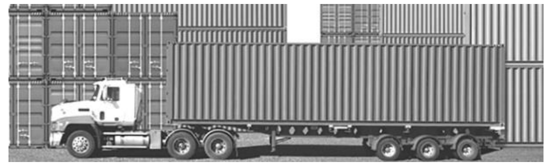


C. H. Robinson is one of Australia and New Zealand's leading consolidators with vast experience in single shipper FCL and LCL and providing our own direct FAK services from many countries. Our services include all documentary and physical requirements for the movement of the goods with our own scheduled sailings from overseas and local ports. C. H. Robinson uses EDI to distribute documents and information between the shipper, forwarder and importer with our C. H. Robinson Xtract system.

- Air Forwarding

C. H. Robinson offers a comprehensive range of airfreight services to and from global markets. Our air services are seamlessly integrated with tracking and financial management through all phases of the supply chain.

- Border Clearance



C. H. Robinson is widely regarded as one of Australia and New Zealand's leading Customs brokerage agencies, providing specialist services and expert advice from a highly skilled team of licensed Customs and biosecurity accredited brokers. Our clients choose C. H. Robinson because we work in the interests of our client and take one approach to risk management which is full compliance.

- Project and Out of Gauge Shipment Management

Managing project freight and out of gauge import and export shipments requires specialised expertise. C. H. Robinson has positioned a senior National Project Manager with key operational staff to manage these projects, in consultation with qualified international agents and carriers.

EXPERIENCE

C. H. Robinson Worldwide (AU) Pty Ltd is one of the largest international freight forwarding and brokerage agencies in Australia and globally. We have achieved this through a long history of cultivating a team of talented people who understand the big picture and embrace their role in it. C. H. Robinson has a team of the best international supply chain and regulatory minds in the business and we arm them with a strong best practice system and a culture of continuous improvement. The result is constant striving for improved efficiencies and creating lifetime loyalties through exceeding expectations.

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C. H. ROBINSON CONTRACTORS

C. H. Robinson engages a number of contractors to facilitate logistics arrangement on behalf of its clients. This applies to, but is not limited to, the following specialist type-companies:

- Vessel Operators for Break Bulk vessels for part or full charter and general liner services
- Cellular (containerized) vessels
- Barge operators
- Supply vessel operators
- Air Charter Agent/s
- Air Lines
- Couriers
- Transport companies
- Heavy Haulage companies
- Crane companies
- Stevedores
- Sea Ports and their respective authoritative bodies
- Laydown / Storage facilities
- Supply Bases (globally)

C. H. Robinson provides SANTOS with a vast range of international services, creating an umbrella which covers its supply chain on a global scale. This has typically involved the following services:

- Containerized cargo (i.e. 20' or 40' containers); import and export to and from Australia as well as cross trade consignments
- Hiring of offshore equipment such as cargo baskets to load unconventional cargo such as mooring chain, for example
- Crane and Rigger hire including labour
- Air freight; in-gauge and out-of-gauge cargo, import and export to and from Australia as well as cross trade consignments
- Air charters, both international and domestic (Australia)
- Break bulk cargo; import and export to and from Australia as well as cross trade consignment based on part-charter, full charter and general vessel liner services (i.e. ex-Singapore to Dampier)
- Project cargo (e.g. cutting of flow line at Jurong Port, Singapore and tarpaulin replacement on umbilical and flowline reels also at Jurong Port, Singapore)

- Australian domestic air and road (interstate) services, such as:
  - Hot shots (Australia-wide)
  - General haulage
  - Air freight (express and next day services)
  - Short and long term storage

PROJECT SPECIFIC CONTRACTORS

In order to facilitate the logistics required to meet the IBC delivery days on the oil spill response plan, C. H. Robinson will engage and manage its following Contractors:

AIR CHARTER AGENT

This agent is the world's leading aircraft charter company, with a proven reputation for innovation, expertise and professionalism. Established in 1973, it has four decades of experience providing specialized air charter solutions for both passenger and cargo movements. With more than 30 locations strategically across 6 continents, its global coverage is unparalleled. This agent has the ability to source and mobilise a variety of aircrafts at any given point in time globally and is a specialist in providing aircrafts to load and carry equipment related to the oil, gas and resources sector.

OVERSEAS AGENTS

Today, we're one of the world's largest third party logistic providers. Our extensive global network and strong regional carrier relationships provide C. H. Robinson with substantial buying power, allowing C. H. Robinson to offer multiple carrier options, flexibility of service and rates as well as firm capacity during peak periods (such as in the case of an oil spill emergency). We know our people, processes and technology are at the core of our success, and we continually strive to use our strengths to help our customers work smarter, not harder. We are confident C. H. Robinson can help SANTOS further expand its global footprint and that C. H. Robinson will provide best-in-class service exceeding industry standards.

This security of working with quality partners is particularly important for the Oil and Gas Industry where a guarantee of international expertise is an essential service element.

We believe in accelerating global trade to seamlessly deliver the products and goods that drive the world's economy. With more than a century of industry experience, we know what it takes to manage rapid growth, embrace change, and to stay competitive in the marketplace—delivering innovative supply chain solutions to more than 113,000 customers across the world. Whether you need truckload services, ocean or air shipping, supply chain consulting, or more—we use the strengths of our knowledgeable people, proven processes, and global technology to provide unmatched connectivity, capabilities, and experience.

LOCAL TRANSPORTERS (AUSTRALIA)

C. H. Robinson Oceania holds contracts with a variety of service providers to facilitate its operations on behalf of its clientele. These contracted service providers have long established relationships with C. H. Robinson, having proven their capabilities in the oil, gas and resources sector over the last 14 years in the Oceania market. In the case of this oil spill response plan, C. H. Robinson has a number of transport operators available to assist and provide the required amount of transport trailers, prime movers and staff required to execute the work scope effectively, efficiently and safely. In having a number of transport operators on call, C. H. Robinson is not restricted to the possible limitations of any one given transport operator (or other such contractor). With other such like-for-like contractors, C. H. Robinson has the flexibility of reaching out to various other resources in order to achieve its set outcome.

IN-HOUSE STAFF (AUSTRALIA)

C. H. Robinson Perth employs 37 staff and has 2 dedicated employees working on the SANTOS account on a day to day basis. Other resources can be called upon in the case of an oil spill emergency such as the C. H. Robinson State Manager and other C. H. Robinson project staff with expertise in the area of emergency/critical movement of commodities via all modes of transport available. C. H. Robinson staff are contactable 24 hours a day, 7 days a week, 365 days a year (irrespective of public holiday or seasonal festivities). It has the flexibility of dispatching staff to any domestic or global location. C. H. Robinson employs its own in-house Customs Brokers meaning that at any given point in time, Customs clearance formalities for any given shipment can be completed around the clock.

THIRD PARTY CONTRACTOR – QUBE, PORT HEDLAND FACILITY (OSRP SUPPORT BASE)

Pilbara Footprint

Qube has been the leading provider of stevedoring services in the Pilbara since their commencement of operations in Port Hedland over 20 years ago. Over recent years, Qube has made a significant investment in developing their operations and workforce, supported by investment in mobile plant, heavy equipment and a significant transport fleet to improve their levels of service to their customers with:

- Existing management structure and employees;
- Existing certified agreements covering stevedoring and transport operations;
- Existing Western Australian High Mass Limit accreditation;
- Existing safety management systems and emergency response plans;

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- Existing transport Depots and maintenance facilities including 700m3 of internal laydown and 5,000m3 of external laydown available at any time;
- Existing fleet of various trailers, road trains, front end loaders, fork lift trucks;
- Proven existing working relationships in the region; and
- Proven operating standards and procedures that meet all statutory requirements.

Pilbara Resources

Qube employs almost 400 personnel in the Pilbara and are well resourced to support C.H Robinson's requirements.   Qube's depth of resources is supported by the ability to mobilise other staff with specialised skills from any one of the multiple operations within their network in the Pilbara and Western Australia to meet their customer's needs.

Figure 1: Qube Wedgefield Depot

Figure 2: Aerial view of Qube's Port Hedland facility

2.0 C. H. Robinson Local Office & Overseas Agent Details

Below is a list highlighting C. H. Robinson's overseas local agent or office details for each of the respective countries where stockpiles are stored globally.

IBC Global Location	C. H. ROBINSON Local Agent (Air)	C. H. ROBINSON Local Agent (Sea)
OSRL GDS Loyang Offshore Supply Base Singapore	C.H. Robinson Freight Services (Singapore) Pte Ltd 115 Airport Cargo Road, Cargo Agent Building C#04-03 Singapore 819466	Bintang Mas Shipping Pte Ltd (Project Division) 2 Boon Leat Terrace #08-02 Harbourside Building 2 Singapore 119844
OSRL GDS Lower William Street Southampton SO14 5QE United Kingdom	Transcar Projects Ltd 1 Crayside 5 Arches Business Park Sidcup, Kent United Kingdom	Transcar Projects Ltd 1 Crayside 5 Arches Business Park Sidcup, Kent United Kingdom

IBC Global Location	C. H. ROBINSON Local Agent (Air)	C. H. ROBINSON Local Agent (Sea)
Dasic Winchester Hill, Romsey, Hampshire, SO51 7YD, United Kingdom	Transcar Projects Ltd 1 Crayside 5 Arches Business Park Sidcup, Kent United Kingdom	Transcar Projects Ltd 1 Crayside 5 Arches Business Park Sidcup, Kent United Kingdom
OSRL GDS VEOLOG Bat 1. Rue Henri Guillaumet FRANCE 51555 Aéroport Vatry Chalons en champagne	C.H. Robinson France SAS 165 Avenue du Bois de la pie Parc de reflects – ZAC Paris Nord II, BP 18371 Roissy CDG Cedex, France	C.H. Robinson France SAS 165 Avenue du Bois de la pie Parc de reflects – ZAC Paris Nord II, BP 18371 Roissy CDG Cedex, France
Nalco 7705 Highway 90- A, Sugar Land, TX 77478	C.H. Robinson Project Logistics Inc. 900 Town & Country Lane, Suite 310 Houston, TX 77024 USA	C.H. Robinson Project Logistics Inc. 900 Town & Country Lane, Suite 310 Houston, TX 77024 USA
OSRL GDS 5251 NW 103 Ave Sunrise FL 33351 USA	C.H. Robinson Project Logistics Inc. 900 Town & Country Lane, Suite 310 Houston, TX 77024 USA	C.H. Robinson Project Logistics Inc. 900 Town & Country Lane, Suite 310 Houston, TX 77024 USA
OSRL GDS 34 Sycamore Crescent Atlas Gardens Cape Town South Africa	Megafreight Services (Pty) Ltd – Cape Town 13th Floor The Towers South 2 Heerengracht Street Cape Town, 8001 South Africa	Megafreight Services (Pty) Ltd – Cape Town 13th Floor The Towers South 2 Heerengracht Street Cape Town, 8001 South Africa

IBC Global Location	C. H. ROBINSON Local Agent (Air)	C. H. ROBINSON Local Agent (Sea)
OSRL GDS ZIRANLOG ARMAZÉNS GERAIS E TRANSPORTES LTDA Rua do Alho 1.129 A Penha Circular Rio De Janeiro	C.H. Robinson Worldwide Logistica Brazil Av Dr Cardoso de Melo, 1.855-CJ 121 Vila Olimpia Sao Paulo Brazil	C.H. Robinson Worldwide Logistica Brazil Av Dr Cardoso de Melo, 1.855-CJ 121 Vila Olimpia Sao Paulo Brazil

C. H. Robinson local Perth 24 hour contact details:

Contact	Position	Phone number
Thomas Bonavia	Team Leader – Account Management	+61 431 497 572
Daniel Emmelhainz	Team Leader – Account Management	+61 425 775 931
Stefan Muenger	Customer Service Manager	+61 478 489 568
Adam Hughes	General Manager, Perth W.A.	+61 425 315 639

C. H. Robinson – Australia:

Below is a list highlighting C. H. Robinson's Australian office locations.

Location	Office Details
Perth (SANTOS Contracted Office)	C. H. Robinson Worldwide (AU) Pty Ltd Unit 4-8, 11 Fricker Road Perth Airport WA 6105
Melbourne (Head Office)	C. H. Robinson Worldwide (AU) Pty Ltd 460 Bay Street Port Melbourne VIC 3207
Melbourne	C. H. Robinson Worldwide (AU) Pty Ltd 3 Concorde Drive Keilor Park VIC 3042
Brisbane	C. H. Robinson Worldwide (AU) Pty Ltd 42 Thompson Street Bowen Hills QLD 4006
Sydney	C. H. Robinson Worldwide (AU) Pty Ltd B1/2-8 McPherson Street Banksmeadow NSW 2019
Adelaide	C. H. Robinson Worldwide (AU) Pty Ltd 252 Richmond Road Marleston SA 5033

3.0 Logistics Planning & Equipment Type

Cargo: IBC Units; 1,000 kg / (L) 120 x (W) 100 x (H) 116 cm (each)

Packaging - Specification

container for transport

SCHUTZ

ECOBULK MX 1000 UN / DN150, closed /
int. camlok-butterfly-valve, ETFE-g. / 2 label plates /
Steel-framepallet

SCHÜTZ GmbH & Co.KGaA
Schützstraße 12
D 56242 Selters / Germany

Date: 20.12.2012 / TE-KO / ss
Side 1 from 2

Article - No.: 4024018

Technical data:

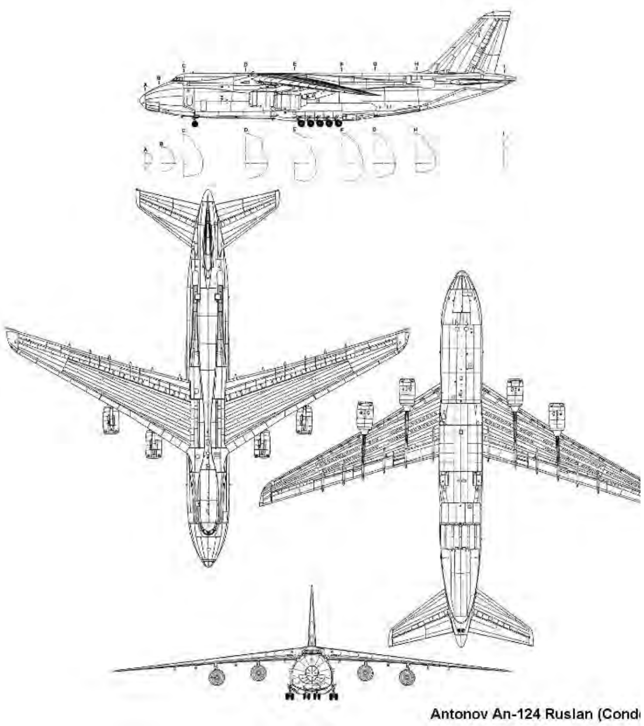
Nominal Capacity:		1000	Litre
Brimful Capacity:		1060	Litre
Length:		1200	mm
Width:		1000	mm
Height with pallet:		1160	mm
Filling opening:		150	mm
Discharge opening:		50	mm
Fork opening:		100	mm
Label plate:		2	piece
Corner Protector:		4	piece
Weight:	Inner container:	23,0	kg
	Total approx.:	65,5	kg

Technical subjects to change, all dimensions approximately

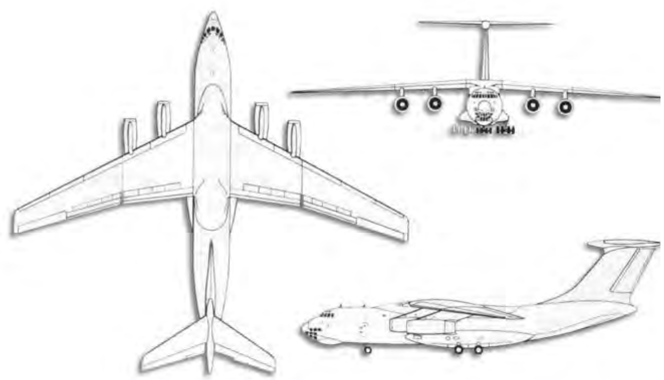
Aircraft Types (Worldwide Availability)

Basis – Charter

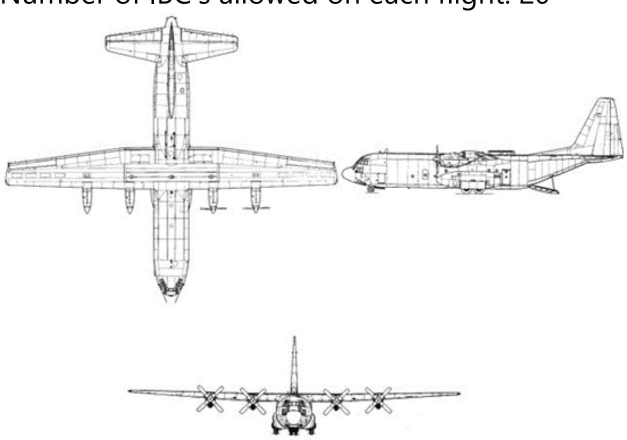
AN-124; Antonov
Number of IBC's allowed on each flight: 120



IL-76; Ilyushin
Number of IBC's allowed on each flight: 45



C-130; Hercules
Number of IBC's allowed on each flight: 20



B747-400; Boeing
Number of IBC's allowed on each flight: 50
**Requires the aid of a hydraulic loader*

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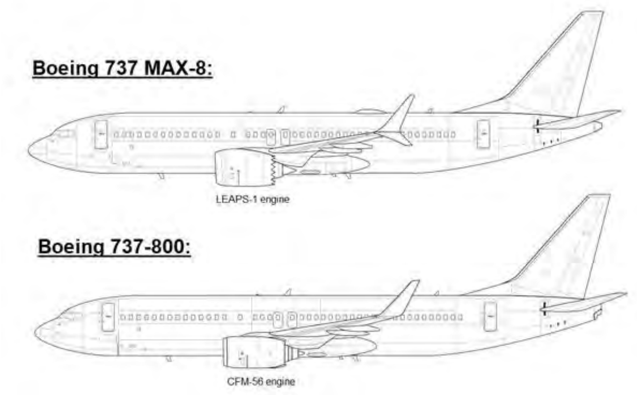
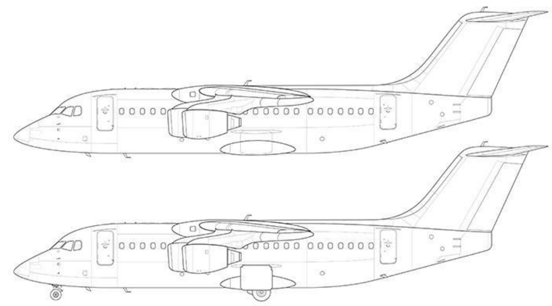
B737F; Boeing

Number of IBC's allowed on each flight: 10



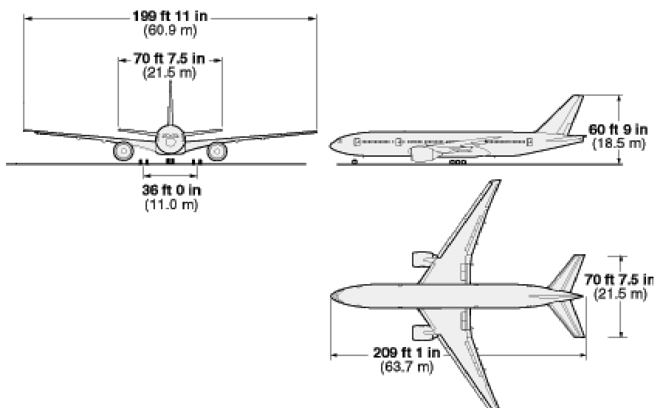
Bae146; Boeing

Number of IBC's allowed on each flight: 7

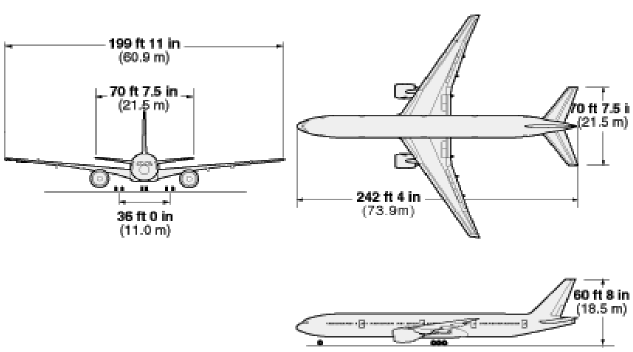


B777F; Boeing

Number of IBC's allowed on each flight: 42



Boeing 777-200



Boeing 777-300

Aircraft Endurance

Route	Boeing 747		AN124		C130		IL76		BAe146F		Boeing 737F		Boeing 777F	
	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops	Approx Flight Time (hrs)	No. of Fuel Stops
SIN-LEA/PHE	4	0	4	0	6	0	4	0	N/A	N/A	4	0	4	0
LHR-LEA/PHE	19	1	46	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	1
MIA-LEA/PHE	23	1	48	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23	1
HOU-LEA/PHE	21	1	46	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21	1
CDG-LEA/PHE	18	1	42	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18	1
CPT-LEA/PHE	12	1	20	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	1
RIO-LEA/PHE	19	1	46	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	1
AVV-LEA/PHE	4	0	4	0	5	0	4	0	4	1	4	0	4	0

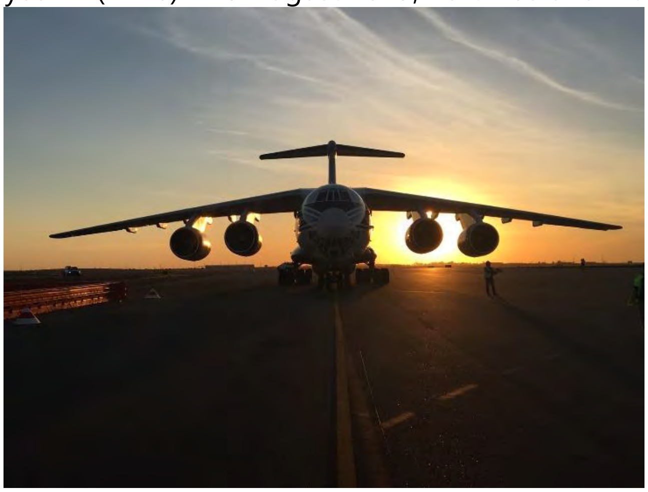
**Above data is subject to final payload and weather conditions. Refueling to be arranged at Learmonth, Exmouth and Port Hedland Airports (WA), respectively.*

Recent C.H. Robinson Aircraft Charter Activity

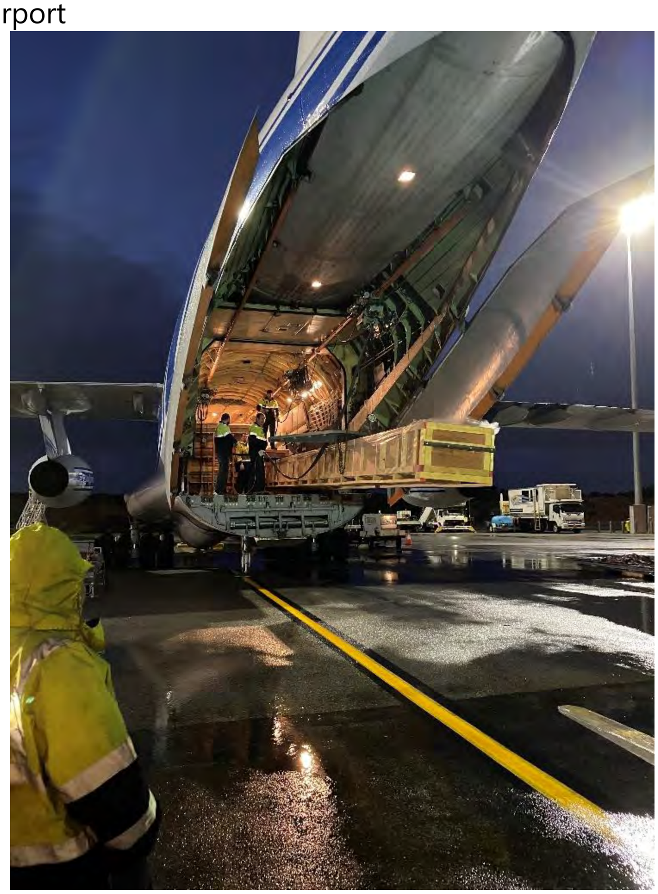
Ilyushin (IL-76) – 12 July 2019, Port Hedland International Airport

Antonov (AN-124) – 07 August 2019, Perth International Airport

Ilyushin (IL-76) – 29 August 2019, Port Hedland International Airport

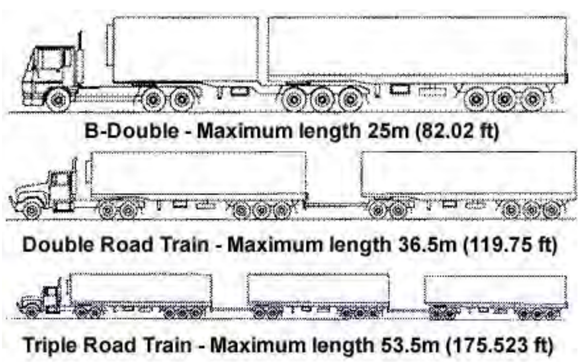


Ilyushin (IL-76) – 25 May 2020, Perth International Airport



Antonov (AN-124) – 10 June 2020, Perth International Airport

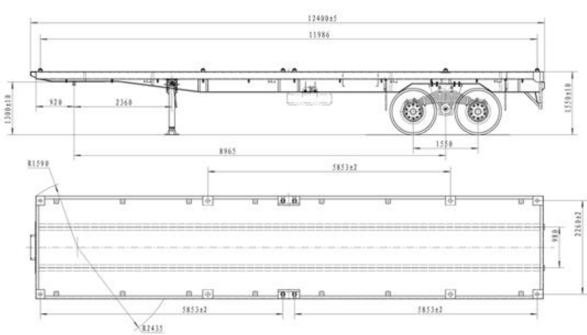
Transport Trailer Types



B-Double: Limit of 34 x IBC's per B-Double combination

Double Road Train: Limit of 44 x IBC's per Road Train Combination

Triple Road Train: Limit of 66 x IBC's per Road Train Combination

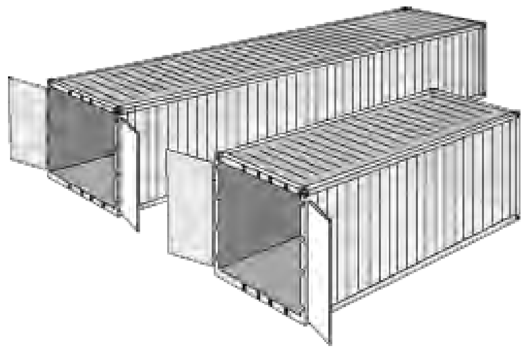


40' Standard Semi Trailer:

1) Limit of 22 x IBC's per trailer
2) Maximum cargo gross weight allowable: 24T
3) Standard Length: 13.1m
4) Standard Width: 2.5m

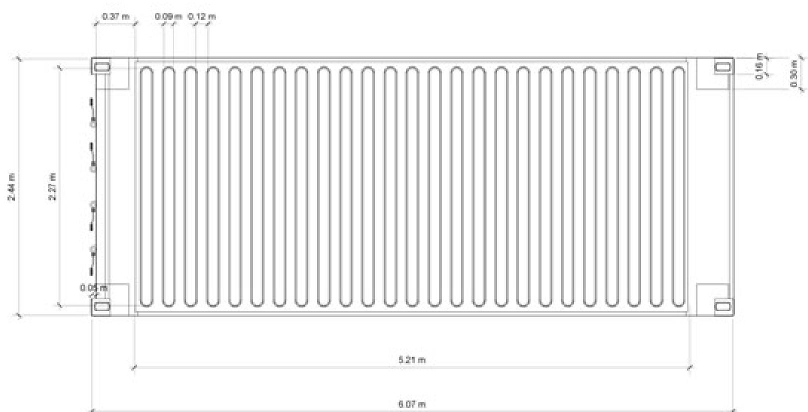
**Note – transportation at both origin and destination is based on Free on Truck terms (FOT)*

Shipping Line Container Types (limited to Project scope)



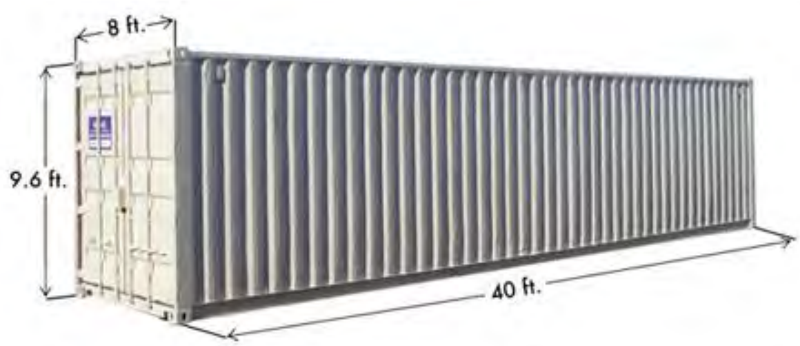
20' General Purpose Container:
Limit of 8 x IBC's per container

40' General Purpose Container:
Limit of 20 x IBC's per container (preferred equipment for transportation of IBC's via ocean freight)



20' General Purpose Container:

Internal Length: 5.919m
Internal Width: 2.34m
Internal Height: 2.38m
Max. Payload: 22,100kg / 33m3
*Note, maximum weight per loaded container cannot exceed 22,100kg



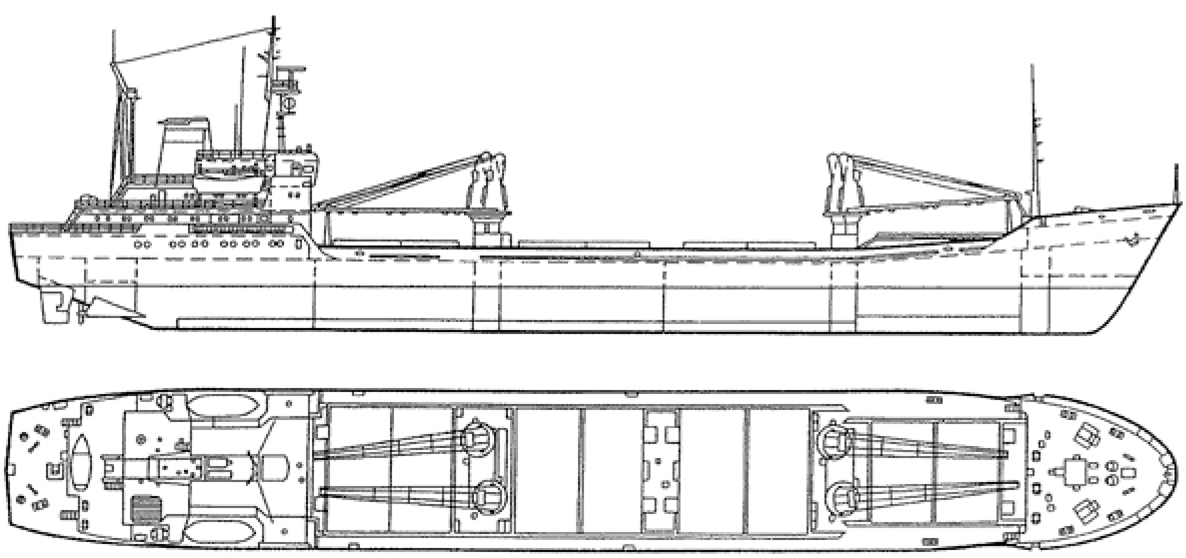
40’ General Purpose Container:

Internal Length: 12.051m
Internal Width: 2.340m
Internal Height: 2.380m
Max. Payload: 27,397kg / 67.3m3
*Note, maximum weight per loaded container cannot exceed 24,000kg (weight limit of each standard 40’ transport trailer at destination, AU)

BREAK BULK (FULL CHARTER) SHIPPING – A CONSIDERATION

C. H. Robinson propose a consideration of consolidating the collection of dispersant IBC’s from an international key region (e.g. Europe, covering the collection of all France and United Kingdom dispersant stock piles). A chartered vessel can received and load a large number of IBC’s on board (as opposed to the limitations of aircrafts) and will have direct sailing as per the charter agreement to call into whichever Australian port is required direct from the origin port, for the purpose of end delivery of stock piles, whether this be Port Hedland or Dampier for example.

The cost of this charted vessel would be approximately the cost of one chartered Antonov AN-124. Whilst this vessel is being arranged, other dispersant from locations such as Singapore and Cape Town can be arranged via air freight to facilitate the ongoing requirement of dispersant stock pile accrual.



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4.0 Scope of Work

This logistics plan has been designed to work in conjunction with and to compliment the Global Dispersant Stockpile Logistics Execution Plan.

ACTION	C. H. ROBINSON	SANTOS	REMARKS
Initial Contact			
Client phones in with call out request		✓	
Obtain details of qty, type of dispersant required		✓	
Agree qty, type of dispersant required and bases to issue dispersant from		✓	
Inform duty team of designated base(s)		✓	
Activate mobilization protocols	✓		
Country of Dispatch			
Arranging air/ship/road transport for dispersant	✓		Scope to include the sourcing of vessels, aircraft and transport equipment including prime movers and appropriate transport trailers
Coordination of freight agent/shipping handler/air charter handler	✓		
Loading and mobilization of dispersant to agreed airport/port	✓		Scope to include collection of IBC's from respective dispersant location
Provision of loading lists for consignment to logistics handler including Commercial Invoice, Packing List, FTA or COO documentation		✓	In conjunction with OSRL
Accepting consignment at airport/port	✓		

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Client/Client's handler produces all export and import paperwork		✓	In conjunction with OSRL
Logistics handler loads aircraft/ship ready for departure	✓		
Monitor / provide updates on transport progress (road, air or sea) until arrival at end destination	✓		
Customs clearance formalities for international shipments (air/sea)	✓		
Coordination of aircraft/vessel container unloading and loose delivery to nominated place of delivery.	✓		Scope to include container unpacking for sea freight shipments and loose delivery of IBC's ex-Fremantle to Exmouth or Port Hedland
Provision of required equipment to transport all mobilized IBC's to/from aircrafts/vessels at both origin and destination	✓		
Exceptions			
Arranging of logistics alongside general OSRL SLA equipment at all IBC collection points (internationally and domestically within Australia)	✓	✓	Basis FOT; C. H. Robinson contracted transporter to be loaded/unloaded at both origin and destination points (unless otherwise agreed upon)
Storage / Laydown facilities	✓	✓	

5.0 Australian Customs, DOA & Shipping Documentation

In order for C. H. Robinson to Customs clear each international shipment into Australia with Australian Customs, the following documentation will be required:

a) Air Way Bill or Ocean Bill of Lading
b) Commercial Invoice
c) Packing List (if available; not compulsory)
d) Free Trade Agreement (FTA) or Certificate of Origin (COO) where applicable to participating countries (i.e. USA, Singapore)
e) Material Safety Data Sheet (MSDS) to support the commodity itself for safe transportation, handling and treatment in the case of a spill or leak of the dispersant from its IBC containment

*Note – C. H. Robinson can Customs clear consignments arriving into Australia prior to their arrival at the destination port or airport. In order for this to be achieved, the standard shipping documentation such as the Bill of Lading and Commercial Invoice will need to be presented upon dispatch of the aircraft or vessel at origin in order to allow for timely clearance (especially in the case of air freight).

From an Australian Customs and Department of Agriculture (DOA) perspective, C. H. Robinson will still require all the usual shipping documentation including the transport document (Air Way Bill or Ocean Bill of Lading), Manifest (or Mate's Receipt), Commercial Invoice, Packing List, etc. In a genuine emergency situation C. H. Robinson would make an effort to have the cargo delivered with or without all the usual documentation and most authorities would be sympathetic to C. H. Robinson cause if aware of the extenuating circumstances at hand. They would still however, require C. H. Robinson to complete a formal clearance so correct documentation would always be required in order to complete properly.

FTA or COO certification (where applicable) would still be required even in the case of an oil spill emergency. Otherwise the imported IBC's would be subject to 5% Customs duty.

In the case of an air charter into Australia, the Civil Aviation Safety Authority (CASA) could potentially fast-track the approval process for inbound flight permits for chartered aircrafts which typically take on average 3 working days to process and approve. This process is for overflight and landing permits for international aircrafts to be able to enter into Australian air space. Likewise, CASA manage the clearing of air space along the flight path for the intended aircraft and this clearance applies to all countries affected by the flight path.

Australian Customs and the DOA may also potentially allow international chartered aircrafts to land directly into Learmonth Airport where Exmouth is the end destination for international air freighted IBC's. The general ruling however is that international flights must first land at an international airport.

In the case of Exmouth being the end destination for shipped IBC's, chartered aircraft would potentially first land at Perth Airport, Port Hedland Airport or Darwin Airport initially, that being the first arrival airport but not necessarily the aircraft's intended end destination airport. This is for the standard Customs and DOA clearance and screening process which, once completed, allows the aircraft to continue on its journey to its final destination airport; in this case, Learmonth Airport.

6.0 Summary

This document, in conjunction with the Logistics Plan, clearly defines firstly the capability C. H. Robinson and its partners have in providing a global logistics solution with its network and extensive reach to draw on transportation solutions to meet any demand, any time, and most importantly anywhere in the world. Furthermore the document demonstrates a defined planning scenario to meet the demands of a fast action oil spill response (single source strategy), to provide local and global stock piles of dispersant capability, that is an essential strategy in dealing with a loss of containment; the document ensures that it considers all of the detail from point of collection to point of delivery and calls out to the responsibilities of C. H. Robinson, its partners and most importantly SANTOS. As noted, in conjunction with the Logistics Plan this provides the details in being able to execute the mobilisation, address the administrative requirements and comply with all State and regulatory requirements in mobilising local, national and global stock piles of dispersant.

Logistics Planning Guide
Global Dispersant Stockpile

Revision 7

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Fax: +44 (0)23 8033 1972

Contents

Revision History

Revision	Date	Author	Reviewer	Approver
Revision 6	14/09/15	M. Carter-Groves	M. Cole	C. Hammick
Revision 7	01/07/18	D. Redington	I. Midgley	P. Foley

1 Introduction

1.1 Global Dispersant Stockpile Overview

Oil Spill Response Dispersant Limited (OSRDL) is an Oil Spill Response Ltd (OSRL) supplementary Service, supporting the Global Dispersant Stockpile (GDS). GDS is an industry owned and funded joint initiative providing GDS members with the capability for both surface and subsea incidents.

OSRDL owns, stores and maintains the dispersant and associated support equipment (Equipment) in a response ready state, providing the Client with readily available Equipment, freight and logistical support and technical support when required.

5000 m^3 of dispersant and associated support equipment is pre-positioned in six locations across four continents. The Equipment is transportable by road, air and sea for deployment. Any GDS member may request 100% of the stockpile at any time.

Key facts:

- 5000 m^3 of three dispersant types located at six strategic locations
- 100% of the stockpile can be mobilized for a single incident
- Dispersant types in the GDS are those with the most worldwide approval
- Locations of dispersant types aligns with regional approvals
- Any member of OSRL can subscribe to the GDS via a supplementary agreement and execution of supplier end user indemnities
- The Client has full responsibility for the regional approval and application of the dispersant, however OSRL will assist where required
- The stockpile can be used with the Subsea Well Intervention Service (SWIS) dispersant toolkit
- OSRL will arrange stockpile resupply as soon as dispersant has left the storage warehouse (Primary Storage)
- Client is responsible for insurance and freight from Primary Storage, OSRL will assist if required
- The Equipment is a sale to the Client on mobilisation from the Primary Storage

1.2 Purpose

This Logistics Planning Guide (LPG) is an aid to assist the planning and understanding of the processes for the mobilisation and delivery of the Equipment. This helps to ensure that operational logistics capability is delivered on time, in the right quantity and correct configurations, in a fully serviceable condition and to the correct location. The guide covers details of the following:

- Locational information
- Storage media (containers and types etc)
- Potential transport configuration requirements (air, road and sea)
- Logistical, export and selling procedures
- Mobilisation guidance
- HSEQ
- Resupply
- Equipment return

1.3 Audience

This LPG is designed to be a simple to use, informative document for use by OSRL and Client personnel.

2 Equipment

2.1 Locations and Volumes

The GDS is located at the following locations:

Figure 1 GDS Global Locations

2.2 Equipment Storage

If Equipment is mobilised from the Primary Storage location; either temporarily located at a port, airport, on a trailer or aboard a vessel (Secondary Storage location) – the following considerations must be observed:

- Temporary shelter to protect the dispersant from direct sunlight, high humidity and salt water. If solid shelter is unavailable, opaque sheeting should be applied to cover the IBCs.
- Considerations should be observed if storage location poses a potential environmental impact; such as gradient run off or open drains etc. If drainage systems are in the vicinity of the dispersant, then suitable drain covers must be utilised. Drain covers are available in the Going Away (GA) box, see Section 9.1.
- IBC relocated from the Primary Storage location must be accompanied with a spare empty IBC, gravity transfer hose and the GA box, see Section 2.3

2.2.1 Secondary Storage Weekly Checks

On mobilisation of the Equipment from Primary Storage; this could be during freight, temporary laydown area, at the incident location, in bulk storage or on a vessel – the following weekly checks should be observed:

1. Ensure there are no dispersant leakages from the containers or the discharge valves.

2. Ensure the Equipment is secure and weather tight, ensure either solid shelter or opaque sheeting is maintained.
3. Ensure IBCs are stored in accordance with manufacturer's instructions (stored between 10 ^{o}C - +30 ^{o}C, away from direct sunlight).

2.3 Stockpile Support Equipment

GDS stockpiles are aligned to ensure suitable stockpile response support equipment is available at the primary and secondary storage locations in the event of a dispersant spillage as well as a means of transferring the dispersant into bulk storage with the high-volume diesel transfer pump and associated hoses and valves. Figure 2 below illustrates a typical stockpile support equipment layout at the Primary Storage locations.

Figure 2 Primary Storage Support Equipment

The Primary Storage locations are facilitated with a 1000 litre capacity wheeled chemical spillage bin, double IBC bund and one spare empty IBC (with transfer hose) – this equipment shall be located and maintained at the Primary Storage location. The spillage bins include spillage instructions/absorbent pads/boom/drainage covers/putty sheets or pots/PPE. The spillage bin is located at an accessible location, or relocated to a location of high risk during IBC movements.

The GA box and one spare empty IBC (with transfer hose) will be mobilised with the first mobilisation of IBCs, to support the stockpile during freight transport and onwards to Clients location. The GA box inventory is described in Section 9.1. If the secondary storage location becomes fragmented, the GA box and spare empty IBC shall remain with the largest volume.

Figure 3 below illustrates the support equipment that will be loaded with the first IBC road freight load.

Figure 3 Secondary Storage Location Support Equipment

3 HSEQ

3.1 Safety Data Sheet

Safety Data Sheets (SDSs) will be provided as appropriate within the GA box. They are an important component of product stewardship and occupational safety and health. It is intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and include information such as:

- Physical and chemical data (e.g. melting point, boiling point, flash point etc.)
- Toxicity
- Health effects
- First aid
- Reactivity
- Toxicological information
- Storage
- Disposal
- Transport
- Protective equipment
- Spill handling procedures

The SDS follows a 16-section format which is internationally agreed. However, SDS formats can vary from source to source within a country depending on national requirements.

Sufficient SDS will be included in the GA box in the event the mobilised stockpile becomes fragmented.

3.2 Hazard Codes

The United Nations' Globally Harmonised System (GHS) provides a voluntary agreement for the classification and labelling of chemicals. GHS becomes legally binding through a suitable national or regional legal mechanism.

There is no risk to human health or the environment whilst dispersants are stored in their correct packaging, aided by suitable spillage mitigation measures. The risk of exposure or potential environmental impact only occurs in cases of spillages, handling and the operational application of the product. More recent packaging labels and SDS may be marked with the signal words 'Danger' or 'Warning' and carry UN GHS pictograms to identify the hazards. GDS IBCs carry at least one of the following pictograms:

Pictogram	Hazard
	• Corrosives
	• Carcinogen • Respiratory Sensitizer • Reproductive Toxicity • Target Organ Toxicity • Mutagenicity • Aspiration Toxicity
	• Irritant • Dermal Sensitizer • Acute toxicity (harmful) • Narcotic Effects • Respiratory Tract • Irritation

The same symbols are used by the UN for Dangerous Goods transport, however dispersant itself is not classed as a Dangerous Good for transport by road, sea or air and as such is not regulated. The HS code for all the GDS as well as all other OSRL dispersants is HS code 3402.9090.

When dispersant is to be transported by air, the air waybill should be marked with 'not restricted' (section 8.2.6.2, IATA Dangerous Goods Regulations).

3.3 Dispersant Spillage Instructions

In the event of an inadvertent dispersant leak or spillage occurring between the Primary Storage and the incident location, the procedure is listed in the GA box and listed in Appendix 9.3.

4 Mobilisation

4.1 Contact Details

In the event of a Client incident or general advice, either email eoc@oilspillresponse.com or contact the Southampton or Singapore Duty Manager by phone on the following numbers:

Southampton +44 2380 331551
Singapore +65 62661566

4.2 General Considerations

The Duty Manager will request:

- A completed and signed (by a nominated call out authority) OSRL Mobilisation Form
- Ensure the Client is a member to the GDS
- Ensure full execution of Total Fluides and Nalco end user indemnities (details available internally in 'call outs and contacts')

GDS Equipment will be mobilised from the most appropriate Primary Storage location depending on the incident location and dispersant type required. In most circumstances the Equipment will be mobilised by road then air, using either chartered cargo aircraft or on scheduled flights where possible. If requested, OSRL will deliver the Equipment to the point of entry of the required country.

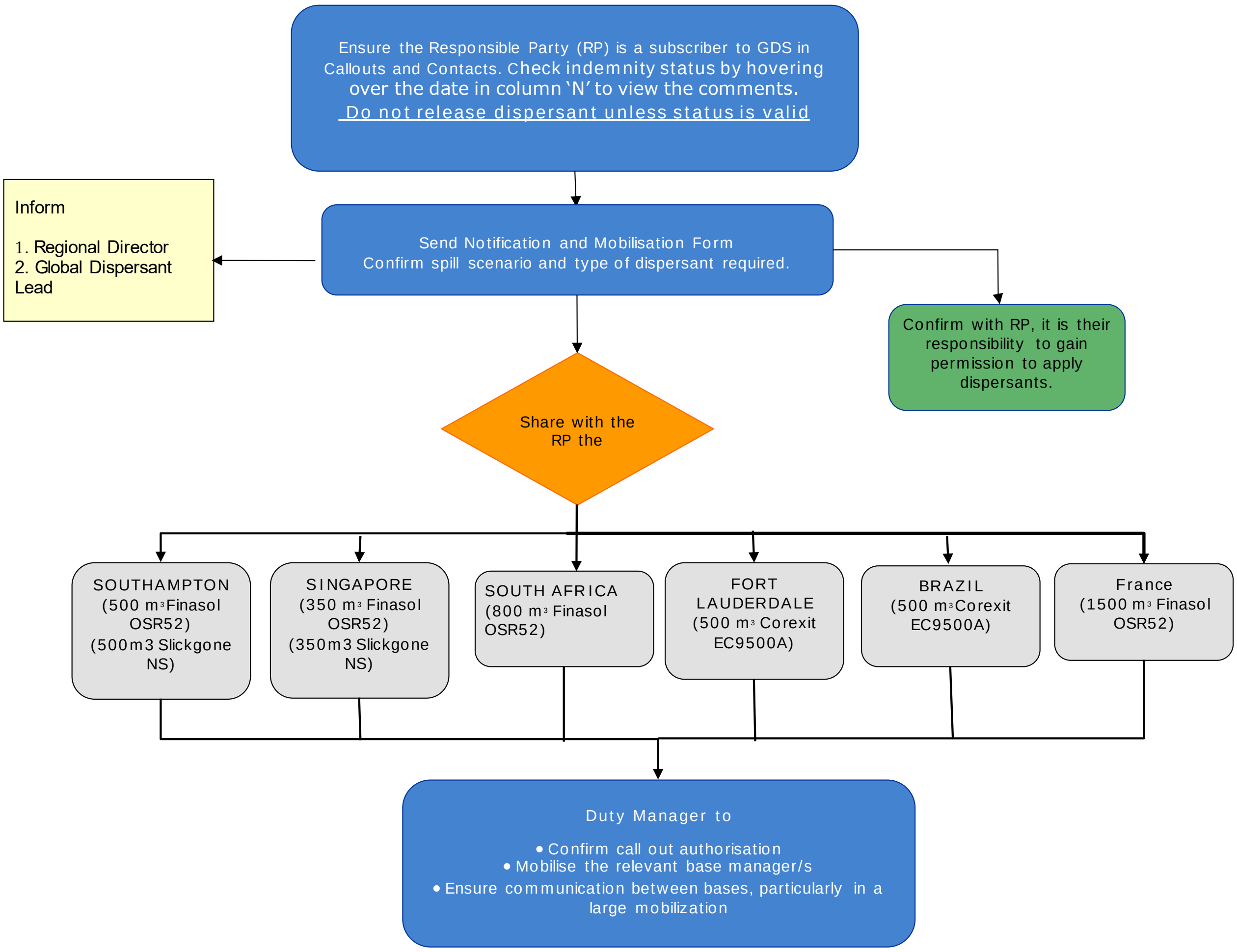
Road freight followed by sea freight is also an option, depending on timelines. OSRL will deliver to the designated port of the required country.

The following should be considered when mobilising the Equipment:

- Which is the nearest Equipment stockpile to the incident area
- What is the time differential between mobilisation by air, mobilisation by sea or mobilisation by road
- How much time is required to initially mobilise the required vehicles / vessels / aircraft
- What are the local documentation requirements for customs and other in country agencies (packing lists, pro-forma, certification and fumigation certificates, cargo tracking notes or translations etc.)
- Are load plans, lift plans, transportation plans, vehicles, cranes etc. in place for the transportation of the equipment by air, sea, and road in the incident country
- What information needs to be communicated to in country authorities (i.e. customs agencies, national police and environment agencies) regarding the arrival of the Equipment
- Are there robust procedures in place for tax or importation
- Are there Client representatives available at receiving airports and ports

4.3 EOC Decision Flow Diagrams

The OSRL Emergency Operations Centre (EOC) flow diagrams are an OSRL internal decision-making tool to assist the Duty Manager. These may also be useful to the remote storage bases as well as the Client.



4.3.1 Southampton

Which dispersant does Responsible Party (RP) require?

Slickgone NS UP TO 500 m^3

FINASOL OSR52 UP TO 500 m^3

OSRL will need to work with the RP to determine the best way of organising the logistics.

- The RP may decide to conduct their own logistics.
- The RP may ask OSRL to coordinate the shipping of dispersant as part of SLA services

Task 1
Begin the process of arranging or coordinating with logistics services as agreed with the RP.

Task 2
Mobilise Williams Shipping quoting OSRL retainer contract 02380 701 314 and/or transport@williams-shipping.co.uk

Inform Williams that the cargo will be aviation secure and therefore curtain side trailers and TIR seals will be required.

Task 3
Ensure loading I/C has Unit 5 loading locker key (Black No7) from Reception. Provide Loading Safety Plan to I/C. Arrange for

Task 4

It is important to note that under the GDS Contracts we must provide 'reasonable assistance with customs documentation', therefore you must check with the client what their requirements are for paperwork. The minimum will be load lists and MSDS'.

The dispersant is stored in Unit 5 and on the database in specific rows, these are in the 'Bay/Rack' column on the database (dispersant in row 1 has a bay rack of U5.R1, row 2 is U5.R2 etc.).

The guide for producing the required paperwork in the database is

Does the spill have the potential to use more than this base?

If so, notify the duty teams for the other bases to begin preparation

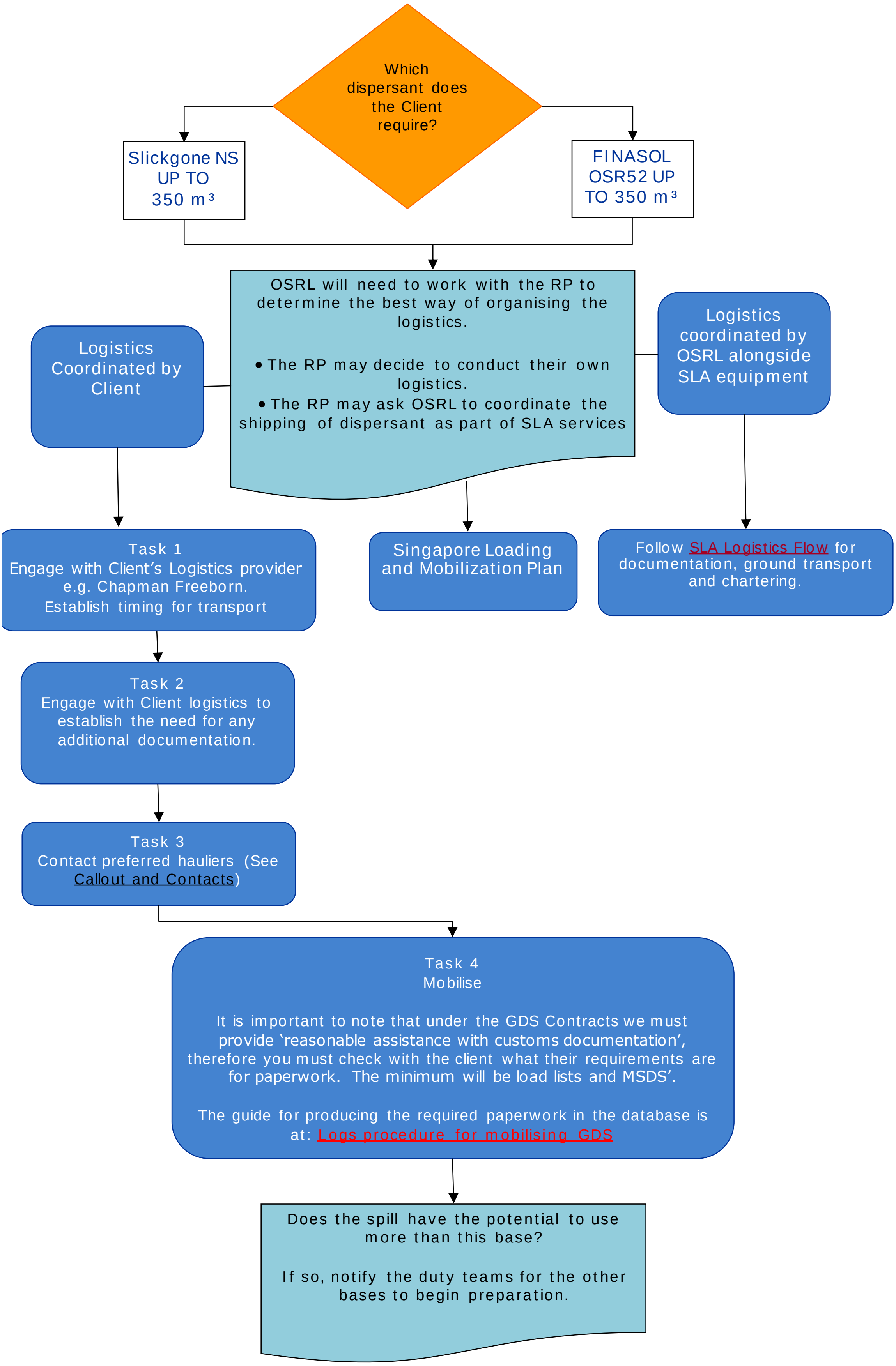
Williams Contract Summary
24/7 contact
1st truck to arrive within 12 hours of call
2nd-13 hours, 3rd – 14 hours, 4th- 15 hours

Trucks must be curtain siders capable of carrying 26 IBC's

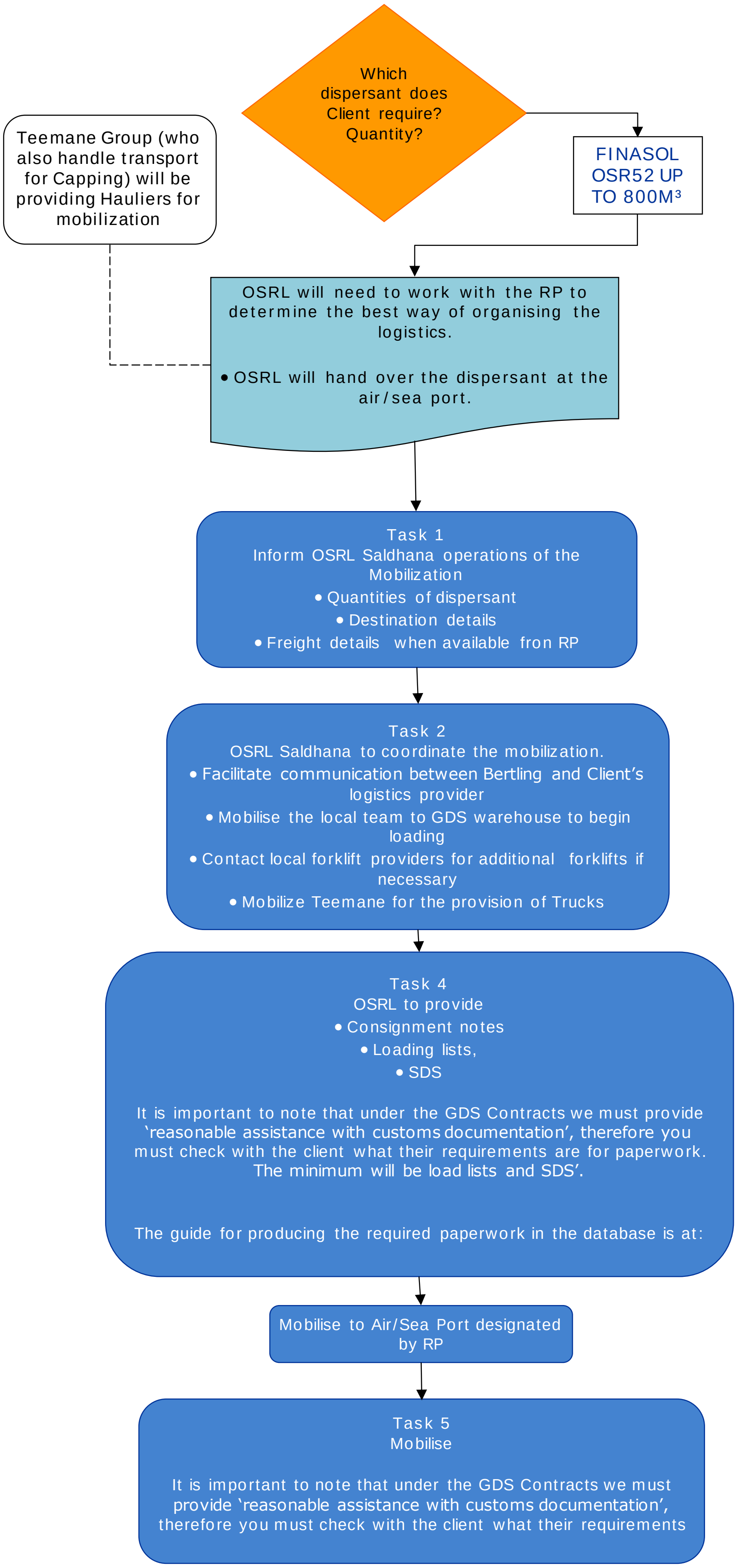
Williams should notify us of any change to truck type when called

Driver should be aviation secure and arrive on side

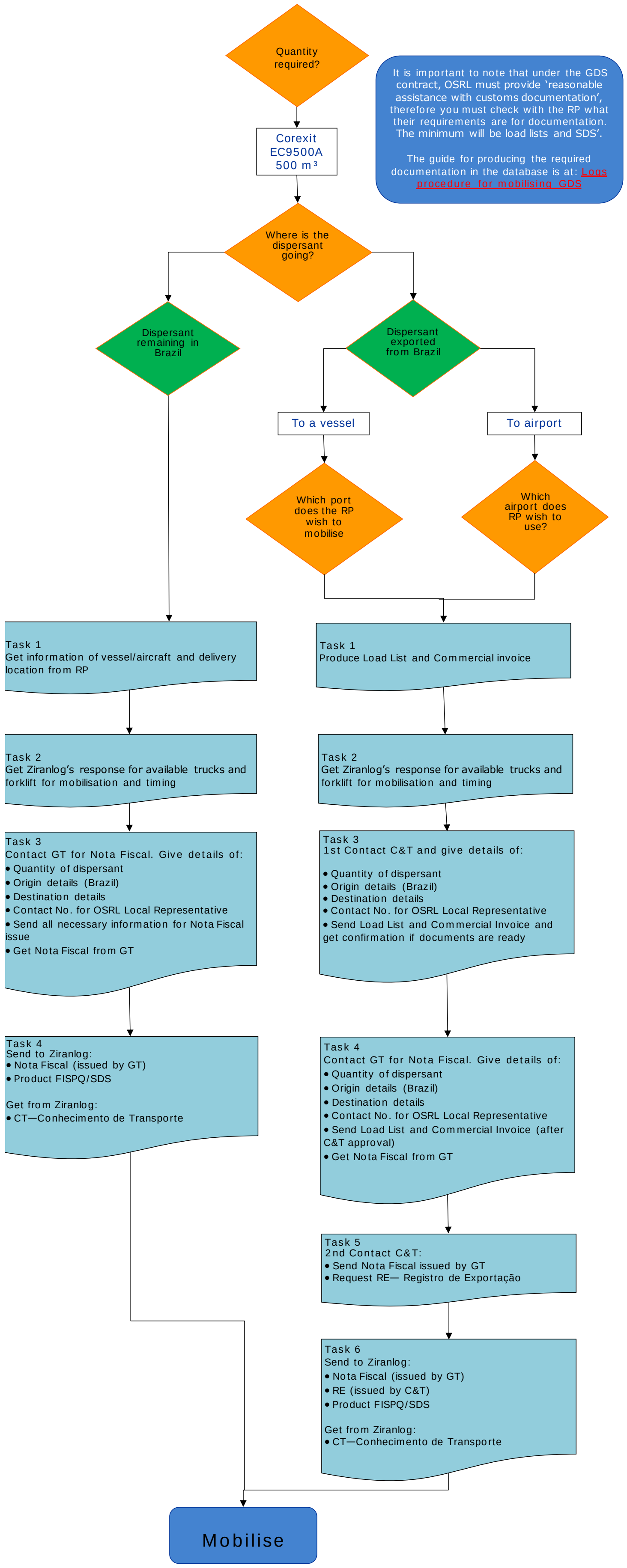
4.3.2 Singapore



4.3.3 Cape Town



4.3.4 Brazil


Quantity required?
It is important to note that under the GDS contract, OSRL must provide 'reasonable assistance with customs documentation', therefore you must check with the RP what their requirements are for documentation. The minimum will be load lists and SDS'.
The guide for producing the required documentation in the database is at: Logs procedure for mobilising GDS
Corexit EC9500A 500 m³
Where is the dispersant going?
Dispersant remaining in Brazil
Dispersant exported from Brazil
To a vessel
To airport
Which port does the RP wish to mobilise
Which airport does RP wish to use?
Task 1
Get information of vessel/aircraft and delivery location from RP
Task 2
Get Ziranlog's response for available trucks and forklift for mobilisation and timing
Task 3
Contact GT for Nota Fiscal. Give details of:
• Quantity of dispersant
• Origin details (Brazil)
• Destination details
• Contact No. for OSRL Local Representative
• Send all necessary information for Nota Fiscal issue
• Get Nota Fiscal from GT
Task 4
Send to Ziranlog:
• Nota Fiscal (issued by GT)
• Product FISPQ/SDS
Get from Ziranlog:
• CT—Conhecimento de Transporte
Task 1
Produce Load List and Commercial invoice
Task 2
Get Ziranlog's response for available trucks and forklift for mobilisation and timing
Task 3
1st Contact C&T and give details of:
• Quantity of dispersant
• Origin details (Brazil)
• Destination details
• Contact No. for OSRL Local Representative
• Send Load List and Commercial Invoice and get confirmation if documents are ready
Task 4
Contact GT for Nota Fiscal. Give details of:
• Quantity of dispersant
• Origin details (Brazil)
• Destination details
• Contact No. for OSRL Local Representative
• Send Load List and Commercial Invoice (after C&T approval)
• Get Nota Fiscal from GT
Task 5
2nd Contact C&T:
• Send Nota Fiscal issued by GT
• Request RE— Registro de Exportação
Task 6
Send to Ziranlog:
• Nota Fiscal (issued by GT)
• RE (issued by C&T)
• Product FISPQ/SDS
Get from Ziranlog:
• CT—Conhecimento de Transporte
Mobilise

4.3.5 Vatry

Which dispersant does RP require?

FINASOL OSR52 UP TO 1500M³

Potential Airports

Vatry Airport (Preferred)—15 minutes
Charles de Gaulle (Paris) 2 Hours
Brussels International Airport - 3.5 Hours
Liege Airport (Belgium) - 3

OSRL will need to work with the RP to determine the best way of organising the logistics.

- The RP will need to arrange the exportation of the dispersant from the port designated.
- OSRL may at its discretion agree to arrange global transportation.

VLS will be providing both storage and mobilization services for OSRL. Personnel and transport are contracted to be on site within 4 hours of Callout with the capacity to load 40 IBC's per hour.

Mobilization Costs
Loading : 4.00 € Per IBC

Road transport to Vatry:
Monday 8am to Friday 5pm per IBC: 25 € IBC
Different charges for other times or Airports other than Vatry

Storage Address
VEOLOG Bat 1.
Rue Henri Guillaumet
FR 51555 Aéroport Vatry

Task 1

Contact the Transport provider (VLS) on their 24 Hour number

+33 3 26 70 07 81 or +33 3 61 49 16 88

E-mail fx.decourt@vatrylog.com and vls@vatrylog.com to confirm the request.

You will need to provide

- Quantities of dispersant
- Destination details

Request the Excel List of OSRL no's for the IBC's that are being mobilised so that the paperwork can be created.

Facilitate communication between VLS and any other

Mobilisation

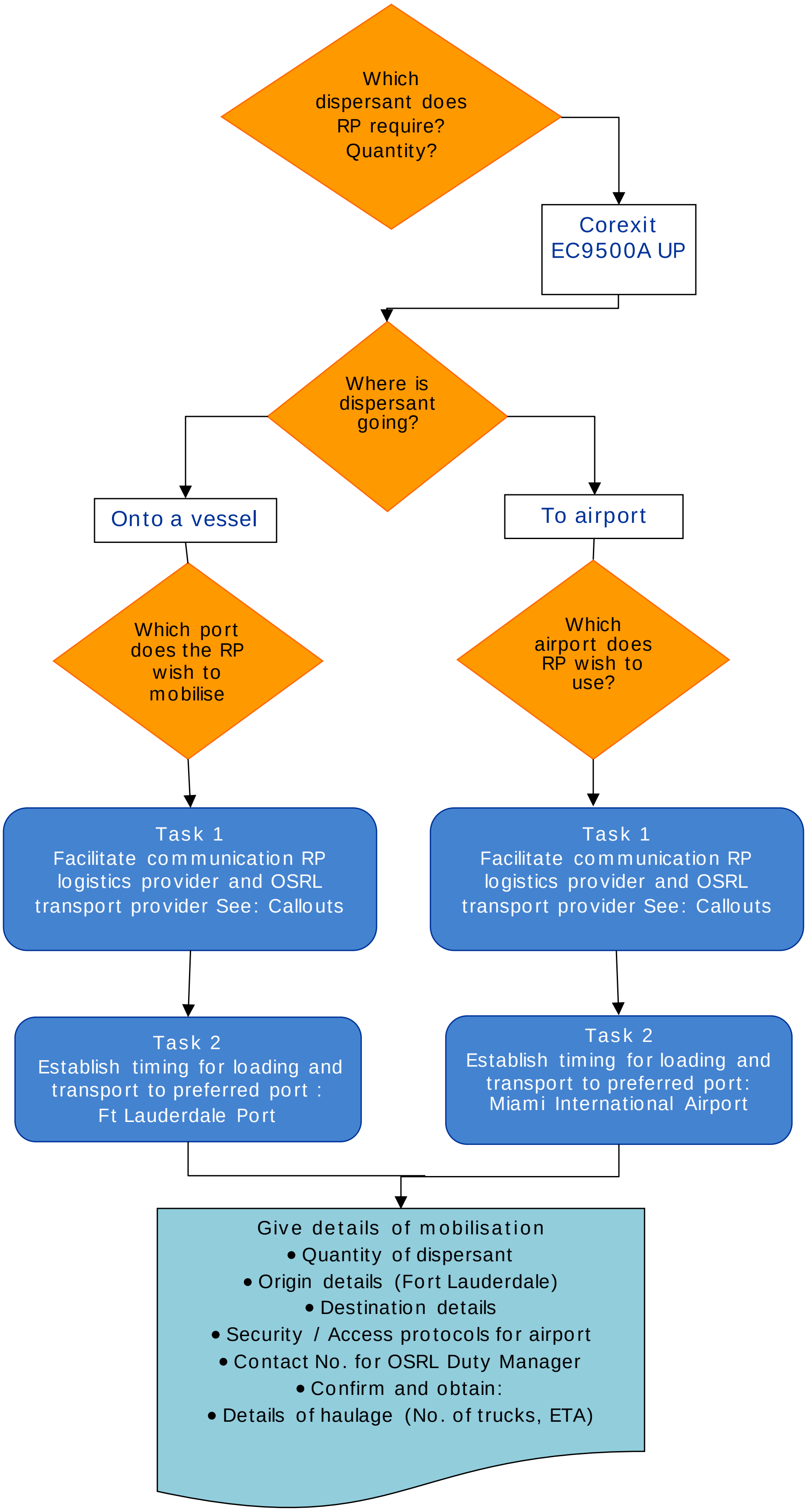
VLS will coordinate loading and transport to the designated location however OSRL must create the required paperwork.

It is important to note that under the GDS Contracts we must provide 'reasonable assistance with customs documentation', therefore you must check with the client what their requirements are for paperwork. The minimum will be load lists and SDS'.

Once you receive the list of barcodess, produce the clients requested paperwork.

If the client asks OSRL to arrange flights the costs for these must be checked with the client before booking.

4.3.6 Fort Lauderdale



4.4 Primary Storage and Regional Information

Table 1 GDS Location Address and Volumes

Country	Address	Type and Volume	Notes
UK	OSRL Southampton Lower William Street Southampton SO14 5QE United Kingdom	Slickgone NS 500 m^3 132,500 US Gal Finasol OSR 52 500 m^3 132,500 US Gal	Primary Storage is an aviation secure site on the south coast. A secure curtain sided trailer is used so the dispersant delivered in an aviation secure condition, so reducing customs clearance. The Southampton Response Department have the responsibility of mobilising the Equipment. There is a retainer road freight contract with Williams Shipping, to provide 40' curtain sided trailers within twelve hours. **East Midlands Airport** (IATA: EMA, ICAO: EGNX) is an airport in the East Midlands of England, located in North West Leicestershire. **Airport Technical Information:** https://www.world-airport-codes.com/united-kingdom/east-midland-2055.html **Contact Details:** http://www.azworldairports.com/airports/a2720ema.cfm Should a mobilisation require SLA equipment, then onward transport for the GDS dispersant can be arranged by the OSRL duty team to be sent alongside other equipment. **Port of Southampton:** 24 Hours contact no: +44 (0)2380 706346

Country	Address	Type and Volume	Notes
Singapore	OSRL Singapore Loyang Offshore Supply Base 25C Loyang Crescent Mail Box No 5105 Block 503 TOPS Avenue 3 Singapore 506818	Slickgone NS 350 m^3 92,750 US Gal Finasol OSR 52 350 m^3 92,750 US Gal	Primary Storage is in close proximity to Singapore Changi Airport. The Singapore Response Department have the responsibility of mobilising the Equipment. Loading for sea transport can be carried out via the jetty at Loyang Offshore Supply Base near to the OSRL site. There is a retainer road freight contract with TOPS to provide 2 x 40' flatbed trailers within one hour, then prime movers with two hours. Singapore Changi Airport is located on the east coast of Singapore. The airport has excellent connection by road to all parts of the island. The density of traffic at peak times can cause delays. There are two cargo handlers that operate within the Changi Airport Cargo Complex. They are DNATA and SATS. **Airport Technical Information:** https://www.world-airport-codes.com/singapore/changi-international-6919.html **Contact Details:** http://www.azworldairports.com/airports/a2440sin.cfm Loyang Offshore Supply Base is strategically positioned in key transport areas, as well as maritime access to South China Sea. Loyang jetty and wharves are located in sheltered waters and have eleven quaysides for vessels, and can accommodate vessels of various lengths. Water depth of the quaysides ranges from 7 – 9.5m to allow for larger vessels to come along side. There is a full complement of logistics support equipment available on site. http://www.topsloyang.com/index.htm

Country	Address	Type and Volume	Notes
France	Vatry Logistics Services Veolog Bat2 Rue Henri Guillaumet 51006 Châlons en Champagne France	Finasol OSR 52 1500 m^3 397,500 US Gal	Primary Storage is located 0.7 miles from of Vatry commercial airport. VEOLOG own and run the warehouse within the airport complex of Vatry airport. It has good road access (2 km to motorway) and parking for deliveries both inside the compound and on the access road outside the compound. OSRL has a service level agreement with Vatry Logistics Services (VLS), located within the airport complex, to arrange both personnel for loading and transport for either road freight or delivery to the airport within two hours. Vatry Airport is commercial airport serving Châlons-en-Champagne district in north-eastern France. It is 147 km (91 mi) from the centre of Paris. **Vatry Airport Technical Information:** https://www.world-airport-codes.com/france/vatry-international-8059.html **Contact Details:** http://www.azworldairports.com/airports/a1570xcr.cfm **Charles De Gaulle Airport Technical Information** https://www.world-airport-codes.com/france/charles-de-gaulle-5672.html **Contact:** http://www.azworldairports.com/airports/a1570cdg.cfm **Le Havre Port** Tel. +33.(2).35.52.54.56 - Fax +33.(2).35.52.54.13

Country	Address	Type and Volume	Notes
South Africa	OSRL South Africa 7 Sycamore Crescent Atlas Gardens Cape Town South Africa	Finasol OSR 52 800 m^3 212,000 US Gal	Primary Storage is near a variety of ports, the major highway and Cape Town International Airport. The warehouse is unmanned but OSRL personnel can be at location within two hours. There is a Memorandum of Understanding (MOU) with Teemane Freight who will provide flatbed trailers and drivers to the location at short notice. **Cape Town International** Airport (IATA: CPT, ICAO: FACT) is the primary airport serving the city of Cape Town. It is located approximately 20 kilometres from the city centre. **Airport Technical Information:** https://www.world-airport-codes.com/south-africa/cape-town-international-1251.html **Contact Details:** http://www.azworldairports.com/airports/a2480cpt.cfm **Port Of Cape Town** http://www.transnetnationalportsauthority.net/OurPorts/Cape%20Town/Pages/Overview.aspx

Country	Address	Type and Volume	Notes
Brazil	ZIRANLOG ARMAZÉNS GERAIS E TRANSPORTES LTDA Rua do Alho 1.129 A Penha Circular Rio De Janeiro	Corexit EC9500A 500 m^3 132,500 US Gal	Primary Storage is with ZIRANLOG ARMAZÉNS GERAIS E TRANSPORTES LTDA, a large transport and storage provider. OSRL has a dedicated section of warehouse within the larger logistics complex in Rio de Janeiro. ZIRANLOG will arrange loading of the flatbed trucks and deliver to the required destination. OSRL Brazil staff are required to arrange the Nota Fiscal, a requirement to permanently export Equipment from Brazil. Contact details are: vicenteallevato@oilspillresponse.com SergioAfonso@oilspillresponse.com Brasil Serviços de Contenção de Vazamento de Petróleo Ltda Praça Lopes Trovão s/n Parte I | Porto de Angra dos Reis | CEP 23900-490 | Rio de Janeiro | Brasil | **Telephone:** +55 24 3421-5481 **INTERNATIONAL AIRPORT GALEAO (GIG)** GIG airport is located 20 km north of central Rio de Janeiro. The airport is operated by Infraero; it is the largest airport site in Brazil. It should be noted that GIG airport cannot currently load/unload cargo exceeding 20 metric tonnes to/from a Boeing 747 400 aircraft. **Technical Information**: https://www.world-airport-codes.com/brazil/galeoantonio-carlos-jobim-international-6296.html **Contacts**: http://www.azworldairports.com/airports/a1210gig.cfm **PORT OF ANGRA DOS REIS** Port of Angra (TPAR) and is primarily used to support oil & gas offshore operations, as well as heavy lift operations. The supply base itself covers approximately 88,000 m^2 and has a 400m quayside, 30m of which are dedicated for small boats operations only. Draft is approximately 9m depth, allowing larger vessels to dock. There is a full complement of logistics support equipment available on demand. **Port contact details**: +55 24 3421-5424

Country	Address	Type and Volume	Notes
USA	2345 Stirling Rd Fort Lauderdale FL 33312 USA	Corexit EC9500A 500 m^3 132,500 US Gal	Primary Storage is near a variety of ports, the major highway and Miami International Airport. The warehouse is supported by the staff of the Fort Lauderdale base response staff. There area has abundant freight suppliers. Miami International Airport is the primary airport serving the South Florida area. The airport is eight miles (13 km) northwest of Downtown Miami. **Airport Technical Information:** https://www.world-airport-codes.com/united-states/miami-international-4698.html **Contact Details:** http://www.azworldairports.com/airports/a2740mia.cfm

4.5 Responsibilities

In accordance with the GDS supplementary agreement, OSRL will arrange the loading of the Equipment ready for initial road freight. It is the Client's responsibility to insure and freight the Equipment from the Primary Storage location, to either a temporary secondary storage location or onward to the Client's incident location. However, OSRL has relationships and some road freight retainer agreements with regional freight companies and would assist and arrange freight either to the initial port/airport or direct to the Client's location if requested.

OSRL Responsibilities

- Provide a focal point to support the Client 24/7
- Assist the Client completing the shipping and customs documentation as required for the incident destination whether by road, sea or air from all storage locations
- If required assist with initial road transport to mobilise the Equipment to the nominated airport or port, then onwards to the nominated in county airport/port
- If required provide transport routes, timings and costs
- In the event of a large incident, OSRL will manage the Burn Plan (dispersant usage planning model) to monitor dispersant freight movements, deliveries and usage at the incident location so adequate dispersant is available to the Client at the incident
- OSRL will organise the resupply of dispersant at the Primary Storage location/s
- Manage OSRL's Global Dispersant Inventory (alternative global stockpiles) and make contact with regional dispersant stockpile owners in order to potentially purchase and/or temporarily use alternative dispersant stockpiles if a high demand continues

Client Responsibilities

- Provide initial road transport to mobilise the Equipment to the nominated airport or port, then onwards to the nominated in county airport/port
- Insure the Equipment once it leaves the Primary Storage warehouse
- It is the Client's responsibility to gain approval to apply the dispersant at the incident location, however OSRL will provide assistance where required

If requested by the Client, OSRL will ensure that the required Equipment is mobilised to the most appropriate destination airport or seaport as agreed with the Client. Upon notification from the Client, OSRL will start working with our cargo charter brokers to identify suitable methods to mobilise the requested Equipment. Any costs and routings will be confirmed with the Client in writing prior to mobilisation.

4.5.1 Air Freight Responsibilities

The diagram below illustrates the responsibility demarcation for air freight:

Figure 4 OSRL and Client Sea Freight Responsibility Demarcation

4.5.2 Sea Freight Responsibilities

The diagram below illustrates the responsibility demarcation for sea freight:

Figure 5 OSRL and Client Responsibility Air Freight Demarcation

4.6 Documentation - UK/Singapore/France/South Africa/North America

OSRL will prepare the following documentation (in English) as part of standard procedures:

- Packing lists
- Pro-forma invoices
- Load summary
- Dangerous Goods Notes (for GA box only)
- Safety Data Sheets (SDS)
- Commercial Invoices

If Certificates of Origin or any translations are required they can be applied for by OSRL however this may cause delays.

If the Client requests OSRL to assist onwards freight from Primary Storage, the Client is to provide OSRL the following information to export the Equipment:

- Consignee details (name, contact number and address of the site)
- Notifying party (logistics company supporting the shipment)
- Special in-country permit/customs procedures and requirements
- Translation requirements for provided documentation, according to destination country
- If any country specific documentation is required then the Client should task their freight forwarders to work with the government agencies to see whether these requirements can be waived or avoided during an oil spill. Any requirement for extra documentation could delay the equipment's arrival in country.

4.7 Documentation - Brazil

4.7.1 Selling Procedure

Refer to "Brazil Dispersant Selling Procedure Inside Brazil (Oil Spill Dispersants) Document Number OSRL-SW-PRO-00017" for full selling details. It is responsibility of OSRDB (Oil Spill Response do Brasil Armazenamento e Distribuição de Dispersantes Ltda) to issue all documentation required during the event of selling Equipment in Brazil. It is responsibility of the Client to provide all the necessary information to guarantee accuracy of the documentation.

For the sale of Equipment within the State of Rio de Janeiro, OSRDB must use the code **CFOP 5102**, which applies for the "sale of goods purchased or received from third parties". For such sale transaction, the applicable ICMS tax rate is 20%, (18% plus 2% of FECP). FECP is a state government additional levy.

For the sale of Equipment outside the State of Rio de Janeiro, OSRDB should use the code **CFOP 6102**, which applies for the "sale of goods received or purchased from third parties to other States". In this case, the applicable ICMS tax rate for interstate transaction to any state will be 4% according to the Senate Resolution n. 13/2012, once the Equipments are transferred interstate.

Obligations of the Client

According to applicable legislation (Article 15, Annex I of Book IV of RICMS/RJ) the recipient of Equipment should keep the NF-e (sale invoice) for safe keeping, even when kept outside the company, for the period specified by tax legislation for fiscal documentation, making the document available to the tax authorities when requested.

The recipient should verify they are authorized to use the NF-e issued by OSRDB. If the recipient is not accredited to issue NF-e tax invoices as an alternate they can keep on file the DANFE (Documento Auxiliar de Nota Fiscal Eletrônica) related to this NF-e, for submission to the tax authorities when requested.

4.7.2 Exportation Procedure

Refer to "Brazil Exportation Procedure (Oil Spill Dispersants) Document Number OSRL-SW-PRO-00016". It is the responsibility of OSRDB to issue the documentation required for the export of Equipment. It is the responsibility of the Client to provide all necessary information to guarantee the accuracy of the export documentation.

Documents required during the negotiating phase with the overseas importer

Pro-forma Invoice (Fatura Pro-Forma)
Issued by exporter (not required for exercises) and must include the following information:

- Full information of the exporter and importer (name, address, CNPJ or equivalent (company registration number); number of state enrolment, etc.
- Detailed description of the items to be exported (name of the product, quantity, gross weight and net weight, unit price, tariff code (in case NCM 3402.1900), type of packaging presented for transport, minimum and maximum quantity per shipment, fiscal code
- Date and place of delivery (place of loading/shipment and unloading) and name of the transport company
- Payment condition and its terms
- Period of validity of the proposal "pro-forma"
- Place for signature of exporter and importer

The pro-forma Invoice is not a mandatory document and may be replaced by a quote submitted by fax or letter containing the same information listed above.

Letter of Credit
The Letter of Credit is **issued by the importer (purchaser)** abroad. It is delivered to the exporter upon receipt of the Pro-forma Invoice and its purpose is to confirm the interest in purchasing the product. The Letter of Credit should contain the same information as the Pro-forma Invoice. It is not mandatory and may be replaced by a purchase order issued by the importer abroad.

Documents of international validity required for loading and shipment of product to the importer

Commercial Invoice (Mandatory to OSRDB)
The Commercial Invoice is a document **issued by the exporter** to confirm the international transaction. The Commercial Invoice validity commences with the despatch of the goods from the exporters national territory. The Commercial Invoice is essential for the importer to allow customs clearance in the destination country. The Commercial Invoice is one of the main documents required by most customs authorities around the world to release shipping and/or shipments.

The Commercial Invoice is a document of legal character and is subject to international law, in addition of being a fundamental tool between the exporter and importer, as it serves to record the business transaction carried out between both parties. It has to be issued in the language of the importer or in English.

Packing List (Mandatory to OSRDB)

The Packing List is a document written in English and issued by the exporter for the shipment of goods packed in one or more storage media (TEU, crates etc) and containing various types of products. It is necessary for the customs clearance of the goods and provides a line by line description for the importer upon arrival in the country of destination. The document is a simple list relating in detail the products to be shipped, as well as the following information:

(i) Number of document;
(ii) Name and address of exporter and importer;
(iii) Date of issuance;
(iv) Description of the goods, quantity, unit, gross and net weight;
(v) Places of loading and unloading;
(vi) Name of transport company and date of departure; and
(vii) Quantity of volumes, identification of the volumes in numerical order, type of packing, gross and net weight per volumes and dimension in cubic meters.

Bill of Lading (BL) or Air Way Bill (AWB)

The Bill of Lading will be **issued by the Carrier Company** that certifies the receipt of the cargo, the transport conditions and the obligation of delivering the goods to the addressee contracted, giving it the ownership of the goods. It is, at the same time, the receipt of goods, a contract of delivery and a document of ownership, that constitute a credit title. This document is issued according to the type of transport used, if the shipment will be shipped via sea than the bill of lading will be applied, if the shipment is shipped via air than an Air Way Bill (AWB) will be applied. It must clearly identify the type of freight, as well as the form of payment (prepaid or collect).

Certificate or Policy of Insurance for Transport

This document is required when the condition of sale involves the purchase of insurance for the goods, for example, the Incoterm CIF. It must be provided by the insurance company before shipment of the goods. OSRL do not normally ship as CIF as either our insurance policies or member insurance policies ensure that OSRL owned goods are insured for transit.

Documents necessary for shipping, billing and registration with the parties involved in the foreign trade of the Brazilian territory

Export Register (Registro de Exportação)

The *Registro de Exportação* is an electronic document issued and filed via Siscomex (foreign trade integration system), which the exporter or their legal representative uses to inform Brazilian customs of the commercial deal, the foreign exchange currency and the fiscal nature of the export. The export register is the license that presents, in detail, how the transaction will be performed and must contain the tariff code (NCM) of the product. This document must be obtained prior to the customs clearance export declaration and very few operations are exempted from this document.

Depending on the product category and NCM, the analysis, review and acceptance of this license take place automatically within the Siscomex´s system.

Tax Invoice (Nota Fiscal – Brazilian Legal Invoice)

The Nota Fiscal (NF-e) which is prepared by Grant Thornton (GT), must accompany the Equipment from the Ziranlog facility until the effective release by the Customs Authorities/Federal Revenue Department of Brazil (RFB). It is the document which will follow the product during the internal transport from the Ziranlog facility to the port/airport of shipment. The tax invoice **must use the code CFOP 7.102**, which is applicable for sale of goods received or purchased from third parties by an export operation.

Export Dispatch Declaration

The customs clearance of goods in the export operation is when the customs authorities check the accuracy of all the information provided by the exporter; such as the commercial documents, fiscal, tax and administrative matters, as well as the load and the specific legislation referring to it. If everything is in accordance with the legal procedures required, the goods will be customs cleared and its export will be allowed.

The Export Dispatch Declaration ensures the exporter declares all information and initiates the customs clearance procedure. The information is inserted electronically in the Siscomex system and if previous exports are identified and recorded on the system, the export process may be simplified.

Proof of Export/Customs Clearance (Comprovante de Exportação)

The *Comprovante de Exportação* is the **official document issued by the Customs Authorities/Federal Revenue Department of Brazil**, which approves the shipment of the goods. It represents the export operation and has legal jurisdiction for administrative purposes, tax and foreign exchange matters.

Foreign Exchange Contract

The Foreign Exchange Contract is the **document issued by the commercial bank** in charge of any currency exchange transactions.

4.8 Consignment Security Declaration

A Consignment Security Declaration (CSD) is required for air freight to reduce the required Customs checks required for export but can only be completed by a regulated agent or known consignor.

The CSD provides regulators with an audit trail of how, when and by whom cargo has been secured along the supply chain.

The objective of the CSD is to meet International Civil Aviation Organisation (ICAO) requirements to 'ensure that each consignment tendered to an aircraft operator or a regulated agent is accompanied by documentation, either on the air waybill or a separate declaration; this requirement is being implemented globally by more and more countries.

To avoid numerous different security declarations, IATA in co-operation with the industry regulators, have developed a standard CSD.

OSRL Southampton are Regulated Agents and can complete CSDs to prove that OSRL Equipment meets ICAO standards; other locations have agreements with Customs where possible.

4.9 Bulk Storage

If dispersant is transferred into bulk storage (ISO tanks/road tanker/vessels tanks/aviation storage system etc), dispersant types must not be mixed. The dispersant volume shall be assigned the earliest date of manufacture (DOM) and the largest previous IBC batch number, by volume. The tanks should either be of a stainless-steel construction or coated with an epoxy paint. The tank headspace should be as small as practicable. A ship's tank should ideally be fitted with baffles to reduce sloshing. If dispersant is stored in bulk, care must be taken to remove all previous contents to prevent contamination.

If the dispersant is transferred from bulk storage and returned into individual IBC storage, the following considerations should be observed:

- Previous bulk storage DOM and batch number shall be assigned to the IBCs
- Gain a 40ml well mixed sample and conduct LR448 efficacy test
- Ensure no additional particulate contamination is entrained, filter dispersant if required

5 Transport

5.1 General Considerations

Road routes to/from airports/seaports of Equipment embarkation and disembarkation are to be proved to ensure that distribution of Equipment from arrival ports is possible.

Dispersants are not classified as Dangerous Goods under the following international agreements for transportation and are therefore not regulated by:

- ADR (European Agreement on International Carriage of Dangerous Goods by Road)
- IATA (International Air Transport Association)
- IMDG (International Maritime Dangerous Goods Code)

Under the ADN (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways), dispersants are regulated if their flash point is between 60 °C and 100 °C (typically this is the range into which dispersants' flash point falls). Scenarios leading to dispersant transportation on European inland waterways are likely to be very limited. Under the UN classification for transportation, dispersants are categorised as Packing Group III (least danger).

5.2 Customs Procedures

Although there is a drive to harmonise global customs procedures there are significant regional variations. Care and attention is to be paid, as part of the oil spill contingency planning process to the specific customs requirements for each country and territory that each shipment will pass through, whether by air, sea or road. The following selected organisations provide country specific customs information. This list is not exhaustive so further investigation and research will be necessary:

a. **European Union** http://ec.europa.eu/ecip/
b. **United States** http://www.cbp.gov/
c. **Brazil** http://www.receita.fazenda.gov.br/
d. **Singapore** http://www.customs.gov.sg/leftNav/trad/Import+and+Export+Procedures.htm
e. **South Africa** http://www.fedex.com/za/shippingguide/importguidelines/
f. **Indonesia**https://www.deloitte.com/assets/Dcom-Indonesia/Local%0Assets/Documents/Indonesian%20Customs%20Guide%202012-web.pdf
g. **Nigeria** https://www.customs.gov.ng/index.php
h. **Angola** http://www.alfandegas.gv.ao/
i. **Mexico** http://www.aduanas.gob.mx/aduana_mexico/2008/importando_exportando/142_10068.html
j. **Norway** http://www.toll.no/default.aspx?id=3&epslanguage=en

5.3 Consignment Tracking Information

Consignment tracking is the process, procedures and associated technology used to give both the consignor and consignee visibility of items in transit, whether in real time or at last known location. Visibility of items in transit is crucial for pragmatic operational planning and execution. Knowing where items in transit are and when they will be available for use at the required location, including expected arrival date and time, helps ensure the efficient and effective co-ordination of available resources to maximise operational capability.

Tracking of items in transit is achieved by:

- The reporting of the arrival or departure of the item
- Recording the:
    - Identification of the item
    - Location where observed
    - Time and date

This process can be electronic, manual and electronic, or entirely manual, depending on the location and availability of consignment tracking information systems and member companies' own installed systems.

5.4 Road Transport

The Equipment is suitable for road transportation; however consideration must be paid to the following:

- Transit times
- Driving hours limitations
- Overhead clearance
- Weight limits
- Load lashings
- Local transport restrictions and regulations

The Equipment is deployable by road depending on the incident location and Primary Storage location. In some situations, this may be quicker and more cost effective than airfreight.

All the Primary Storage locations have suitable hauliers or haulier retainer contracts, providing a haulier if the Equipment is to be transported to either a port/airport or onwards to the incident.

5.4.1 General Considerations

The following considerations must be observed prior to and during road transport:

- Liability insurance for both the dispersant value as well as potential environmental damage and pollution moves from OSRL to the Client following movement from the Primary Storage location for GDS. Additional insurance is not required for routine maintenance and mobilisation exercises where the Equipment remains under the ownership of OSRL, as this is covered by the OSRL Marsh insurance policy.
- IBCs must be single stacked when transported by road freight. Schütz Ltd advise full IBCs may be transported double stacked, however double stacking is likely to exceed trailer payload and axle weight distribution.
- Secured curtain sided carriers are to be used if IBCs are mobilised from an aviation secure location. Non-curtain sided trailers may be used for all other non-aviation secure locations; however screening of the IBCs must be conducted prior to airfreight.
- To prevent IBC frame distortion during road transit on a flatbed type trailer, it is recommended IBCs are lashed over the top of the HDPE container but under the top metal frame, see Figure 6 below. Slight HDPE container distortion may occur when lashing is tightened. Over the top lashings are not required for a curtain sided type trailer.
- It is the responsibility of the freight carrier to secure the load in accordance with company or regional requirements. Any damage occurring to the load during transport, then the liability insurance will provide a financial means to make good any damage caused.

Figure 6 IBC Lashing

5.5 Sea Transport

5.5.1 General Considerations

Mobilising Equipment by sea is likely to have a slower delivery time but could be suitable and cost effective in certain situations, particularly if the incident is relatively near a Primary Storage location or delivery times dictate.

Dispersant IBCs can either be loaded for sea transport breakbulk as individual IBCs, loaded into DNV 2.7.1 (Offshore containers) or transferred into integrated ships tanks or ISO storage tanks.

Storage and transport of full IBCs in sea containers must be limited to single stacking, due to the requirement for specialised forklifts to double stack loading and unloading.

OSRL can arrange sea freight if requested by the Client, otherwise the following are Client considerations:

- Charter the vessel/s and associated ships' agent
- Ensure all vessel port state clearances are carried out
- Form a contract with a stevedoring company to load equipment to vessel (details provided by OSRL)
- On site representative(s) to accept Equipment

5.5.2 Sea Fastening

The sea-fastening procedures will be the responsibility of the vessel crew. Welding of some equipment to decks may be required for safe at-sea operation.

5.5.3 Sailing Timelines

The table below illustrates vessel sailing distances to some key ports. This is list is not exhaustive, further information may be sought from www.portworld.com.

Sailing distance in NM	Stavanger (NO SVG)	Bergen (NO BGO)	Aberdeen (GB ABD)	Falmouth (GB FAL)	Rotterdam (NL RTM)	Lisbon (PT LIS)	Dakar (SN DKR)	Las Palmas (ES LPA)	Houston (US HOU)	Rio de Janeiro (BR RIO)	Lagos (NG LOS)	Luanda (AO LAD)	Cape Town (ZA CPT)	Singapore (SG SIN)	Fremantle (AU FRE)
Stavanger (NO SVG)	0	89	280	767	439	1450	2931	2112	4879	5605	4533	5301	6515	8632*	9989*
Bergen (NO BGO)	89	0	302	835	513	1518	2999	2180	4858	5669	4601	5369	6583	8701*	10058*
Aberdeen (GB ABD)	280	302	0	656	388	1338	2819	2001	4707	5493	4422	5189	6404	8521*	9878*
Falmouth (GB FAL)	767	835	656	0	392	746	2227	1409	4584	4895	3829	4597	5812	7929*	9286*
Rotterdam (NL RTM)	439	513	388	392	0	1074	2555	1736	4966	5229	4157	4925	6139	8257*	9614*
Lisbon (PT LIS)	1450	1518	1338	746	1074	0	1525	710	4501	4217	3128	3895	5110	7207*	8564*
Dakar (SN DKR)	2931	2999	2819	2227	2555	1525	0	821	4447	2758	1602	2369	3584	8400*	8320
Las Palmas (ES LPA)	2112	2180	2001	1409	1736	710	821	0	4325	3509	2424	3191	4406	7614*	8971*
Houston (US HOU)	4879	4858	4707	4584	4966	4501	4447	4325	0	5279	5937	6693	7500	11630*	10947**
Rio de Janeiro (BR RIO)	5605	5669	5493	4895	5229	4217	2758	3509	5279	0	3294	3370	3290	8818	7882
Lagos (NG LOS)	4533	4601	4422	3829	4157	3128	1602	2424	5937	3294	0	1097	2583	8168	7323
Luanda (AO LAD)	5301	5369	5189	4597	4925	3895	2369	3191	6693	3370	1097	0	1599	7184	6339
Cape Town (ZA CPT)	6515	6583	6404	5812	6139	5110	3584	4406	7500	3290	2583	1599	0	5589	4743
Singapore (SG SIN)	8632*	8701*	8521*	7929*	8257*	7207*	8400*	7614*	11630*	8818	8168	7184	5589	0	2160
Fremantle (AU FRE)	9989*	10058*	9878*	9286*	9614*	8564*	8320	8971*	10947**	7882	7323	6339	4743	2160	0

* = via Suez Canal
**= via Panama Canal
All information extracted from Port World (http://www.portworld.com/map/)

5.6 Air Transport

5.6.1 General Considerations

- Are there internal procedures in place within the Client company to arrange cargo handlers at the delivery airport
- If the Equipment is to be sent by air, does the airport of disembarkation receiving the Equipment have the resources and infrastructure in place
- Can the airport of Equipment disembarkation allow take off/landing of the chartered aircraft (noise regulations, runway specification, slot availability etc.)
- Are special permits required to allow the landing of chartered aircraft
- Will refuelling stops be necessary due to the distance and aircraft payload

OSRL have contracts with air charter brokers who can provide favourable air charter rates, OSRL will also work with Client's own charter brokers as required. It is strongly advised that planning is carried out by the Client to ensure that facilities are available for offloading cargo at destination airports.

5.6.2 Liquid Cargo

The Boeing Company issued an Advisory Directive (AD) in 2010 advising that their cargo aircraft should only carry up a maximum 42% liquid cargoes at any one time. The AD relates to aircraft stability, it is not a Safety Directive - it is a decision for other air cargo carriers whether they comply with this AD. If the 42% limit is required, then OSRL will attempt to include additional solid cargo to save costs.

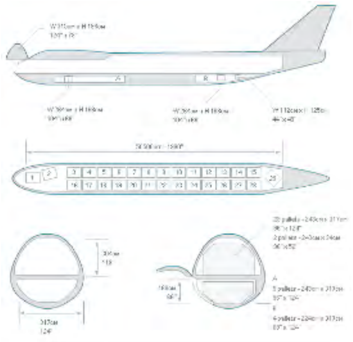
5.6.3 Aircraft

It is important to consider that Boeing 747s cannot be accepted by all airports. Specific aircraft availability and airport capabilities can be assessed at the time of a mobilisation to ensure that the best mobilisation option is selected based on the incident location.

All aircraft loading will be subject to individual aircraft operator guidelines, loadmaster requirements and aircraft weight and balance rules.

There are several types of cargo aircrafts that may be used, see below of an assortment of aircraft and their facilities. Please consider the descriptions as guidance and not as authoritative information.

Boeing B747-F



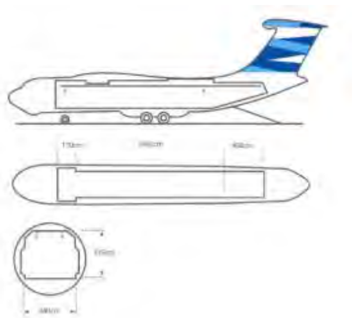
The Boeing B747-F freighter is a heavy cargo aircraft with the following facilities:

- Nose door and large side cargo door
- Belly freight
- Main cargo deck with 29 pallet positions (largest palletised cargo aircraft)
- Pressurised cargo cabin suitable for freight of all kinds
- Temperature control range from 4°C - 30 °C
- Roller bed systems

This aircraft is suitable for the transportation of the following:

- Heavy machinery
- Oversize equipment
- Oil and gas equipment
- Maximum gross payload 112,630 kg
- Range (maximum payload) 8230 km

Ilyushin IL-76TD-90VD



The IL-76TD-90VD is a medium size cargo aircraft with the following facilities:

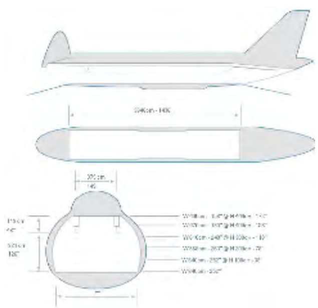
- Rear loading ramp
- Onboard cranes and cargo handling equipment
- Self-loading and discharge capabilities

Suitable for the transportation of the following:

- Heavy machinery
- Oversize equipment
- Oil and gas equipment
- Aerospace industry equipment and satellites
- Aid, relief and peacekeeping cargo
- Military cargo

- Maximum gross payload 46,000 kg
- Range (maximum payload) 4530 km

Antonov AN-124, AN-124-100



The Antonov AN-124 is a heavy cargo aircraft with the following facilities:

- Front and rear loading ramps
- On-board cranes and cargo handling equipment
- Self-loading and discharge capabilities,

suitable for the transportation of the following:

- Heavy machinery
- Oversize equipment
- Oil and gas equipment
- Aerospace industry equipment and satellites
- Aid, relief and peacekeeping cargo
- Military cargo

- Maximum gross payload 120,000 kg
- Range (maximum payload) 4350 km

Note: Unlike the AN-124, the 747 does not have the on board capabilities of loading and offloading itself. In order to complete loading and offloading of these aircraft the airport ground handling crew will need to have an adequate Main Deck Loader (MDL). Most international airports globally have the equipment needed to offload this aircraft.

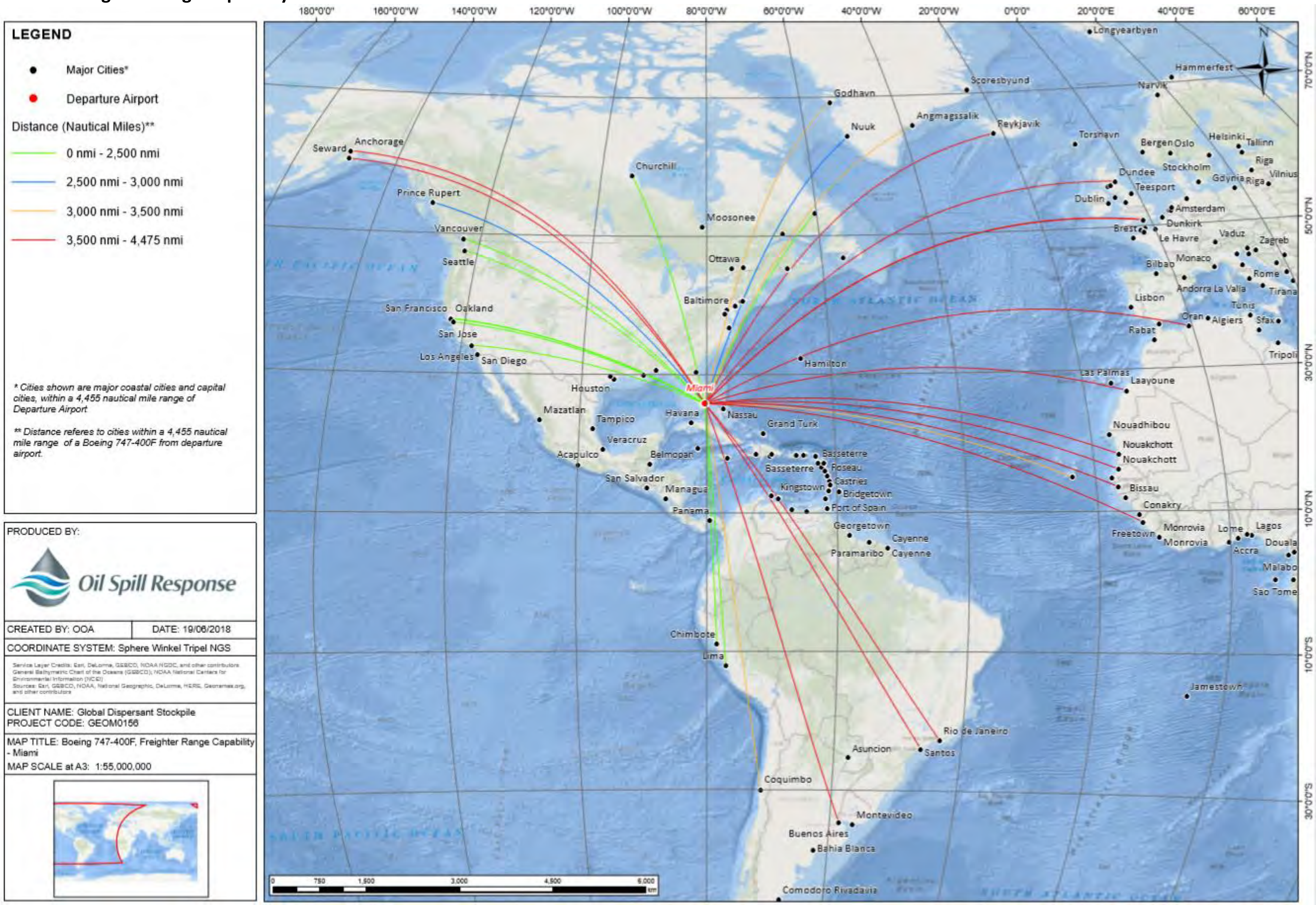
5.6.4 Distance, Range and Time Information

There are various issues that can affect the timing for a mobilisation by air; examples of these include (all arranged by aircraft charter company):

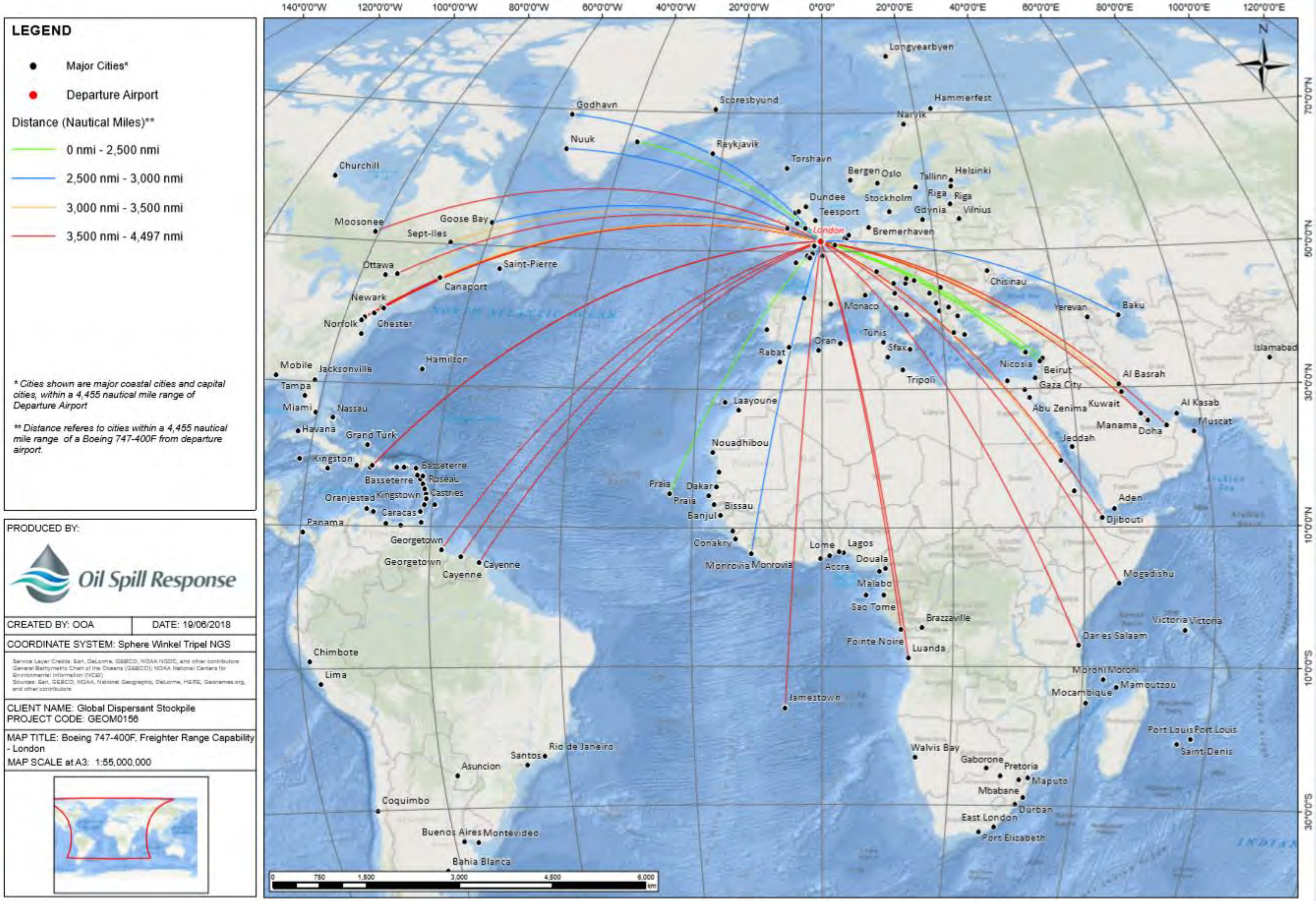
- Identification of aircraft
- Aircraft relocation
- Maximum working hours
- Clearances/landing rights
- Crew rotation/rest
- Refuelling stops
- Over-flight and landing rights

The following range maps illustrate an initial flight leg of the 747-400 prior to fuel and crew stops:

747-400 Freighter Range Capability from Miami



747-400 Freighter Range Capability from London



747-400 Freighter Range Capability from Singapore

LEGEND

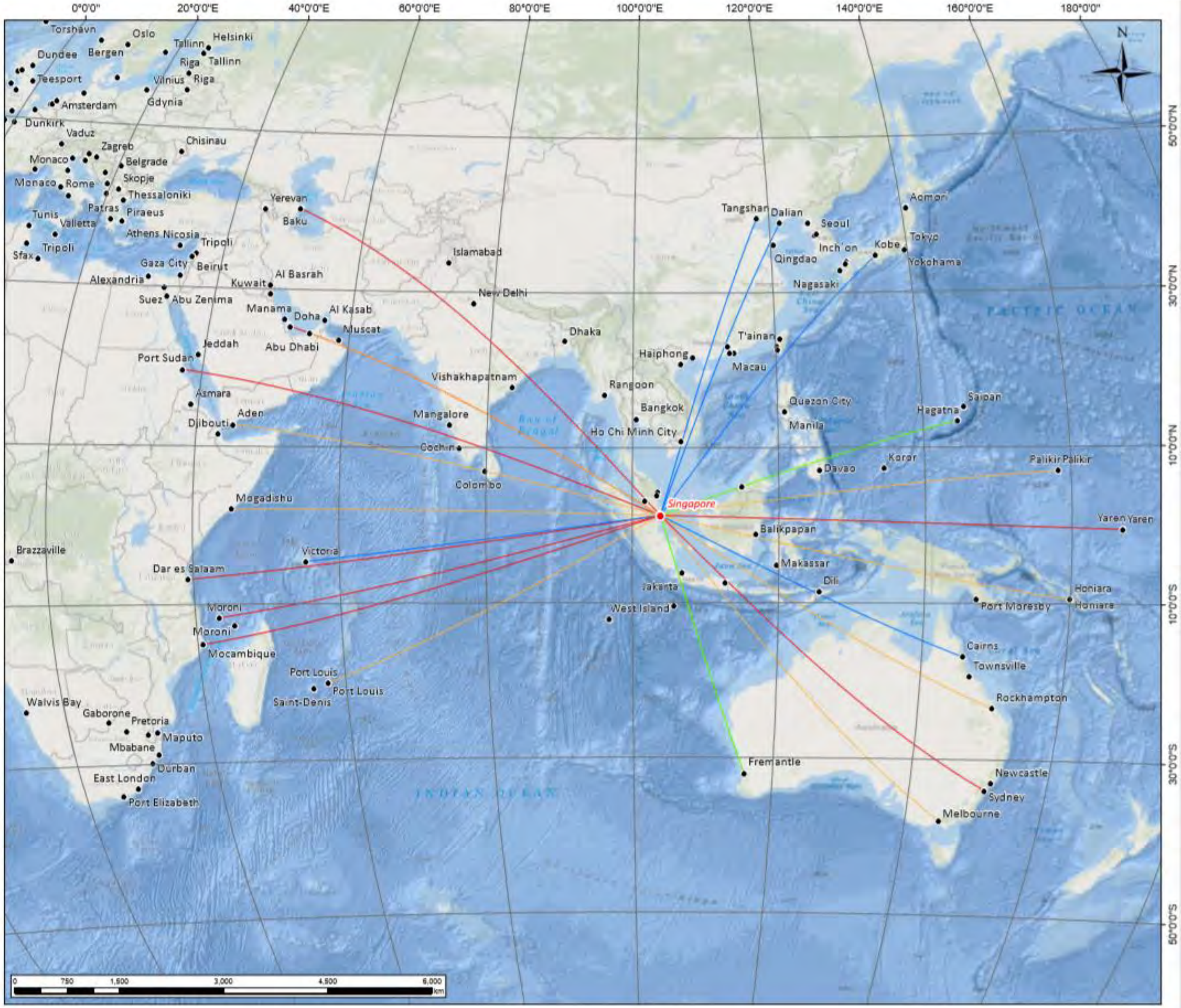
- Major Cities*
- Departure Airport

Distance (Nautical Miles)**

- 0 nmi - 2,500 nmi
- 2,500 nmi - 3,000 nmi
- 3,000 nmi - 3,500 nmi
- 3,500 nmi - 4,410 nmi

** Cities shown are major coastal cities and capital cities, within a 4,455 nautical mile range of Departure Airport*

*** Distance referes to cities within a 4,455 nautical mile range of a Boeing 747-400F from departure airport.*



PRODUCED BY:

Oil Spill Response

CREATED BY: OOA	DATE: 19/06/2018

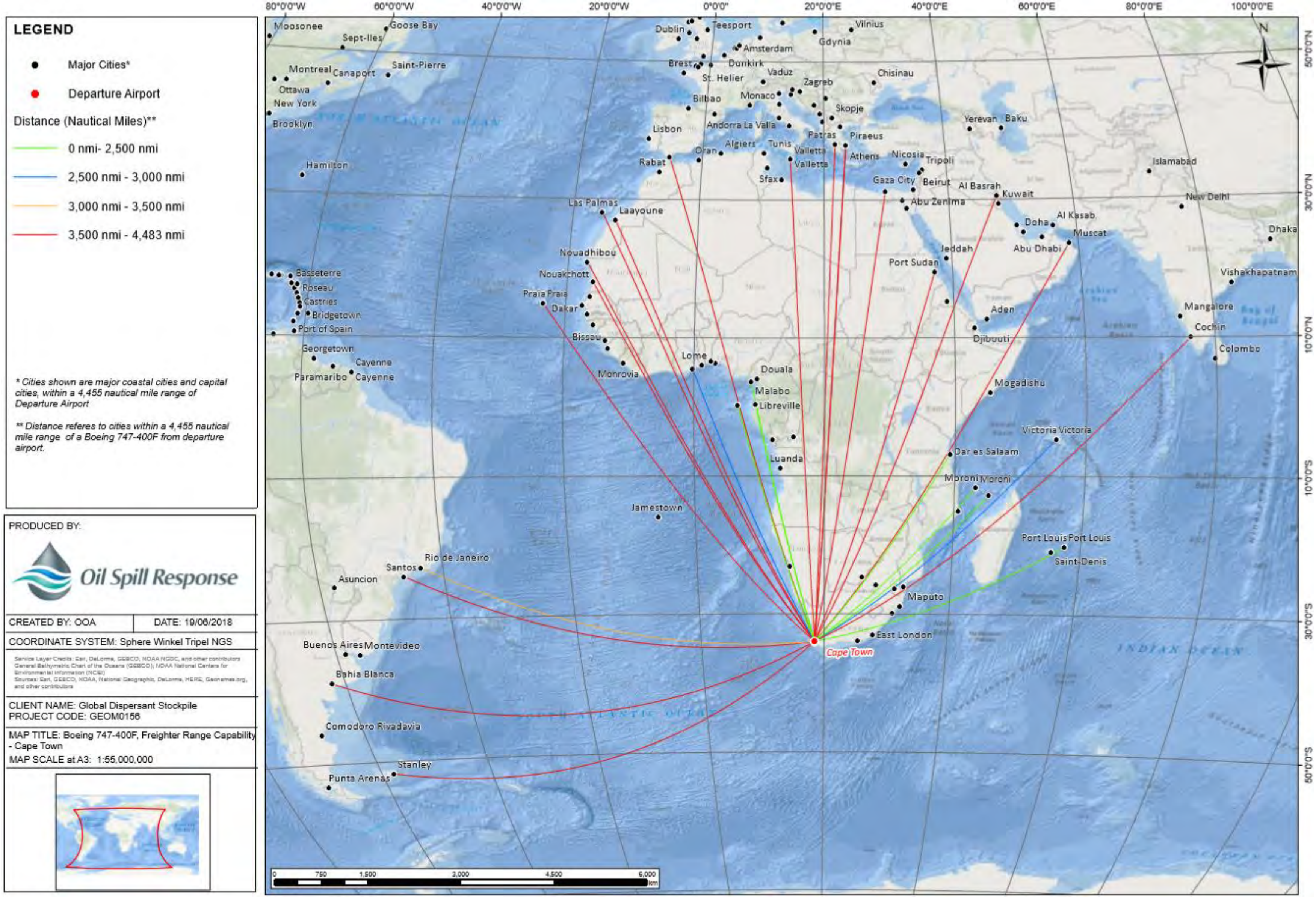
COORDINATE SYSTEM: Sphere Winkel Tripel NGS

Service Layer Credits: Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors General Bathymetric Chart of the Oceans (GEBCO); NOAA National Centers for Environmental Information (NCEI)
Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

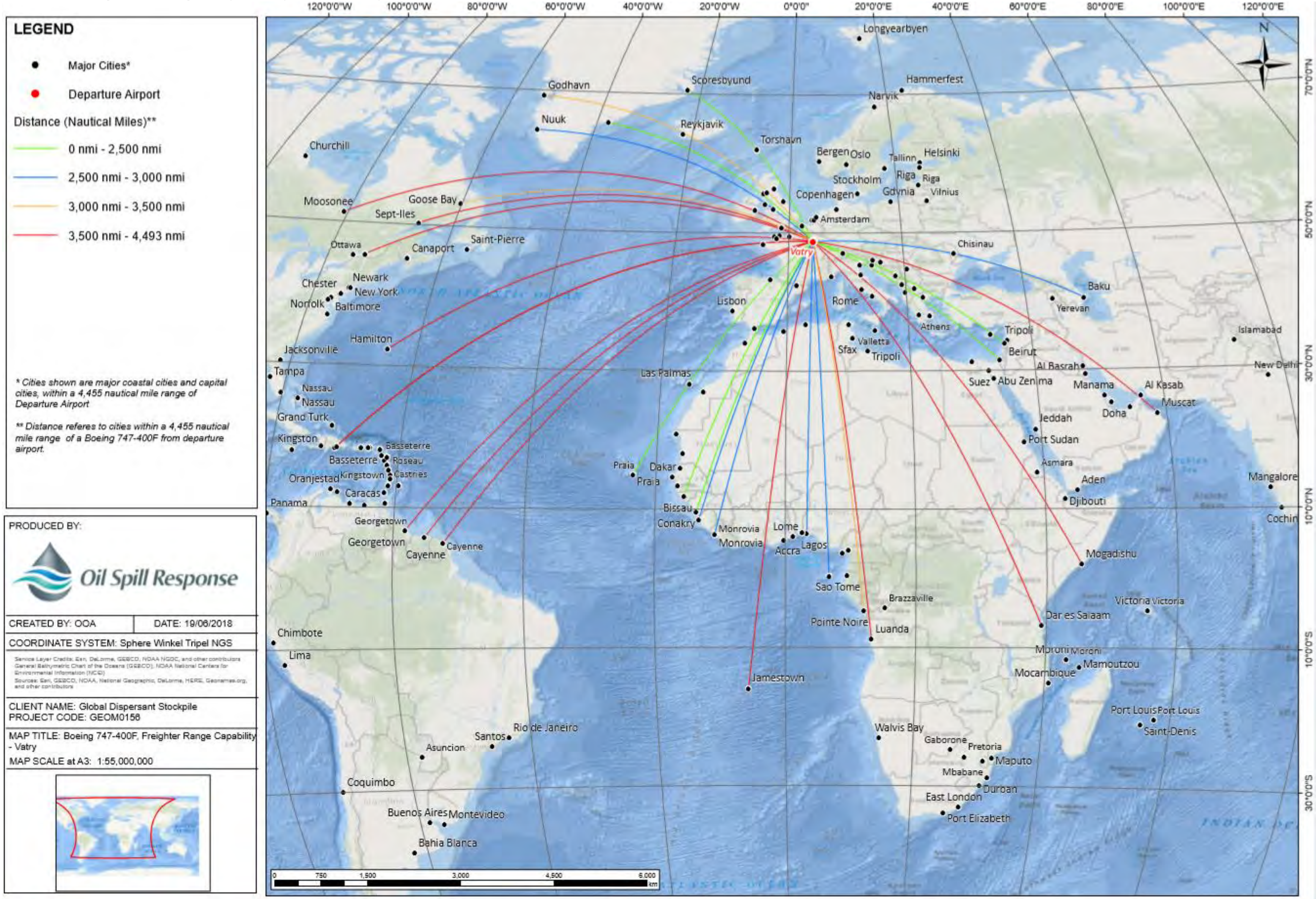
CLIENT NAME: Global Dispersant Stockpile
PROJECT CODE: GEOM0156

MAP TITLE: Boeing 747-400F, Freighter Range Capability - Singapore
MAP SCALE at A3: 1:55,000,000

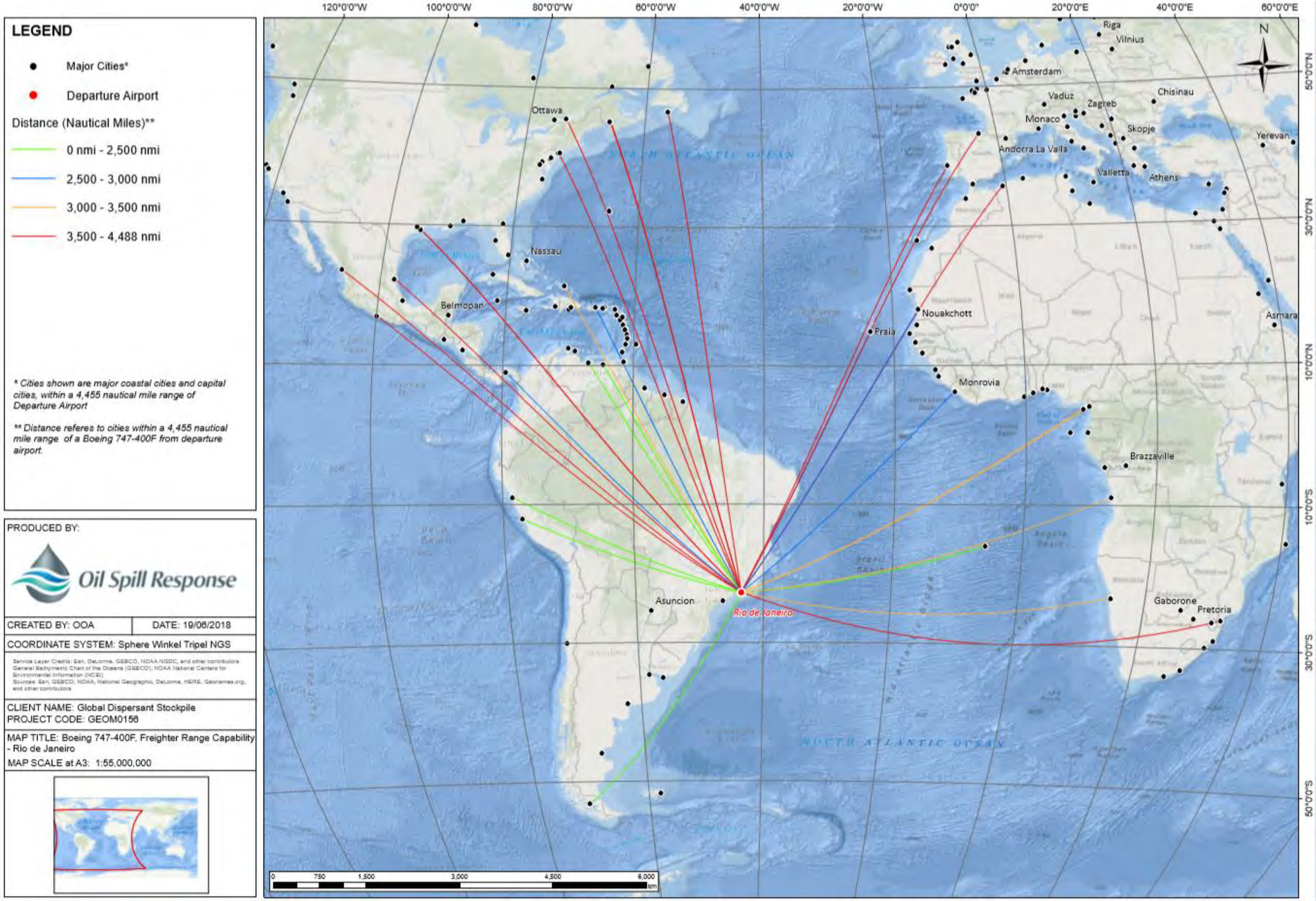
747-400 Freighter Range Capability from Cape Town



747-400 Freighter Range Capability from Vatry



747-400 Freighter Range Capability from Rio de Janeiro



6 Equipment Return

In accordance with the GDS Supplementary Agreement, the Equipment is sold to the Client at the Primary Storage location. The lead time to resupply the complete GDS stockpile will take a number of months. OSRL is obliged to replace any Equipment used as soon as possible in the event another GDS Client requires Equipment.

However, if the Client no longer requires the Equipment at the incident, OSRL will consider repurchasing the Equipment from the Client. Client shall cover all costs associated with exportation/importation, return freight and associated duties to the Primary Storage location. If the Equipment has been exposed to direct sunlight or temperatures outside of the recommended storage parameters for extended periods, or located in bulk storage, then the dispersant will undergo efficacy testing prior to OSRL acceptance. If any of the Equipment is subject to excessive corrosion or general damage on return, then the Client shall also bare the associated costs to ensure the Equipment is restored to a suitable standard.

7 Dispersant Resupply Guidance

Supplier	Dispersant	Delivery Information
Dasic International Winchester Hill Romsey Hampshire SO51 7YD United Kingdom Tel: +44 (0) 1794 512 419 Email: sales@dasicinter.com	Slickgone NS	90 IBCs available within 24 hours. 54 IBCs/day, following a 7 to 10-day lead time
Nalco Environmental Solutions Nalco Environmental Solutions LLC 7705 Highway 90-A Sugar Land TX 77478 USA Tel: +001 2812637709 Email: debby.theriot@nalco.com	Corexit EC9500A	100 IBCs/day, following a 14-day lead time
Total Fluides 24 Cours Michelet 92800 Puteaux France Tel: + 33 (0) 1 4744 5950 Email: anthony.liu@total.com	Finasol OSR52	30 IBCs/day, following a 10-week lead time
Notes		1. Capacity is based on the assumption that raw material suppliers can keep up supplies. True production capacity could be reduced dramatically, especially if dispersant is also being sourced from multiple manufacturers. Most dispersant manufacturers use sodium di iso octyl sulphosuccinate and sorbitan monooleate surfactants in their formulations. If several companies are sourcing these materials at the same time, the supply chain would be severely strained. Do not add together the production capacities quoted by the various dispersant manufacturers.
		2. All volumes listed above would be delivered in 1000 litre IBCs.
		3. OSRDL must purchase dispersants from the Total Fluides/Nalco during resupply, then either restock the GDS or sell it to the Client. The Client cannot purchase direct from Total Fluides/Nalco (in accordance with end user indemnity agreements). There are no purchase restrictions with Dasic products, as there are no end user indemnities required.

8 Glossary

Logistics terminology used within the document is, where possible, universal. Where regional variations occur the reader is to note.

For the purposes of the context of the document the following simplified terms and abbreviations are used:

Burn Plan – a model to plan and predict available, delivered and applied dispersant at location.

Deployment – move and bring into effective action, i.e. deploying stores and Equipment to required destinations.

DOM – the dispersant date of manufacture.

DNV 2.7.1 – Standards for Offshore containers, OSRL equipment referred to as DNV in this plan meets either DNV 2.7.1 (Offshore containers).

Equipment – the dispersant and stockpile support equipment.

GHS - The United Nations' Globally Harmonised System provides a voluntary agreement for the classification and labelling of chemicals.

GT – Grant Thornton, an independent accounting and consulting firm, providing assurance, tax and advisory services in Brazil.

IATA – International Air Transport Association.

ISO Container/20 Foot Container/TEU – A standard (with some weight variances) shipping container. TEU = Twenty Foot Equivalent Unit (20 ft container is 1 x TEU, a 40 ft container is 2 x TEU).

Lead time - The period of time from when the item is ordered to when the item is delivered to, and received at, the final destination ready for use (technically Supply Lead Time). The understanding of lead times is a critical management component.

Logistics - management and flow of resources between point of origin and point of consumption.

Maintenance - the process of preserving a condition in respect of Equipment, associated items and other items in storage therefore ensuring items are fit for issue and subsequent use. Including planned and unplanned activities.

Material Handling Equipment - equipment that relate to the movement, storage, control and protection of materials, goods and products.

Mobilisation - Make something movable or capable of movement, i.e. making stores and Equipment ready for deployment.

MOU – Memorandum of understanding between two parties

Primary Storage – the primary long-term storage warehouse location of the Equipment prior to mobilisation.

Recovery - move items back from deployment location to home storage base location.

Secondary Storage – any Equipment location following mobilisation from Primary Storage; this could be during freight, temporary laydown area, at the incident location, in bulk storage or on a vessel.

SDS – a Safety Data Sheet is to provide OSRL, Client and associated contractors with procedures for handling or working with that substance in a safe manner.

9 Appendices

9.1 GA Box Inventory

- 1 x Large forkliftable storage box
- 1 x Diesel pump frame mounted on a wheeled trolley
- 3 x 6m 2” hoses with 2” female-male camlock nylon connectors
- 1 x 1m Plastic/poly pick up tube with 2” female camlock and 2” ball valve
- 1 x IBC Cap Spanner
- 1 x 1m x 2m bund
- 1 x Going Away spill kit (90 litres)
- 1 x bale of drizits
- PPE storage for three persons
    - 9 x Impervious suits (3 x med. 3 x large, 3 x extra-large)
    - 3 x UVEX goggles
    - 1 x box nitrile gloves
    - 3 x Pairs of gauntlets
    - 1 x Reel of gaffer tape
    - 1 x Eye wash station
    - 1 x Dispersant Information folder (SDS, COSHH, Emergency Contact etc)
- Spares & Ancillaries Storage Box
    - 3 x Pump & diesel engine manuals
    - 3 x 2” Ball valve with 2“female/male connections
    - 1 x 2” T – piece with 2” male inlet and 2 x 2” female outlets
    - 1 x 2” double male adapter
    - 1 x 2” double female adapter
    - 2 x 2” NPT/camlock adapters
    - 1 x Viton repair kit – 9907- KT026
    - 1 x Drain plug – 9907–723-30
    - 1 x Filler plug – 9907-722-30
    - 1 x Fuel filter - BW699-1093
    - 1 x Air filter - BWL2175254
    - 1 x 5lt diesel can
    - 1 x Medium funnel
    - 1 x Toolkit
    - 1 x Pack of medium cable ties
    - 2 x 2” Female camlock hose connections
- 1 x Dispersant effectiveness kit
- 2 x Flush drain covers
- 2 x Traffic cones
- 1 x bag of rags

9.2 IBC Specification

Packaging - Specification
ECOBULK

SCHÜTZ

MX 1000 UN EVOH / DN150 closed /
butterfly-valve, FKM-g. / 2 label plates / Steel-framepallet

SCHÜTZ GmbH & Co.KGaA
Schützstraße 12
D 56242 Selters / Germany

Date: 15.06.2016 / TE-KO / ss
Page 1 from 2

Article - No.: 4027214

Technical data:

Nominal Capacity:		1000	Litre
Brimful Capacity:		1060	Litre
Length:		1200	mm
Width:		1000	mm
Height with pallet:		1160	mm
Filling opening:		150	mm
Discharge opening:		50	mm
Fork opening:		100	mm
Label plate:		2	piece
Corner Protector:		4	piece
Weight:	Inner container:	15,5	kg
	Total approx:	56,0	kg

Technical subjects to change. all dimensions approximately

Packaging - Specification

ECOBULK

SCHÜTZ

MX 1000 UN EVOH / DN150 closed / butterfly-valve, FKM-g. / 2 label plates / Steel-framepallet

SCHÜTZ GmbH & Co.KGaA
Schützstraße 12
D 56242 Selters / Germany

Date: 15.06.2016 / TE-KO / ss
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Article - No.: 4027214

Construction:

Outer Container:	Rectangular grid box made of tubular Steel material, with bottom plate, connected on top with tie-bar, label plate with Schütz-Ticket on the front side, additional label plate on the back side.	
Material:	Grid / Bottom plate:	Steel, galvanized
	Corner Protector:	4 pieces made of PE-HD, black
Inner Container:	Rectangular blow molded tank of high density polyethylene. Six-layer technology. With filling opening in the middle of the top section. Discharge opening at the bottom of the front side.	
Material:	Outer layer:	PE-HD, natural
	Center layer:	PE-HD, natural, regrind EVOH and adhesive resin
	Interior layer:	PE-HD, natural
Filling Opening:	DN150 with external thread, closed with screw cap and gasket.	
Material:	Screw cap DN150:	PE-HD, red
	O-ring gasket:	TPE
Discharge Opening:	Screwed butterfly-valve DN50 with grey handle. Outlet sealed with PE-lined Alu-film. Valve closed with screw cap, PE-disk and flat-gasket. Outlet nozzle enclosed.	
Material:	Butterfly-valve housing:	PE-HD, natural
	Flap-gasket:	PP
	Flat-gasket:	FKM
	Screw cap DN50:	PE-HD, black
	Flat-gasket screw cap:	PE, foam
	PE-disk:	PE-HD, red
	Outlet nozzle:	PE-HD, natural
Pallet:	Steel-framepallet (1000 x 1200 mm), 4-way entry	
Material:	Steel, galvanized	
Heavy metals:	Concentration level of heavy metals (Pb, Cd, Cr VI and Hg) in packaging does not exceed 100ppm	
Delivery:	Ready to fill. The customer or filler is responsible for testing the material compatibility of the filling material with the packaging	
UN-Marking:	UN 31HA1/Y …/ BAM12868	

Technical subjects to change, all dimensions approximately

9.3 Dispersant Spillage Instructions

Safety

1. Safety is priority
2. PPE is to be worn in the event of any spillage
3. First aid kit located in the GA box
4. Eyewash bottle located in the GA box

Initial Actions

1. Load vocal alarm
2. Don PPE (located in GA box)
3. Apply putty to IBC breach if possible
4. Contain or reduce spread using absorbent pads and booms
5. Cover drains with putty matts or drain covers if IBC is not bunded
6. Transfer remaining dispersant into spare empty IBC, using transfer pipe

Secondary Actions

1. Inform HSEQ representative if working alone
2. Manage the spread of dispersant with spill kits, assisted by colleagues
3. Cordon off area and manage clean up