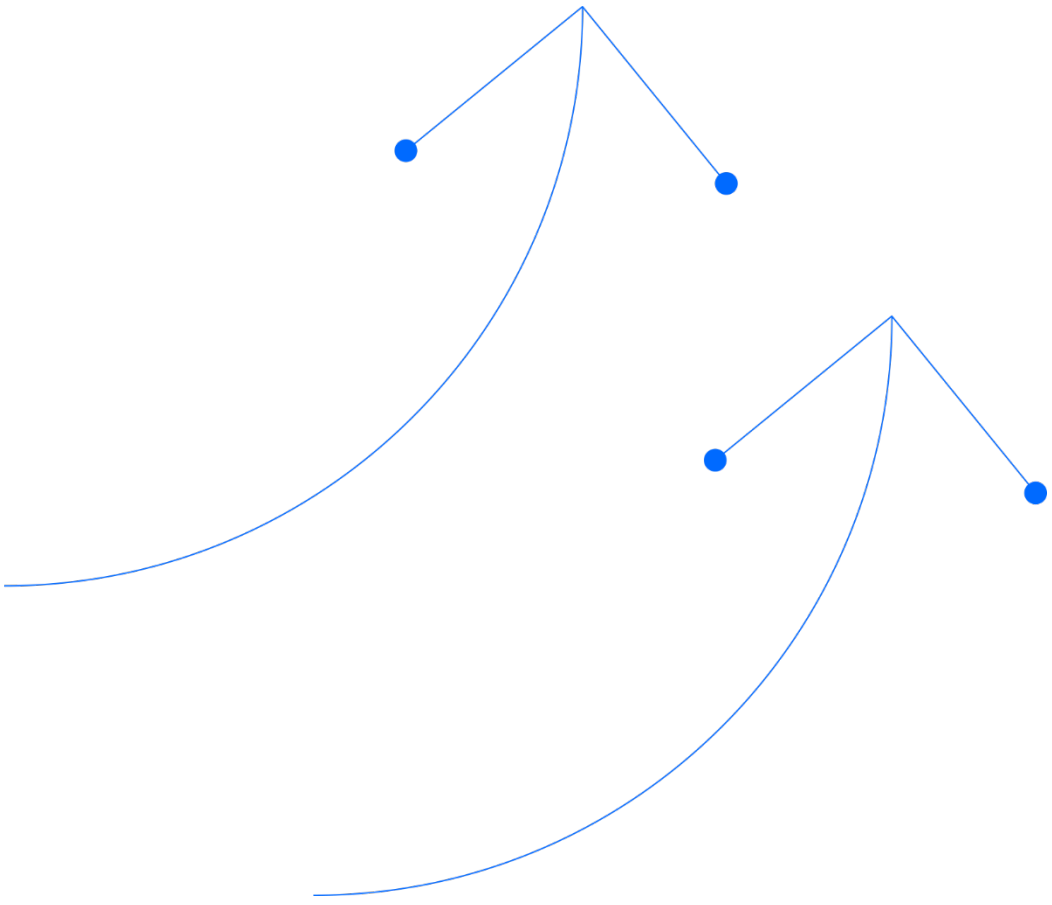
Santos

Barossa

Gas Export Pipeline (NT waters) Oil Pollution Emergency Plan (Operations Phase)

April 2025

Document No.: BAS-210 0226



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Barossa Gas Export Pipeline (NT waters) Oil Pollution Emergency Plan (Operations Phase)

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Project / Facility	Barossa Development Project
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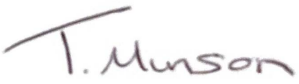
Rev	Owner	Reviewer(s) *Managerial/Technical/Site*	Approver
	Senior Manager Environmental Approvals – WA, NA & TL	**Lead Oil Spill Risk & Planning Coordinator** **Principal Oil Spill & Emergency Response Coordinator**	**Barossa Production Manager**
0		 p.p. 	

Rev	Rev Date	Author / Editor	Amendment
0	03/04/2025	BlueSands Environmental and RPS / Santos	For issue

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Santos Company Site Representative (CSR)	link only
IMT Room – Perth office	link only
Allseas	●
AMOSC	●
Darwin Port	●
NT DEPWS	●
AMSA	●
OSRL	●

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List of acronyms

Abbreviation	Definition
AEP	Australian Energy Producers (formerly Australian Petroleum Production and Exploration Association [APPEA]; from 13 September 2023)
AFMA	Australian Fisheries Management Authority
AIS	Automatic identification system
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre Pty Ltd
AMP	Australian Marine Park
AMSA	Australian Marine Safety Authority
API	American Petroleum Institute
APPEA	Former Australian Petroleum Production & Exploration Association (to 12 September 2023; now Australian Energy Producers [AEP])
BAOAC	Bonn Agreement Oil Appearance Codes
BP	Boiling Point
CA	Control Agency / Controlling Authority
CASA	Civil Aviation Safety Authority
CEO	Chief Executive Officer
CM	Crisis Management
CMST	Crisis Management Support Teams
CMT	Crisis Management Team
CSR	Company Site Representative
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEPWS	Department of Environment, Parks and Water Security (NT)
DEW	Department of Environment and Water (SA)
DISR	Department of Industry, Science and Resources (Commonwealth)
DLNG	Darwin Liquefied Natural Gas
DPIF	Department of Primary Industry and Fisheries (NT)
EHS	Environmental, Health and Safety
EMBA	Environment That May Be Affected
EMSA	European Maritime Safety Agency
EPA	Environment Protection Authority (NT)
EPS	Environmental Performance Standard
ER	Emergency Response
ERP	Emergency Response Plan
ERT	Emergency Response Team
FOB	Forward Operating Base
g/m^2	Grams per square metre
GAPA	Government and Public Affairs
GEP	Gas Export Pipeline
GIS	Geographic Information System
GOWRS	Global Oiled Wildlife Response Service
GPS	Global Positioning System

Abbreviation	Definition
Ha	Hectare
HEV	High Environmental Value
HMA	Hazard Management Agency
HR	Human Resources
HSE	Health, Safety and Environment
IAP	Incident Action Plan
IBC	Intermediate Bulk Container
ICC	Santos Incident Coordination Centre
ICS	Incident Command System
ID	Identity; identification
IMO	International Maritime Organisation
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environmental Conservation Association
kL	Kilolitre
km	Kilometre
KPI	Key Performance Indicator
KSAT	Kongsberg Satellite Services
L	Litre
m	Metre
m^2	Square metre
m^3	Cubic metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MDA	MacDonald, Dettwiler and Associates Ltd.
MDO	Marine Diesel Oil
mg/L	Milligrams per litre
MGB	Mobile Garbage Bin
mm	Millimetre
MNES	Matters of National Environmental Significance
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
MSA	Master Services Agreement
NA	Not Applicable
NA	Northern Australia
NC	No Contact
NEBA	Net Environmental Benefit Analysis
nm	Nautical mile
NOAA	National Oceanic Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NP	National Park
NSW	New South Wales
NT	Northern Territory

Abbreviation	Definition
NT IC	Northern Territory Incident Controller
NT IMT	Northern Territory Incident Management Team
NTOSCP	Northern Territory Oil Spill Contingency Plan
NTOWRP	Northern Territory Oiled Wildlife Response Plan
NW	North-West Western Australia
NWS	North West Shelf
OMP	Operational Monitoring Plan
OPEP	Oil Pollution Emergency Plan
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	On-Scene Commander
OSCP	Oil Spill Contingency Plan
OSM	Operational and Scientific Monitoring
OSM-BIP	Operational and Scientific Monitoring- Bridging Implementation 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	Oiled Wildlife Advisor
OWR	Oiled Wildlife Response
PINP	Phillip Island National Park
POLREP	Marine Pollution Report
PPA	Priority Protection Areas
ppb	Parts per billion
PPE	Personal Protective Equipment
ppm	Parts per million
PWC	Parks and Wildlife Commission of the Northern Territory
RCC	Rescue Coordination Centre (AMSA)
SA	South Australia
SCAT	Shoreline Clean-up Assessment Technique
SIMA	Spill Impact Mitigation Assessment
SLA	Service Level Agreement
SM	Scientific Monitoring
SME	Subject Matter Expert
SMP	Scientific Monitoring Plans
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plans
SRP	Shoreline Response Program
STR	Shoreline Treatment Recommendations
TEMC	Territory Emergency Management Council (NT)
TEP	Territory Emergency Plan (NT)

Abbreviation	Definition
TMPC	Territory Marine Pollution Coordinator (NT)
TRG	The Response Group
TRP	Tactical Response Plan
TSB	Territorial Sea Baseline
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
US	United States
VI	Varanus Island
VOC	Volatile Organic Compound
VOO	Vessels Of Opportunity
VPO	Vice President Offshore Upstream WA/NA
WAMOPRA	Western Australia Marine Oil Pollution Risk Assessment
WAOWRP	Western Australian Oiled Wildlife Response Plan
WSP	Waste Service Provider

1. Quick Reference Information

If an incident occurs that puts human safety at significant risk, tasks included in this Oil Pollution Emergency Plan (OPEP) may not be implemented, and the International Convention for the Safety of Life at Sea (SOLAS) 1974 may take precedence.

<table>
<tr><th>Parameter</th><th colspan="3">Description</th><th>Further information</th></tr>
<tr><td>Petroleum Activity</td><td colspan="3">Barossa Gas Export Pipeline (GEP) operations. Activities within the operational area include:
Operation of approximately 8.26 km of the nearshore Barossa GEP in Northern Territory (NT) coastal waters
Operation of approximately 91.74 km of the nearshore Barossa GEP in Internal waters
Pipeline inspection, maintenance, monitoring and repair (IMMR) activities
Environmental monitoring / sampling (e.g. sediment and marine growth), including vessel-related activities.</td><td>Section 2: Operations Environmental Management Plan (OEMP)</td></tr>
<tr><td>Location</td><td colspan="3">Coastal waters
Northern Territory (NT) waters from the NT / Commonwealth waters boundary to the Territorial Sea Baseline (TSB), approximately 91 km from Darwin.
Internal waters
NT waters from the TSB to the upstream weld of the beach valve at the Darwin Liquified Natural Gas Plant, Wickham Point, Darwin.</td><td>Sections 2.1 to 2.3: OEMPs</td></tr>
<tr><td>Petroleum title/s (Blocks)</td><td colspan="3">Coastal waters
Coastal and territorial waters licence NTC/PL5
Internal waters
Inland waters licence NTC/PL37</td><td>N/A</td></tr>
<tr><td>Water depth</td><td colspan="3">Coastal Waters
Water depths range from approximately 50 m from the NT / Commonwealth boundary to 47 m at the TSB.
Internal Waters
Water depths range from approximately 47 m at the TSB to 0 m at the beach valve. The offshore area from Darwin is less than 30 m deep and the main channel of Port Darwin ranges from 15-25 m deep.</td><td>Sections 2.1 and 3.2.2.2: OEMP</td></tr>
<tr><td rowspan="4">Worst-case spill scenarios</td><td>Spill location</td><td>Hydrocarbon</td><td>Worst-case volume</td><td rowspan="4">Section 6.1</td></tr>
<tr><td>KP23 (Coastal waters)</td><td>Marine Diesel Oil (MDO)</td><td>300 m^3</td></tr>
<tr><td>KP91.5 (Internal waters)</td><td>MDO</td><td>300 m^3</td></tr>
<tr><td>KP114 (Internal waters)</td><td>MDO</td><td>300 m^3</td></tr>
<tr><td>Hydrocarbon properties</td><td colspan="3">MDO:
Density at 15 °C = 890 kg/m^3
Dynamic viscosity = 14 cP @ 25 °C
API = 27.5
Pour point = −9 °C
Persistent fraction (BP >380 °C) = 10%
Oil property classification = Light persistent (Group 2)</td><td>Appendix A</td></tr>
<tr><td>Weathering potential</td><td colspan="3">MDO is a mixture of volatile and persistent hydrocarbons with low viscosity. It will spread quickly and thin out to low thickness levels, thereby increasing the evaporation rate. Under constant wind conditions (5 knots), up to 36.1% is predicted evaporate during the first 24 hours. The remaining MDO on the water surface will weather at a slower rate and be subject to more gradual decay through biological and photochemical processes.</td><td>Appendix A</td></tr>
<tr><td>Protection priority areas</td><td colspan="3">Darwin Harbour (East Arm, West Arm, Wickham Point)</td><td>Section 6.5</td></tr>
</table>

2. First-strike response actions

If the spill is from a vessel, initial response actions to major oil spill incidents are under the direction of the relevant Vessel Master or Santos Company Site Representative and in accordance with vessel-specific procedures (e.g. Shipboard Oil Pollution Plans [SOPEPs]). The Emergency Commander is either the Santos Company Site Representative (if present) or Vessel Master for vessel-based incidents. This will be determined during the initial activation stages of the incident.

Following the initial actions undertaken by the Emergency Commander to ensure the safety of personnel and to control the source of the spill, the Emergency Commander will assess the situation based on:

- What caused the spill?
- Is the source under control?
- What type of hydrocarbon has been spilled?
- How much has been spilled?

Response information contained within this OPEP is concerned primarily with a large-scale (Level 2/3) hydrocarbon spill where the Perth-based Incident Management Team (IMT) is engaged for support.

Level 1 spills are managed through on-site response and do not typically require the stand-up of the IMT for support, however, on-site response actions to monitor the spill and regulatory requirements for reporting still apply. 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 at the Santos IMT in Perth 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 IMT Incident Commander.

The Barossa Oil Spill First Strike Response Plan and the Barossa Emergency Response Plan (BAF-213 6896) (both available in Santos' Emergency Response [ER] SharePoint site) should be referred to alongside the first-strike activations in Table 2-1.

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 or vessel-specific procedures, as applicable	Emergency Commander
Immediate	Control the source using site resources, where possible	Control the source using available on-site resources (installation / facility / vessel) Refer to Source Control Plan in Section 9	Emergency Commander
30 minutes of incident being identified	Notify Santos Offshore Duty Manager / Incident Commander	Verbally communicate to Santos Offshore Duty Manager / Incident Commander's duty phone	Emergency Commander
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	Emergency Commander
60 minutes of incident being reported	Gain situational awareness and begin on-site spill surveillance	Level 1 spills may only require the use of on-site resources to conduct monitor and evaluate activities (e.g. vessel surveillance). Refer to Monitor and Evaluate Plan in Section 10	Emergency Commander Incident Commander (Perth-based IMT)
Refer to timeframes in Section 7	Notify regulators and stakeholders within specified timeframes	Activate the External Notifications and Reporting Procedures – Section 7	Initial notifications by Planning Section Chief – Section 7
Level 2/3 spills (in addition to actions above)			
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Barossa Production Manager/ Incident Commander
IMT actions (0 to 48 hours)			
Within 90 minutes from IMT call-out	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), and Barossa Oil Spill First Strike Response Plan	Incident Commander Planning Section Chief
Refer to timeframes in Section 7	Notify regulators and stakeholders 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 Planning Section Chief 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)

When (indicative)	Activations		Who
	Objective	Action	
Refer to timeframes in Section 10	Implement monitor and evaluate tactics to provide situational awareness to inform IMT decision-making	Vessel surveillance (Section 10.1) Aerial surveillance (Section 10.2) Tracking buoys (Section 10.3) Oil spill trajectory modelling (Section 10.4) Satellite imagery (Section 10.5)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader Environment Unit Leader
Activate on Day 1 as applicable to the incident	Implement source control support to stop the release of hydrocarbons into the marine environment. **Degree of IMT support will be scenario-dependent**	Activate the Source Control Plan. Go to Section 9	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 11	Reduce potential exposure of shorelines and wildlife to floating oil through mechanical dispersion	Activate the Mechanical Dispersion Plan Go to Section 11	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 16	Assess and monitor effectiveness of response strategies and potential impacts from spill and response	Activate the Santos Northern Australia Operational and Scientific Monitoring Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0003) Go to Section 16	Environment Unit Leader Logistics Section Chief/ Supply Unit Leader Operations Section Chief
Day 1	Identify environmental sensitivities at risk and conduct operational Net Environmental Benefit Analysis (NEBA)	Review situational awareness and spill trajectory modelling Review strategic NEBA and begin operational NEBA (Section 6.6)	Environment Unit Leader
Day 1	Develop forward operational base/s to support forward operations	Begin planning for forward operations base as per Forward Operations Plan (Appendix P)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Day 1	Ensure the health and safety of spill responders	Identify relevant hazards controls and develop hazard register Begin preparing site health and safety management requirements Refer Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)	Safety Officer
If/ when initiated Refer to Section 12	Protect identified shoreline protection priorities	Activate the Shoreline Protection and Deflection Plan Go to Section 12	Operations Section Chief Logistics Section Chief/Supply Unit Leader Environment Unit Leader
If/ when initiated Refer to Section 14	Prevent or reduce potential impacts to wildlife	Activate the Oiled Wildlife Response (OWR) Plan Go to Section 14	Environment Unit Leader Operations Section Chief Logistics Section Chief/ Supply Unit Leader

When (indicative)	Activations		Who
	Objective	Action	
If/ when initiated Refer to Section 13	Clean-up oiled shorelines	Activate Shoreline Clean-Up Plan Go to Section 13	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
If/when initiated Refer to Section 15	Safely transfer, transport and dispose of waste collected from response activities.	Activate the Waste Management Plan. Go to Section 15	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
IMT Actions (48+ hours)			
Ongoing	• For ongoing incident management—indicatively 48+ hours—adopt a formal incident action planning process to continue with the 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, the Australian Maritime Safety Authority (AMSA), the NT IMT may be relevant Control Agencies (refer to Section 4.2). • If another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos' support to the NT IMT (for a spill that impacts the NT shoreline) is detailed in Section 4.5.2.		Control Agency IMT Santos may provide roles to support the NT Control Agency IMT (refer to Table 5-4) if this is mobilised.

3. Introduction

This document is the accompanying Oil Pollution Emergency Plan (OPEP) to the Barossa GEP Coastal Waters Operations Environmental Management Plan (OEMP) (BAS-210 0224) required by Regulation 22(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (OPGGS (E) Regulations). This document is also the accompanying OPEP to the Barossa GEP Internal Waters OEMP (BAS-210 0313), although an OPEP in this detailed form is not a specific requirement of environmental legislation applicable to NT waters.

3.1 Description of activity

Santos Ltd. (Santos) is preparing to conduct operational activities along the Barossa GEP from the Barossa Field to the existing onshore Darwin liquefied natural gas (DLNG) facility. This OPEP is limited to the portion of the pipeline within NT waters, from the NT / Commonwealth boundary to the DLNG facility (pipeline licence NTC/PL5 [Coastal waters] and licence NTC/PL37 [Inland waters]) (refer to Figure 3-1). A separate Barossa Production Operations OPEP (BAS-210 0134) exists for the portion of the pipeline in Commonwealth waters, from the NT / Commonwealth boundary to the Barossa Field.

Water depths along this portion of the Barossa GEP route vary from 50 m at the NT / Commonwealth boundary, to 0 m at the beach valve at the DLNG facility.

Activities within the operational area include:

- Operation of approximately 8.26 km of the nearshore Barossa GEP in NT Coastal waters
- Operation of approximately 91.74 km of the nearshore Barossa GEP in Internal waters
- Pipeline IMMR activities
- Environmental monitoring / sampling (e.g. sediment and marine growth), including vessel-related activities.

Refer to Section 2 of the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313) for a comprehensive description of the activity.

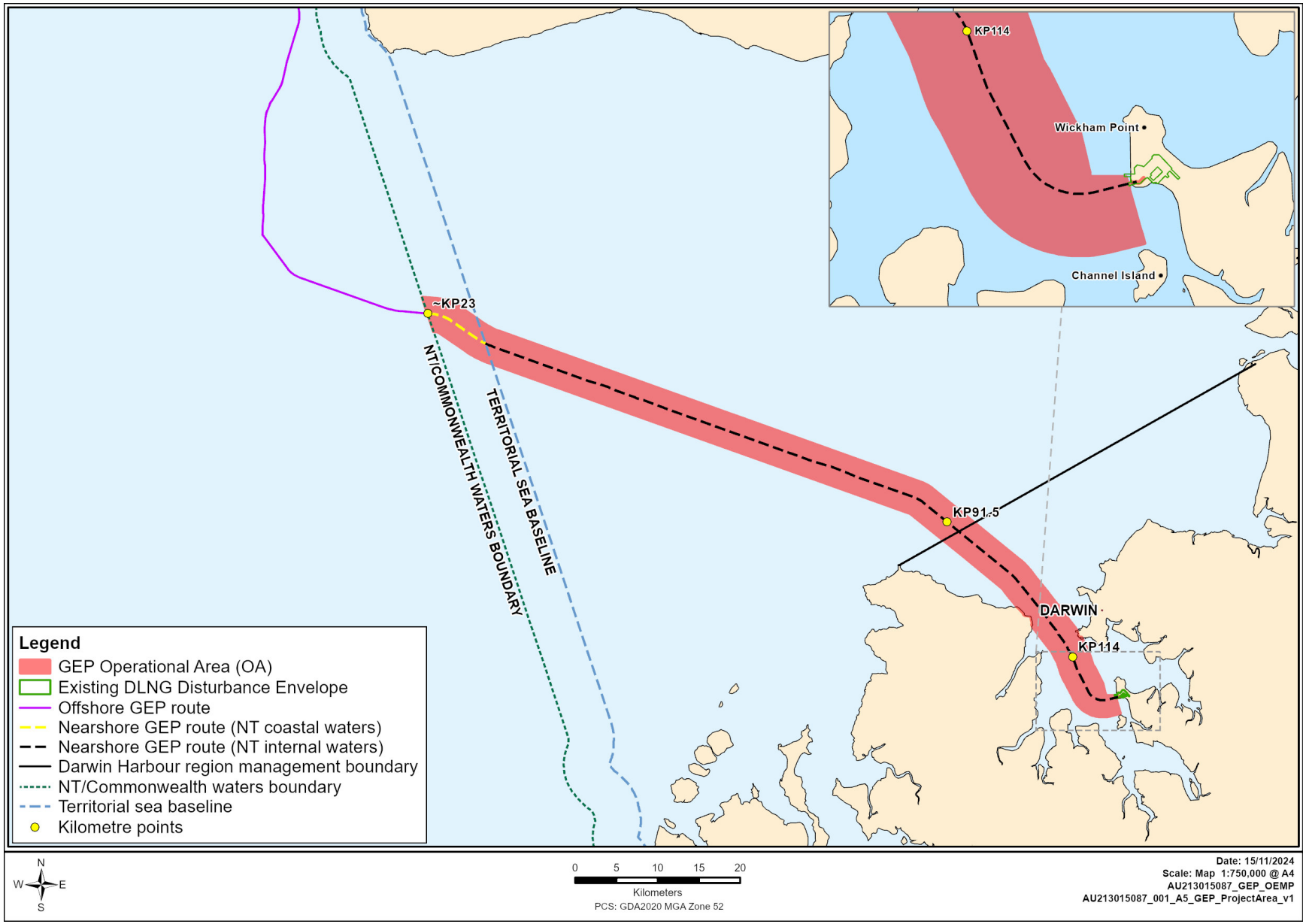

Figure 3-1: Location of the Barossa Gas Export Pipeline Operational Area in NT waters

3.2 Purpose

This OPEP describes Santos' response to a hydrocarbon spill during Barossa GEP Operations activities in NT waters, including Darwin Harbour.

It is consistent with the Australian (national) and NT systems for oil pollution preparedness and response, which are detailed in these documents:

- National Plan for Maritime Environmental Emergencies (AMSA, 2020) managed by AMSA
- NT Oil Spill Contingency Plan (NT DoT, 2014)
- Territory Emergency Plan (NT Government, 2021)
- Darwin Port Oil Spill Contingency Plan (Darwin Port, 2023)

This OPEP is to be read in conjunction with the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313), when considering the existing environment, environmental impacts, risk management, performance standards and the reporting compliance requirements.

This OPEP will apply from acceptance of the Santos Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313), and will remain valid for the duration of life of the OEMPs.

The response strategies outlined in this OPEP have been developed by Santos using risk assessments to identify credible worst-case hydrocarbon spill scenarios, expected/calculated release rates, known information of hydrocarbon types and behaviour, and expected partitioning of the hydrocarbon within the marine environment with an estimate of the volume of persistent oil. This information has been modelled to give a theoretical zone of dispersion that is used to identify potential sensitive receptors and response strategies required to reduce the consequences of a spill to 'as low as reasonably practicable' (ALARP). The response strategies are identified under a NEBA process so the most effective response strategies with the lowest environmental consequences can be identified, documented and prepared for.

3.3 Objectives

The aim of this OPEP is to provide detailed guidance to Santos' IMT, so that it will direct its response effort with the aim of preventing long-term significant environmental impacts by safely limiting the adverse environmental effects from an unplanned release of hydrocarbons to the marine environment to a level that is ALARP. This will be achieved by implementing the various strategies and spill response mechanisms presented throughout this OPEP.

Through this implementation, Santos will:

- initiate spill response immediately following a spill
- establish source control as soon as reasonably practicable to minimise the amount of oil being spilt into the environment
- assess the spill characteristics and understand its fate so as to make informed and clear response decisions
- monitor the spill to identify the primary marine and coastal resources requiring protection
- remove as much oil as possible from the marine environment while keeping environmental impacts from the removal methods to ALARP
- reduce the impacts of the remaining floating and stranded oil to ALARP
- respond to the spill using efficient response strategies that do not damage the environment
- comply with all relevant environmental legislation when implementing this OPEP
- conduct all responses safely without causing harm to participants
- monitor the impacts from a spill until impacted habitats have returned to baseline conditions
- remain in a state of 'readiness' at all times for implementing this OPEP by keeping resources ready for deployment, staff fully trained and completing response exercises as scheduled
- keep stakeholders informed of the status of the hydrocarbon spill response to help reduce social and economic impacts.

3.4 Area of operation

The GEP extends from the Barossa field to the existing onshore facilities at DLNG (Figure 3-1). The geographic extent of this OPEP is limited to the portion of the pipeline within NT waters, from the NT / Commonwealth boundary (KP23) to the DLNG facility (pipeline licence NTC/PL5 [Coastal waters] and licence NTC/PL37 [Inland waters]) (Figure 3-1).

Section 3 of the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313) includes a comprehensive description of the existing environment.

3.5 Interface with internal documents

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

- Barossa Oil Spill First Strike Response Plan
- Emergency Response Bridging Document (inspection, maintenance, monitoring and repair [IMMR] specific scope of work)
- Santos Incident Management Plan – WANATL (7700-650-PLA-0016)
- Santos Incident Management Handbook
- Santos Crisis Management Plan (SMS-HSS-OS05-PD03)
- Barossa GEP Coastal Waters OEMP (BAS-210 0224)
- Barossa GEP Internal Waters OEMP (BAS-210 0313)
- Incident Response Telephone Directory (7700-650-PLA-0016.20)
- Refuelling and Chemical Management Standard (SO-91-IQ-00098)
- Santos Waste Management Plan – Oil Spill Response Support (BAA-201_0027)
- Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)
- Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)
- Santos Oiled Wildlife Sample Collection Protocol
- Oil Spill Scientific Monitoring Baseline Data Review (SO-91-RF-20022)
- Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001)
- Santos Offshore Division Oil Spill Response Readiness Guideline (7710-650-GDE-0001)
- Santos Offshore – Oil and Water Sampling Procedures (7710-650-PRO-0008)
- Santos Marine Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
- Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017).
- Santos Northern Australia Operational and Scientific Monitoring – Bridging Implementation Plan (OSM-BIP)(7715-650-ERP-0003).

3.6 Interface with external documents

Information from the following external documents has been used or is referred to in this OPEP:

- 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 Australian Government's role and responsibilities in the event of an offshore petroleum incident in Commonwealth waters.
- National Plan for Maritime Environmental Emergencies (National Plan) and National Marine Oil Spill Contingency Plan

  - sets out national arrangements, policies and principles for managing maritime environmental emergencies. The plan provides for a comprehensive response to maritime environmental emergencies regardless of how costs might be attributed or ultimately recovered.

- NT Territory Emergency Plan
  - describes the NT approach to emergency and recovery operations, the governance and coordination arrangements, and roles and responsibilities of agencies (go to https://pfes.nt.gov.au/sites/default/files/uploads/files/2021/NTES_Territory_Emergency_Plan_2021.pdf).
- NT Oil Spill Contingency Plan (NTOSCP)
  - outlines the approach to managing marine oil pollution that is the responsibility of the NT Government.
- Darwin Port Oil Spill Contingency Plan
  - outlines the steps required for the management of Marine Oil Pollution emergencies that are the responsibility of Darwin Port. This includes oil spills from vessels or land-based activities that enter Port waters.
- WA DoT Marine Oil Pollution: Response and Consultation Arrangements
  - To be used as the basis for development of NT cross jurisdictional arrangements until the development and finalisation of the NT cross-jurisdictional arrangements (refer to Section 4.2)
- Joint Industry Operational and Scientific Monitoring Framework
  - provides a standardised approach to oil pollution monitoring, including industry guidance, templates, worked examples and standardised OSM plans that titleholders can apply to identify and detail monitoring arrangements and capabilities in their EP/OEMP and OPEP submissions.
- WA Oiled Wildlife Response Plan (WAOWRP)
  - establishes the framework for responding to potential or actual wildlife impacts in WA State waters, within the framework of an overall maritime environmental emergency
  - outlines risk reduction strategies, preparedness for, response to and initiation of recovery arrangements for wildlife impacts during a marine oil pollution incident.
- WA Oiled Wildlife Response Manual
  - a companion document to the WAOWRP for maritime environmental emergencies, designed to standardise operating procedures, protocols and processes for wildlife response.
- NT Oiled Wildlife Response Plan (NTOWRP)
  - AMOSC (on behalf of AMOSC Titleholder Members ConocoPhillips, INPEX and Shell Australia) developed the NTOWRP, which provides useful information relating to wildlife priority response areas in the NT based on the NT's prescribed Sites of Conservation Significance.
- Shipboard Oil Pollution Emergency Plans (SOPEP)
  - under International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements, all vessels of over 400 gross tonnage must have a current 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.
- OSRL 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 coordinating Australian Government departments and agencies in response to maritime environmental emergencies.

3.7 Document review

In line with regulatory requirements, this OPEP shall be reviewed, updated by Santos every five years from the date of acceptance of the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313).

This OPEP may be reviewed and revised 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 have occurred that affect oil spill response coordination or capabilities
- changes to the OEMP that affect oil spill response coordination or capabilities (e.g. a significant increase in spill risk)
- following routine testing of the OPEP if improvements or corrections are identified
- after a Level 2/3 spill 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.

The custodian of this OPEP is the Santos Lead Oil Spill Risk & Planning Coordinator.

4. Spill management arrangements

4.1 Response levels and escalation criteria

Santos uses a tiered system of 3 incident response levels consistent with the National Plan (AMSA, 2020). Spill response levels help identify the severity of an oil spill incident and the level of response required to manage the incident and mitigate environmental impacts. Incident response levels are outlined in the Santos Incident Management Plan – WANATL (7700-650-PLA-0016) and further detailed in Table 4-1 for hydrocarbon spills.

Table 4-1: Santos oil spill response levels

Level 1	
An incident that will not have an adverse effect on the public or the environment, which can be controlled by using resources normally available on site without the need to mobilise the Santos IMT or other external assistance.	
• Oil is contained within the incident site. • Spill occurs within immediate site proximity. • Incident can be managed by the On-site Emergency Response Team (ERT) and its resources.	• Source of spill has been contained. • Oil is evaporating quickly and no danger of explosive vapours. • Spill likely to naturally dissipate. • No media interest/no adverse effect on the public.
Level 2	
An incident that cannot be controlled by the use of on-site resources alone and requires external support and resources to combat the situation; or An incident that can be controlled on site, but which may have an adverse effect on the public or the environment.	
• Danger of fire or explosion. • Possible continuous release. • Concentrated oil accumulating close to the site or vessel. • Potential to impact other installations.	• 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.
Level 3	
An incident that 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

The responsibility for an oil spill depends on the spill's location and its origin. The National Plan (AMSA, 2020) sets out the divisions of responsibility for an oil spill response. Definitions of Control Agency and Jurisdictional Authority are:

- **Control Agency**[1]**:** the organisation assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency. Control Agencies have the operational responsibility of response activities but may have arrangements in place with other parties to provide response assistance under their direction.
- **Jurisdictional Authority:** the agency responsible for verifying that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Jurisdictional Authority is also responsible for initiating prosecutions and the recovery of clean-up costs on behalf of all participating agencies.

[1] *Also known as the 'Controlling Authority' in the NT context as per the Northern Territory Emergency Plan (2021).*

Table 4-2 provides guidance on the designated Control Agency and Jurisdictional Authority for Commonwealth and Territory waters and for vessel and petroleum activity spills.

To help determine a vessel versus a petroleum activity spill, the following guidance is adopted:

- In Commonwealth waters, a vessel is a ship at sea to which the Commonwealth *Navigation Act 2012* applies. This is defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA, 2017a) as a seismic vessel, supply or support vessel, or offtake tanker.
- A petroleum activity includes facilities such as a fixed platform, FPSO/FSO, mobile offshore drilling unit (MODU), subsea infrastructure, or a construction, decommissioning and pipelaying vessel, as defined by Schedule 3, Part 1, Clause 4 and Volume 2, Part 6.8, Section 640 of the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act).

Table 4-2: Jurisdictional Authorities and Control Agencies for hydrocarbon spills

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (3–200 nautical miles from Territory/state sea baseline)	Vessel[2]	AMSA	AMSA		Vessel SOPEP National Plan Barossa GEP Operations OPEP (NT waters) (this document)
	Petroleum activities[3]	National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA)	Titleholder		Barossa GEP Operations OPEP (NT waters) (this document)
NT waters (Territory waters to 3 nautical miles and some areas around offshore atolls and islands)	Vessel	NT Department of Environment, Parks and Water Security (DEPWS)	Vessel owner	DEPWS / NT Incident Controller (IC) / Territory Emergency Management Council (TEMC)[4]	Vessel SOPEP Barossa GEP Operations OPEP (NT waters) (this document) Relevant NTOSCP
	Petroleum activities	NT DEPWS	Titleholder		Barossa GEP Operations OPEP (NT waters) (this document) Relevant NTOSCP
Darwin Harbour (South of the outer harbour limits - Charles Point to Lee Point)	Vessel	DEPWS[5]	Darwin Port Operator	Darwin Port Operator	Vessel SOPEP Barossa GEP Operations OPEP (NT waters) (this document) Darwin Port Oil Spill Contingency Plan
	Petroleum activities	DEPWS	Titleholder / Facility Operator	Titleholder / Facility Operator	Darwin Port Oil Spill Contingency Plan (Darwin Port, 2023) Barossa GEP Operations OPEP (NT waters) (this document)

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

[3] 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 OPGGS Act 2006.

[4] Combination of DEPWS / TEMC / NT Police may assume the 'Control Agency / Controlling Authority' (CA) role if DEPWS is unable to manage as the CA.

[5] DEPWS is also the Hazard Management Authority

4.2.1 Northern Territory – NT Government

For a spill originating from a Santos activity, as soon as possible and within 24 hours of Santos becoming aware of an incident/spill that could reach NT coastal waters or shorelines, Santos will notify the NT Pollution Response Hotline and the DEPWS, in their role as Hazard Management Agency (HMA) for oil spills in NT waters (excluding spills originating within Darwin Harbour[6]) under the 'all-hazards' Territory Emergency Plan (TEP) (NT Emergency Services, 2022)[7].

Upon notification of a spill entering NT waters, or with the potential to enter NT waters, the DEPWS, as the Control Agency[8], specifically, the DEPWS Chief Executive Officer (CEO) in their role as the Territory Marine Pollution Coordinator (TMPC), will notify the Territory Emergency Controller (NT Commissioner of Police or delegate) who will appoint an NT Incident Controller (NT IC). The NT IC will form an NT IMT appropriate to the scale of the incident with representatives from relevant emergency 'Functional Groups' as identified under the TEP. If required an IMT will be established, comprising staff from across NT Government. If requested by the NT IC, members from the National Response Team may also be present. The NT IMT will be supported by existing NT emergency response arrangements, as defined in the NT *Emergency Management Act 2013*, through the TEMC and the TEP.

The Northern Territory Oil Spill Contingency Plan (NTOSCP; Northern Territory Government, 2021) is a sub-plan under the TEP. DEPWS has agreed, through consultation with the NT Government and the Australian Energy Producers (AEP) (formerly Australian Petroleum Production & Exploration Association [APPEA]) Oil Spill Preparedness and Response Working Group (20 June 2023), in principle, to use the WA DoT Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, 2020), as the basis for developing NT cross-jurisdictional arrangements. A working group is being established to develop the NT cross-jurisdictional arrangements, which once agreed, will be updated into the NTOSCP. In the interim, the WA DoT (2020) cross-jurisdictional guidance can be broadly used by titleholders, as reference for how to support the NT IMT. Figure 4-1 shows the coordination structure between Santos and the NT Government for Barossa offshore petroleum incidents.

For all Level 2/3 spills from vessel/petroleum activities that enter NT waters, the DEPWS will assume the role of Control Agency.

The NT IC, with advice from NT environment, scientific and technical advisors, will work with the Santos IMT to agree protection priorities and determine the most appropriate response in NT waters. Santos will provide support to the NT IMT from the Santos IMT at the Incident Coordination Centre (ICC) in Perth. The Santos IMT will provide support, including drafting operational tasks or IAPs, to the NT IC for approval before their release/implementation.

At the request of the NT IC, Santos will be required to provide all necessary resources, including personnel and equipment, to assist the NT IMT in performing its duties for NT waters and shorelines, including providing personnel to:

- work within the NT IMT
- help with response activities such as shoreline protection, clean-up and OWR.

To facilitate coordination between the NT IMT and Santos IMT during a response, the NT IMT and Santos Forward Operating Base (FOB) will be established to ensure objectives align and provide a mechanism for managing conflicting priorities and resourcing requests directly between the Santos IMT in Perth and NT IMT in Darwin.

The NT Government and relevant Control Agency intends using the NTOWRP (AMOSC, 2019) as the basis for determining protection priorities and shoreline response planning.

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[6] *Darwin Port is the Control Agency for oil spills within Darwin Harbour, including all shipping spills, and Level 2 and above facility spills.*

[7] *At the time of writing this document (January 2025) the NT DEPWS is the 'Controlling Authority' and HMA for oil spills in NT waters (excluding Darwin Harbour) under the 'all-hazards' Territory Emergency Plan TEP (NT Emergency Services, 2022).*

[8] *This term is known as the 'Controlling Authority' in the TEP.*

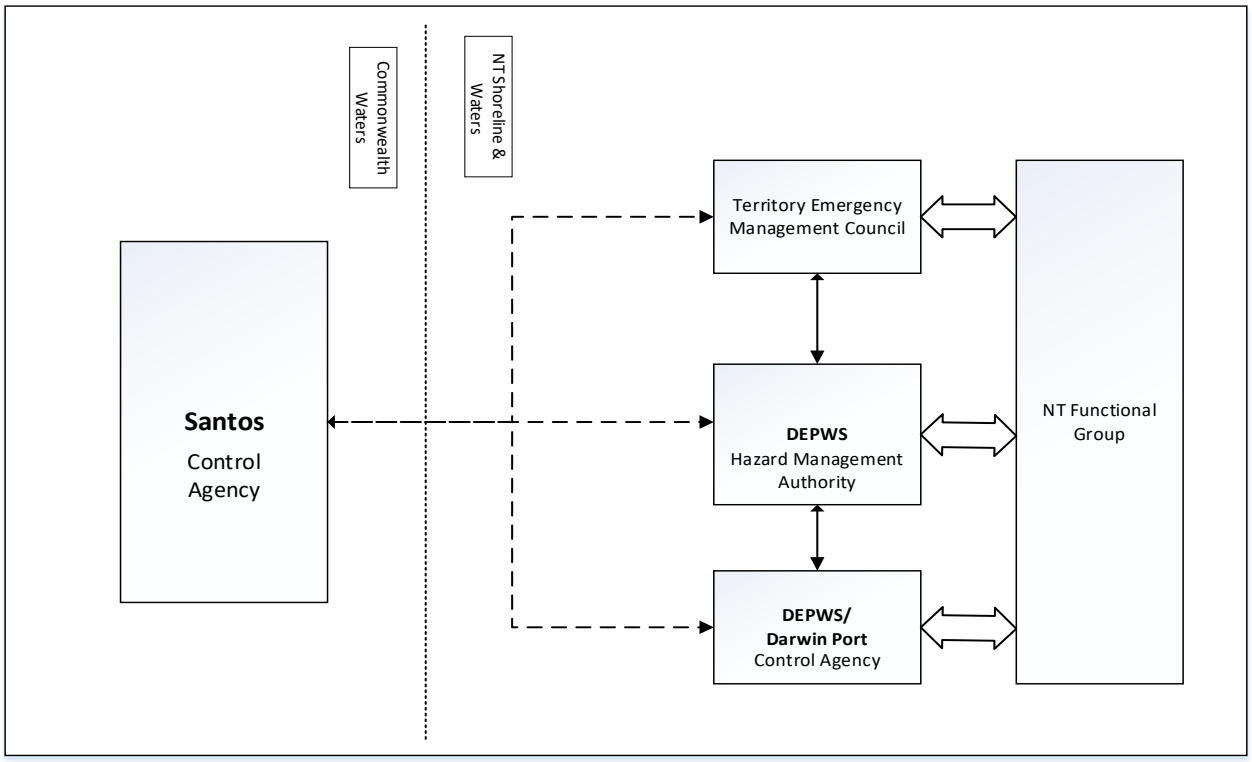

Figure 4-1: Coordination structure between Santos and NT Government for Barossa offshore petroleum incidents

4.2.2 Darwin Harbour spills – NT Government and Darwin Port

For all Level 2/3 spills within Darwin Harbour (Figure 3-1 - south of the outer harbour limits, from Charles Point to Lee Point) DEPWS remain the Hazard Management Authority, while the Darwin Port Operator assumes the role of Control Agency. However, all spills that enter the Darwin Harbour boundary remain the responsibility of the Control Agency at the source of the spill. Darwin Port will support other Control Agencies for spills originating outside the port of Darwin (Darwin Port, 2023).

For a spill within Port limits and originating from a Santos activity, the Darwin Harbour Control should be contacted as soon as possible of Santos becoming aware of an incident/spill. A Marine Pollution Report (POLREP) must be completed and submitted to Darwin Harbour Control and the NT Environmental Protection Authority. Additional information is provided in the Darwin Port Oil Spill Contingency Plan (OSCP) (Darwin Port, 2023).

4.2.3 Vessel spills

AMSA manages the National Plan for Maritime Environmental Emergencies (AMSA, 2020) and is the Control Agency for all vessel-based spills in areas under Commonwealth jurisdiction. AMSA works with state and territory governments, emergency services and private industry to maximise Australia's marine pollution response capability. For all Level 2/3 vessel-based spills in NT waters the DEPWS would assume the Control Agency role. This includes vessels undertaking seismic surveys and associated supply or support vessels.

If a vessel-based spill were to occur in NT waters, the relevant NT Control Agency would respond accordingly.

In all circumstances, the Vessel Master is responsible for implementing source control arrangements detailed in the vessel-specific SOPEP.

Once initial notifications to the Control Agency are made, Santos shall maintain direct contact with the Control Agency and act as a supporting agency throughout the response. This includes providing essential services, personnel, materials or advice to support the Control Agency. In addition, Santos will be required to implement monitoring activities as outlined in the Monitor and Evaluate Plan (Section 10) and Operational and Scientific Monitoring (Section 16).

4.2.4 Cross-jurisdictional petroleum activity spills

If a Level 2/3 petroleum activity spill crosses jurisdictions between Commonwealth and Territory waters, the Jurisdictional Authority remains true to the source of the spill (i.e. NOPSEMA for Commonwealth waters, NT Control Agency for Territory waters).

If a Level 2/3 spill originating in Commonwealth waters moves into Territory waters, multiple Control Agencies will exist: NT Control Agency and the Petroleum Titleholder (Santos), each with its own IMT and Lead IMT responsibilities. The arrangements between NT Control Agency and Santos for sharing resources and coordinating a response are detailed in Section 4.2.1.

4.2.5 Cross-jurisdictional vessel spills

If a Level 2/3 vessel spill crosses jurisdictions between Territory and Commonwealth waters, multiple Jurisdictional Authorities will exist: NT Control Agency for Territory waters and AMSA for Commonwealth waters. Coordination of Control Agency responsibilities will be determined by NT Control Agency and AMSA based on incident specifics, with Santos providing first strike response and all necessary resources (including personnel and equipment) as a supporting agency, as detailed in Section 4.2.3.

4.3 Integration with government organisations

4.3.1 Australian Maritime Safety Authority

Although Santos or the NT Control Agency would be Control Agencies initially for any spill in Territory waters (as outlined in Section 4.2), AMSA is the designated Control Agency for vessel spills in Commonwealth waters. Therefore, if a vessel spill enters Commonwealth waters, AMSA may also become a (or the) Control Agency for the response in those waters. Arrangements for coordinating and potentially transferring Control Agency status are outlined in AMSA Guidance Note NP-GUI-023: Coordination of Cross-Border Incidents (AMSA, 2017b).

AMSA is to be notified immediately of all ship-source incidents through the AMSA Rescue Coordination Centre (RCC) (Santos Incident Response Telephone Directory [7700-650-PLA-0016.20]).

AMSA manages the National Plan, Australia's key maritime emergency contingency and response plan (AMSA, 2020). AMSA fulfils its obligations under the National Plan for non–ship-source pollution incidents on the formal request from the respective Offshore Petroleum Incident Controller/s (AMSA, 2021a). AMSA also has a range of National Plan supporting documents containing related policies, guidance and advisory information.

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.

4.3.2 Department of Industry, Science and Resources

Department of Industry, Science and Resources (Commonwealth) (DISR) will be the lead Commonwealth Agency for providing strategic oversight and Australian Government support to a significant offshore petroleum incident (including oil spill incidents). DISR 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, liaison officer/s will be deployed from DISR to the Petroleum Titleholder 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 Offshore Petroleum Incident Coordination Committee will not be convened, although DISR will remain as the lead agency.

4.4 Interface with external organisations

Santos has contracts in place enabling access to oil spill response organisations (OSROs). OSROs have put specific measures in place to ensure that they are able to continue to meet their commitments to members. This support can be provided directly or remotely to aid the IMT and/or ERT.

4.4.1 Australian Marine Oil Spill Centre

Santos is a participating member of AMOSC and as such has access to AMOSC equipment and personnel as outlined in the AMOSPlan (AMOSC, 2021).

AMOSC has contracts with all its member companies to enable the immediate release of 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 brought together under the AMOSPlan, and are activated via the AMOSC Duty Officer. 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, Chevron, Woodside and Jadestone have signed a memorandum of understanding (MoU) that defines the group's mutual aid arrangements. Under this MoU, these companies have agreed to use their reasonable endeavours to help provide emergency response services, personnel, consumables and equipment.

4.4.2 Oil Spill Response Limited

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

Under the OSRL associate membership Service Level Agreement (SLA), Santos has access to response personnel (18 per incident) and 50% of the global response equipment stockpile. Santos is also a member of OSRL's Global Dispersant Stockpile (GDS) and OSM Services Supplementary Agreement.

The OSM Services Supplementary Agreement provides Santos with access to OSM services. Additional information on OSM services and capability is provided in the Santos Northern Australia OSM-BIP (7715-650-ERP-0003).

4.4.3 The Response Group

The Response Group (TRG) is an international provider of crisis management and emergency response services including oil spill response. TRG are available to Santos 24/7 and can provide personnel for emergency response support.

5. Santos incident management arrangements

5.1 Incident management structure

The Santos IMT (Perth) and Crisis Management Team (CMT) (Adelaide) will be activated in the event of a Level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. Santos maintains internal resources (trained personnel and equipment) across its activities that provide first-strike response capability and support for an ongoing response. If an incident occurs, the IMT Duty Manager would be notified immediately. This rostered role is on call, filled by trained Incident Commanders and available 24 hours/day and 7 days/week. The IMT Duty Manager would then activate the IMT via an automated call-out system. Documentation required in a response is accessed via the Santos Emergency Response (ER) SharePoint site.

As outlined in Section 4, control of the response may be taken over by the relevant Control Agency as the incident progresses. The Santos response structure to a major emergency incident is detailed in the Santos Incident Management Plan – WANATL (7700-650-PLA-0016) and the Santos Incident Management Handbook. These documents describe response planning and incident management that would operate under emergency conditions and 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 forming an IMT and establishing an ICC[9]. The ongoing involvement of the IMT and CMT will depend 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 a Barossa GEP Operations (NT waters) incident includes:

- Facility-based ERT – manage the incident in accordance with Facility Incident Response Plan, Third-party Incident Response Plan, and/or activity-specific Oil Spill Contingency Plan or OPEP
- Santos IMT – Perth-based ICC to coordinate and execute responses to an oil spill incident
- CMT – Adelaide-based to coordinate and manage threats to the company's reputation and to handle Santos' corporate requirements in conjunction with the Perth-based Santos – Vice President Offshore Upstream WA / Northern Australia
- Other field-based command, response and monitoring teams for implementing strategies outlined in the OPEP.

The Santos incident response organisational structure is defined in the Incident Management Plan – WANATL (7700-650-PLA-0016) and Santos Incident Management Handbook, and is shown in Figure 5-1 for reference. The Santos IMT roles and field-based teams are scalable; roles can be activated and mobilised according to the nature and scale of the incident response.

In the event of a Level 2 or 3 spill event, Santos will review the Relevant Persons identification process described in Section 4 of the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313). Relevant Persons, whose functions, interests or activities that may be directly affected by the spill event or response arrangements, will be identified and engaged in accordance with the Santos incident management process, noting notification and communications requests made by Relevant Persons during OEMP consultation with respect to emergency situations.

[9] *The Santos ICC is located in the Perth office. For protracted responses, transitioning the IMT to Darwin in week 2–3 should be considered. If this decision is made, a group should be formed to prepare for and facilitate the move to minimise disruption to the response effort.*

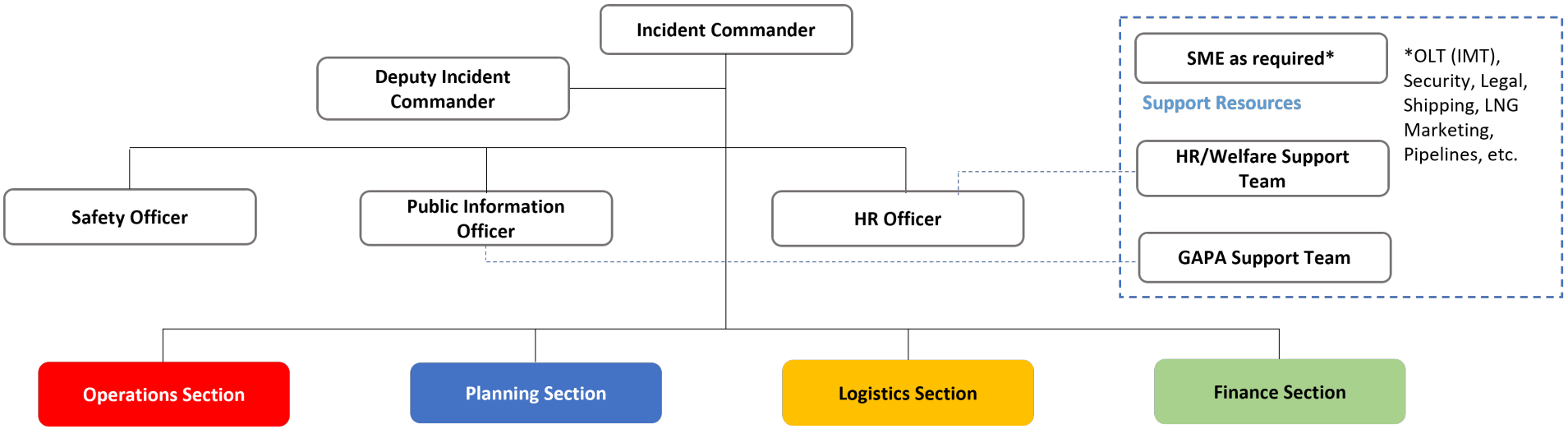

Figure 5-1: Santos incident management team organisational structure

5.2 Roles and responsibilities

The following tables summarise the responsibilities of the Santos CMT (Table 5-1), IMT (Table 5-2), and ERT (Table 5-3) in responding to an incident. Not all the roles listed are shown in Figure 5-1, as some of the roles in Table 5-2 are support roles or are specific to a particular response strategy. Full responsibilities checklists/job cards of each role are described in the Incident Management Plan – WANATL (7700-650-PLA-0016), Santos Incident Management Handbook and Santos Crisis Management Plan (SMS-HSS-OS05-PD03) to support the incident action planning process.

The IMT and ERT are scalable to the nature and scale of the response (i.e. one person can take on multiple roles or one role can be filled by multiple people, where circumstances permit).

DEPWS has agreed in principle, through consultation with the NT Government and the APPEA (now AEP) Oil Spill Preparedness and Response Working Group (20 June 2023), to use the WA DoT Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, 2020) as the basis for developing NT cross-jurisdictional arrangements[10].

Table 5-4 lists indicative roles and responsibilities of Santos personnel required to work within the NT IMT, based on WA DoT (2020) cross-jurisdictional guidance.

Table 5-1: Roles and responsibilities in the Santos Crisis Management Team

Santos CMT role	Main responsibilities
Crisis Management Chair (CEO)	The Crisis Management (CM) Chair (Santos CEO) is responsible for: • Leading crisis management direction • Providing governance and oversight of CMT operations • Providing enterprise and strategic direction to the CMT for resolving the crisis event • Delegating the CM Lead role and accountability to the appropriate ExCom designee • Engaging with the CM Lead to endorse the crisis resolution plan • Liaising with the Santos Board and strategic stakeholders • Providing the full extent of the company's resources to bring about a resolution and recovery from the crisis impact.
CMT Lead/ Duty Manager	The CMT Lead is responsible for: • Determining the need for establishing a Level 3 response and for activating the CMT • Determining which, if any, Crisis Management Support Teams (CMST) are mobilised • Leading the crisis resolution process • Ensuring internal and external notifications are sent to key stakeholders • Using the crisis resolution process to determine enterprise level impacts (potential or actual) and strategic objectives • Ensuring a crisis resolution plan is developed and directing the CMT functions to implement strategies, action plans and tasks • Determining when it is appropriate to conclude the crisis response and stand down all or a portion of the CMT.
CMT Information Management	The CMT Information Managers directly support the CMT by: • Supporting the CMT during crisis management operations • Setting up the crisis management room, assisting with set-up of communications, video conferences and information transfer within the CMT • Advising on CMT operating processes and available resources • Assisting with reserving break-out rooms for the CMT functions and CMSTs • Ensuring CMT crisis resolution forms are used and displayed on the monitors • Providing IAP information when an IMT is established • Monitoring and managing the welfare needs of the CMT.
Crisis Management Advisor	The Crisis Management Advisor is responsible for: • Providing CMT process guidance and advice to CMT Lead, Function Leads, and CMST

[10] *A working group is being established to develop the NT cross-jurisdictional arrangements, which once agreed, will be updated into the NTOSCP. In the interim, the WA DoT (2020) cross-jurisdictional guidance can be broadly used by titleholders, as reference for how to support the NT IMT.*

Santos CMT role	Main responsibilities
	• Supporting and facilitating the crisis resolution planning process • Liaising between the CMT and IMT • Working with CMT Information Managers to manage rosters and handovers for extended CMT operations • Scheduling and facilitating post-crisis debriefings and after-action reviews. The Crisis Management Advisor will support the CMT Lead by: • Facilitating CMT activation requirements with the CMT Lead • Assisting the CMT Lead in maintaining an ongoing assessment of incident potential and analysis of stakeholder impacts • Advising the CMT Lead on CMT structure and requirements for CMST engagement • Coordinating tasks delegated by CMT Lead • Providing tools to the CMT Lead for review and crisis assessment meetings.
CMT Function Leads	CMT Function Leads include Leads for these areas: • Legal Counsel and Risk • Environment Health Safety and Security • Operating Unit Vice President • People • Government and Public Affairs (GAPA) • Media and Communications. The CMT Function Leads are responsible for: • Participating in and contributing to the crisis resolution planning process • Determining critical communications pertaining to their area • Mobilising and coordinating activities of the function's CMST • Advising the CMT Lead on strategic impacts, threats and mitigation created by the crisis event • Developing and implementing strategies to meet objectives endorsed by the CM Chair • Providing support and resources via the CMST to divisional IMTs • Ensuring critical actions, decisions or points of strategic criticality are included in the CMT log • Participating in the crisis management debriefings and after-action reviews.

Table 5-2: Roles and responsibilities in the Santos Incident Management Team

Santos management/ IMT role	Main responsibilities
Vice President Offshore (VPO) Upstream WA/NA	• Depending on the level of the incident, the VPO (and/or their delegate) acts as the primary liaison to the CMT Duty Manager • On activation of the IMT, the VPO is advised by the IMT Duty Manager.
Incident Commander	• Overall management of the incident • Sets response objectives and strategic directions • Oversees the development and implementation of IAPs.
Safety Officer	• Develops and recommends measures for assuring personnel safety • Assesses and/or anticipates hazardous and unsafe situations • May have specialist support as necessary.
Public Information Officer	• Develops and releases information about the incident to media, incident personnel and appropriate agencies and organisations.
Human Resources (HR) Officer	• Advises and assists the Incident Commander, Command Staff and Section Chiefs on any HR-related aspects of an incident.
Operations Section Chief*	• Leads the Operations Section within the IMT • Manages all tactical operations directly applicable to the primary assignments • Activates and supervises operational elements in accordance with the IAP and directs its implementation.

Santos management/ IMT role	Main responsibilities
Division Commander[11]	• Commands an FOB for coordinating resources mobilised to site • Coordinates the field response as outlined in the Barossa First Strike Response Plan and/or IAPs for each operational period developed by the IMT • Establishes and maintains effective operation of the FOB, Divisional Staging Area and any secondary staging areas • Provides advice and input into formulating the IAP for the next operational period. *Refer to the Darwin FOB Duty Card – Division Commander, for further description of roles and responsibilities.*
Air Operations Branch Director	• Ground-based role • Coordinates air operations section (ICS 220) of the IAP • Provides logistical support to incident aircraft.
Offshore Response Branch Director	• Leads the offshore response activities. Depending on the size and nature of the incident, various groups, teams and task forces will be implemented, including Mechanical Dispersion group, Recovery and Protection group, and Dispersant Operations group. • The Mechanical Dispersion group is responsible for executing mechanical dispersion operations in the designated locations in compliance with the IAP. • The Recovery & Protection group is responsible for the deployment of containment and diversion/protection booming and managing on water recovery operations in the designated locations in compliance with the IAP. • The Dispersant Operations Group is responsible for coordinating all aspects of dispersant operations in compliance with the IAP. For aerial applications, the Group works closely with the Air Operations Branch.
Monitoring Branch Director	• Works closely with the Environment Unit to implement the OSM plans required, based on the nature and scale of the incident.
Wildlife Response Branch Director	• Works with relevant state authorities to implement the OWR plan for the incident, including deploying equipment and personnel required.
Waste Branch Director	• Coordinates the on-site activities of personnel engaged in collecting, storing, transporting and disposing of waste materials, in compliance with the IAP.
Shoreline Clean-up Branch Director	• Leads all shoreline response activities • Works closely with the Shoreline Response Program Manager and shoreline clean-up supervisors and various locations.
Planning Section Chief*	• Leads the Planning Section within the IMT • Collects, evaluates, disseminates and uses incident information • Maintains status of assigned resources.
Situation Unit Leader	• Collects, processes, and organises incident information relating to escalation, mitigation or intelligence activities taking place in an incident • Prepares future projections of incident growth, maps, and intelligence information.
Resources Unit Leader	• Maintains the status of all assigned tactical resources and personnel at an incident • Oversees the check-in of all tactical resources and personnel • Maintains a status-keeping system indicating current location and status of all the resources.
Documentation Unit Leader	• Maintains accurate, up-to-date incident files including IAPs, incident reports, communication logs, situation status reports etc.
Environment Unit Leader	• Responsible for environmental matters associated with the response, including strategic assessment, modelling, surveillance and environmental monitoring and permitting.
Technical Specialists	• Certain incidents may require Technical Specialists who have specialised knowledge or expertise. Technical Specialists may function within the Planning Section or be assigned wherever their services are required. Santos will activate Technical Specialists, based on the requirements of the incident, through a range of arrangements. Technical Specialists may include: Modelling Specialist, Operational/Scientific Monitoring Specialist, Response Technology Specialist, Waste Management Specialist, etc.

[11] *This role is only appointed when an FOB in Darwin assumes control of response operations in the Barossa field.*

Santos management/ IMT role	Main responsibilities
Shoreline Response Program (SRP) Manager	• Reports to the Environment Unit Leader • Manages shoreline response • Provides input to Planning and Operations Section Chiefs on shoreline response program to minimise shoreline impacts and Shoreline Clean-up Assessment Technique (SCAT) program.
SCAT Program Coordinator	• Primary point of contact, through SRP Manager, within the IMT for all SCAT activities • Project manager for the SCAT program and designs and directs the SCAT program for any incidents • Implements and manages the day-to-day activities for the SCAT program including establishing good management practices and safety protocols for the field teams, chairing SCAT Field Survey Team briefings and debriefings and producing daily and weekly summaries of field reports.
SCAT Field Coordinator	• Works with SCAT Program Coordinator to develop daily missions and rolling strategy for the field teams • Provides the necessary logistics and equipment support as required.
SCAT Data Manager	• Reports to the SCAT Program Coordinator • Processes field data, quality assurance, data storage and dissemination within the IMT • Provides the SCAT Field Survey Teams with the maps and data required to conduct their missions.
Shoreline Treatment Recommendations (STR) Manager	• Prepares the Shoreline Treatment Recommendations (STRs) • Works with the Environment Unit to obtain reconnaissance information to assess priority areas for initial SCAT surveys and gain approval for land access where appropriate • Ensures all approvals are obtained (e.g. concerning any endangered species, cultural, historical resources etc.) before undertaking shoreline activities • Works with the Environment Unit's Technical Specialists, subject matter experts (SMEs) and stakeholders to ensure that their requirements and constraints are incorporated into STRs • Works with the Operations Section to obtain advice on the feasibility, practicality and effectiveness of potential treatment strategies and tactics • Tracks the progress of approved STRs to generate and update progress reports.
Logistics Section Chief*	• Provides facilities, services and materials in support of the incident • Participates in the development and implementation of the Logistics Section of the IAP.
Services Branch Director	• When activated, this role is under the supervision of the Logistics Section Chief • Manages all service activities for the incident including the operations of the Communications, Medical and Food Units.
Support Branch Director	• When activated, this role is under the supervision of Logistics Section Chief • Develops and implements logistics plan in support of the IAP • Supervises the operations of the Supply, Facilities, Ground Support and Vessel Support Units.
Finance Section Chief*	• Manages all financial, administrative and cost analysis aspects of the incident • Supervises members of the Finance Section
Procurement Unit Leader	• Administers all financial matters pertaining to vendor contracts and leases • Undertakes all procurements in accordance with Santos' policies and procedures.
Claims Unit Leader	• Manages and directs all administrative matters pertaining to compensation and claims-related matters for any incident.
Cost Unit Leader	• Collects all cost data • Provides cost estimates and any cost-saving recommendations for the incident.

** Note: The Section Chiefs are supported by various other roles that will be mobilised depending on the severity of the incident.*

Table 5-3: Roles and responsibilities in the field-based response team (ERT)

Field-based position	Main responsibilities
Emergency Commander[12]	• Assesses facility-based oil spill situations / incidents and responds accordingly • Single point of communications between facility/site and IMT • Directs emergency response activities in accordance with the Santos ER principles and philosophy • Communicates the incident response actions and delegates actions to the Incident Commander. • Manages the spill incident in accordance with Facility Emergency Response Plan, Third Party Incident Response Plan, and/or the activity-specific Oil Spill Contingency Plan or OPEP (this document) • Coordinates medical evacuations as required • Liaises with the Perth IMT Operations Section Chief if/when the IMT is established *Refer to the Facility Incident Response Plan for detailed descriptions of roles and responsibilities.*
Emergency Coordinator	• Establishes and maintains contact with the incident scene • Ensures information is passed to and from the On-Scene Commander, including relevant emergency information from the Command Team time-outs (e.g. source of the spill, if the spill is ongoing or contained, number of personnel responding); also advises On-Scene Commander when the next Command Team time-out will be • Ensures accurate transfer of information from On-Scene Commander to Status Board log person • Communicates with outside assistance (e.g. vessels, aircraft) • If instructed, coordinates activities such as spill control/response strategies • If instructed, liaises with onshore technical authorities and onshore IMT • Informs Emergency Commander of incident and vessel status.
On-Scene Commander (OSC) (ERT Field Team Leader)	• Undertakes command and leads field response as directed by the Emergency Coordinator, where safe to do so • Establishes, when appropriate, a Forward Control Point • Maintains spill responder safety in accordance with Santos' response philosophy • Assures all field and affected area personnel are accounted for • Deploys and implements spill control/response strategy resources to contain and control the spill incident, as per advice from the Emergency Coordinator / Incident Commander / Division Commander. *Refer to the Facility Incident Response Plan for detailed descriptions of roles and responsibilities.*
Medical Evacuation Team	• Manages all medical and transportation requirements related to injured personnel to get them to an appropriate medical facility. *Refer to the Medical Evacuation Procedure (SO-91-IF-00020) for detailed descriptions of roles and responsibilities within the Medical Evacuation Team.*
Wildlife Response Branch	• Responds to oiled wildlife incidents to minimise the impacts to wildlife. *Refer to the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for a description of the wildlife response branch and the Santos Incident Management Handbook for detailed descriptions of roles and responsibilities within the Oiled Wildlife Response Branch.*
Monitoring Branch	• Monitors the effectiveness of response strategies • Monitors impacts to sensitive receptors (and their recovery) from an oil spill and associated response actions. *Refer to the Santos Northern Australia OSM-BIP (7715-650-ERP-0003) for detail on OSM roles and responsibilities.*

[12] *The OSC is generally the Santos Company Representative or the Vessel Master .*

Table 5-4: Indicative Santos personnel roles embedded within the NT IMT

Santos roles embedded within the NT IMT	Main responsibilities
CMT Liaison Officer	• Provides a direct liaison between the Santos CMT and the NT IMT. • Facilitates effective communications and coordination between the Santos CMT Lead and the NT IMT. • Offers advice to NT IMT on matters pertaining to Santos crisis management policies and procedures.
Deputy Incident Controller	• Provides a direct liaison between the NT IMT and the Santos IMT. • Facilitates effective communications and coordination between the Santos Incident Commander and the NT Incident Controller. • Offers advice to the NT Incident Controller on matters pertaining to the Santos incident response policies and procedures. • Offers 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 NT IMT.
Deputy Intelligence Officer	• As part of the NT IMT Intelligence Team, assist the Intelligence Officer in performing their duties in relation to situation and awareness. • Facilitates providing relevant modelling and predications from the Santos IMT. • Assists in interpreting modelling and predictions originating from the Santos IMT. • Facilitates providing relevant situation and awareness information originating from the NT IMT to the Santos IMT. • Facilitates providing relevant mapping from the Santos IMT. • Assists in interpreting of mapping originating from the Santos IMT. • Facilitates providing relevant mapping originating from the Santos IMT.
Deputy Planning Officer	• As part of the NT IMT Planning Team, assists the Planning Officer in performing their duties related to interpreting existing response plans and developing IAPs and related sub-plans • Facilitates providing relevant IAP and sub-plans from the Santos IMT. • Assists in interpreting the Santos OPEP. • Assists in interpreting the Santos IAP and sub-plans from the Santos IMT. • Facilitates providing relevant IAP and sub-plans originating from the NT 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 NT 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, assists the Environment Coordinator in performing their duties related to providing environmental support into the planning process. • Assists in interpreting the Santos OPEP and relevant Tactical Response Plan (TRPs). • Facilitates in requesting, obtaining and interpreting environmental monitoring data originating from the Santos IMT. • Facilitates providing of relevant environmental information and advice originating from the NT IMT to the Santos IMT.
Deputy Public Information Officer[13]	• As part of the Public Information Team, provides a direct liaison between the Santos Media team and NT IMT Media team. • Facilitates effective communications and coordination between Santos and NT IMT media teams[14]. • Assists in releasing joint media statements and conducts joint media briefings.

[13] *In the event of an incident, Santos can provide the NT IMT with a list of agencies, organisations, representative bodies, and other stakeholders that were consulted in the development of the OEMP to assist with the management and provision of public information.*

[14] *In the event the NT IMT assumes the role of Control Agency in Territory waters, Santos acknowledges that the NT IMT will be the lead IMT for public information and warnings and community liaison. In such circumstances, Santos retains the right to manage its own media interests, but acknowledges the strong preference for NT IMT and Santos to issue joint media statements and conduct joint media conferences and the importance of close liaison between the respective Media Teams.*

Santos roles embedded within the NT IMT	Main responsibilities
	• Assists in releasing joint information and warnings through the NT IMT Information and Warnings team. • Offers advice to the NT IMT Media Coordinator on matters pertaining to Santos media policies and procedures. • Facilitates effective communications and coordination between Santos and NT IMT Community Liaison teams. • Assists in conducting joint community briefings and events. • Offers advice to the NT IMT Community Liaison Coordinator on matters pertaining to Santos community liaison policies and procedures. • Facilitates effective transfer of relevant information obtained from the Contact Centre to the Santos IMT.
Deputy Logistics Officer	• As part of the Logistics Team, assists the Logistics Officer in performing their duties related to providing supplies to sustain the response effort. • Facilitates acquiring appropriate supplies through Santos' existing OSRL, AMOSC and private contract arrangements. • Collects Request Forms from NT IMT to action via the Santos IMT. *(Note this individual must have intimate knowledge of the relevant Santos logistics processes and contracts).*
Deputy Waste Management Coordinator	• As part of the Operations Team, assists the Waste Management Coordinator in performing their duties related to managing and disposing of waste collected in State waters • Facilitates acquiring appropriate services and supplies through Santos' existing private contract arrangements related to waste management • Collects Waste Collection Request Forms from NT IMT to action via the Santos IMT.
Deputy Finance Officer	• As part of the Finance Team, assists the Finance Officer in performing their duties related to setting up and paying accounts for those services acquired through Santos' existing OSRL, AMOSC and private contract arrangements • Facilitates communicating financial monitoring information to Santos to allow tracking of the overall cost of the response • Assists the Finance Officer in tracking financial commitments throughout the response, including the supply contracts commissioned directly by NT IMT and to be charged back to Santos.
Deputy Operations Officer	• As part of the Operations Team, assists the Operations Officer in performing their duties related to implementing and managing operational activities undertaken to resolve an incident • Facilitates effective communications and coordination between the Santos Operations Section and the NT IMT Operations Section • Offers advice to the NT IMT Operations Officer on matters pertaining to Santos incident response procedures and requirements • Identifies efficiencies and helps resolve potential conflicts around resource allocation and simultaneous operations of Santos and NT IMT response efforts.
Deputy Division Commander (FOB)	• As part of the Field Operations Team, assists the Division Commander in performing their duties related to overseeing and coordinating field operational activities undertaken in line with the IMT Operations Section's direction. • Provides a direct liaison between Santos' FOB(/s) and the NT IMT FOB. • Facilitates effective communications and coordination between Santos FOB Operations Commander and the NT IMT Division Commander. • Offers advice to the NT IMT Operations Commander on matters pertaining to Santos incident response policies and procedures. • Assists the Safety Coordinator deployed in the FOB in performing their duties, particularly as they relate to Santos employees or contractors. • Offers advice to the Senior Safety Officer deployed in the FOB on matters pertaining to Santos safety policies and procedures.

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 Control Agencies (e.g. NT DEPWS) and third-party spill response service providers.

5.5 Training and exercises

To refresh IMT roles and responsibilities and familiarise personnel 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). Exercise planning takes into consideration virtual/remote access requirements and government-mandated border restrictions.

All workshops and exercises undertaken are recorded in the Santos Environmental, Health and Safety (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 IMT positions.

Competency is maintained through participation in regular response exercises and workshops. Table 5-5 summarises the exercise and training requirements for Santos' IMT members.

Table 5-5: Training and exercise requirements for incident management team positions

IMT role	Exercise	Training
Incident Commander	One Level 3 exercise annually or two Level 2 desktop exercises annually[15]	• PMAOMIR418 • AMOSC – IMO3 (International Maritime Organisation) equiv. Oil Spill Response Command & Control
Operations Section Chief / Source Control Branch Director		• PMAOMIR322 • AMOSC – IMO3 equiv. Oil Spill Response Command & Control
Planning Section Chief Logistics Section Chief Environment Unit Leader		• PMAOMIR322 • AMOSC – IMO2 equiv. Oil Spill Response Management
Safety Officer Supply Unit Leader Geographic Information System (GIS) Team Leader Data Manager[16] HR Officer Situation Unit Leader Documentation Unit Leader IMT Log and Situation Unit Leader		• PMAOMIR322 • 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 5-6).

[15] *All IMT members are required to participate in at least one Level 3 exercise every 2 years.*

[16] *Data Manager is an administrative support role, not an IMT role, but is included here for completeness.*

Table 5-6: 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 every 2 years). AMOSC – IMO1 equiv. Oil Spill Response Operations	16[17]
Santos-trained personnel in Darwin	Santos personnel located in Darwin trained to a minimum recognised oil spill responder training level.	IMO1 – Oil Spill Response Operations	6
Santos Facility ERTs	Present at Facility for first-strike response to incidents.	Internal Santos training and exercises as defined in each facility's Emergency Response Plan (ERP) Emergency Commander to have AMOSC – Oil Spill Response Familiarisation Training.	One ERT per operational facility per shift
Santos Aerial Observers	Undertake aerial surveillance of spill. Deployed by IMT in the aerial surveillance aircraft.	AMOSC – Aerial Surveillance Course (refresher training every 3 years).	7
Santos Oil Spill Response Team	Provides a pool of Santos employees trained to perform leadership roles in an IMT or in the field during an oil spill response.	As per the Santos oil spill response (OSR) training matrix.	140[18]
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 every 2 years). AMOSC – IMO1 equiv. Oil Spill Response Operations and/or IMO2 equiv. Oil Spill Response Management.	As defined in Core Group Member Reports[19] Target of 100 members (minimum 84, maximum 140) , Refer to AMOSC Core Group Program and Policies V2.0 (AMOSC, 2024)
OSRL oil spill response personnel	OSRL professionals, providing technical, incident management and operational advice and assistance available under Santos–OSRL contract.	As per OSRL training and competency matrix.	18 responders guaranteed 80 responders may be approved under best endeavours
TRG response personnel	Emergency response personnel provided by arrangement with Santos.	As per TRG training and competency matrix.	60
AMOSC staff	Professionals, providing technical, incident management and operational advice and assistance available under Santos–AMOSC contract.	As per AMOSC training and competency matrix.	16[20]
OWR roles	Refer to Section 14 and Appendix M		
OSM services provider	Refer to Section 9.1 of the Northern Australia OSM-BIP (7715-650-ERP-0003)		

[17] Santos has a commitment to increase to 21 Core Group personnel (including 4 based in Darwin) before commencing operations.

[18] Note: The number of members in this pool is not directly related to the number of people required in the IMT or field at any one time. Rather it is a resource pool able to be called upon to fill roles in the IMT and field. Santos has arrangements in place to meet any shortfalls during an incident response, as detailed in Section 4.4

[19] A total of 115 personnel in the Core Group as of November 2024 (AMOSC Member's website).

[20] AMOSC has a permanent staff of 16 available on a 24/7 basis (AMOSC Plan, 2021),12 of which are available for field response, and 4 for administrative/management support roles.

Responder	Role	Training	Available Number
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 5-6, these resources are available for spill response and may be activated by the relevant Control Agency:

- National Plan: National Response Team – Trained oil spill response specialists, including aerial observers, containment and recovery crews, and shoreline clean-up personnel, will be deployed under the direction of the relevant Control Agency in a response. The National Response Team is trained and managed in accordance with the National Response Team Policy, approved by the National Plan Strategic Coordination Committee (AMSA, 2021b).
- NT Oil Spill Contingency Plan (NTOSCP): NT Response Team are available to assist under the jurisdiction of the NT IMT. NT Response Team members remain trained and accredited in line with the NTOSCP.

In the event of a spill, the trained spill responders listed in Table 5-6 would be required to undertake various roles in key spill response operations, including shoreline protection, shoreline clean-up and OWR.

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.

5.6 Response testing arrangements and audits

Santos has oil spill response testing arrangements in place in accordance with the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001), which provides a process for continually monitoring OSRO capability. This also includes regular oil spill response equipment inventory checks from the various sources. Testing 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.

5.6.1 Testing arrangements

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.

Santos uses a range of tests to ensure the various response arrangements function as required, including:

- contract/ plan review
- audit
- notification/ communication check
- desktop exercise
- deployment exercise
- Level 2/3 IMT exercise.

These tests, and the testing schedule, are detailed in full in the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001); an excerpt of the testing arrangements plan is shown in Figure 5-2. Objectives are set for the various tests identified for each of the response arrangements. The effectiveness of response arrangements against these objectives are assessed using pre-identified key performance indicators (KPIs).

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

#	Response arrangements and critical components	Type of test	Schedule	Objectives	KPIs
2.	Monitor and Evaluate				
	Monitor and Evaluate - Vessel Surveillance a) Access to vessels	Review – Contract / Agreement	Annually	To confirm access to vessels for surveillance	Review to confirm Master Service Agreements (MSAs) with vessel providers to gain access to vessels
	Monitor and Evaluate - Aerial Surveillance a) Access to aircrafts	Review – Contract / Agreement	Annually	To confirm access to aircrafts for surveillance	Review to confirm Master Service Agreements (MSAs) with aircraft providers to gain access to aircrafts for surveillance
	Monitor and Evaluate - Aerial Surveillance b) Access to trained aerial observers	Review – Contract / Agreement	Annually	To confirm access to trained aerial observers	Review to confirm access to trained aerial observers through; • Trained Santos personnel or • AMOSC Participant Member Contract or • OSRL Associate Member Contract
	Monitor and Evaluate - Unmanned Aerial Vehicles (UAV) a) Access to UAV providers	Review – Contract / Agreement	Annually	To confirm access to UAV providers	Review to confirm access to UAV providers through; • AMOSC Participant Member Contract or • OSRL Associate Member Contract
	Monitor and Evaluate - Fauna observations a) Maintain a list of air charter companies that could provide fauna observation services	Review – List of air charter companies for fauna observations	Annually	To confirm that a list of air charter companies that could provide fauna observation services is maintained	Review to confirm that a list of air charter companies that could provide fauna observation services is maintained
	Monitor and Evaluate – Tracking Buoys a) Access to Tracking Buoys	Review – Contract / Agreement	Prior to activity commencement	To confirm access to tracking buoys	Review to confirm access to Santos owned Tracking Buoys
	Monitor and Evaluate - 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
	Monitor and Evaluate - Oil Spill Modelling a) Access to oil spill modelling service provider	Review – Contract / Agreement	Annually	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

Source: from Santos Offshore Oil Spill Response Readiness Guideline [7710-650-GDE-0001]

Figure 5-2: Excerpt of testing arrangement plan

5.6.2 Audits

Oil spill response audits will follow the Santos Assurance Management Standard (SMS-MS15.1) and are scheduled as per Santos' annual Assurance Schedule. Audits help identify and address 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.

Multiple oil spill response organisations are engaged by Santos. These organisations are responsible for auditing and maintaining their own capacity. The Santos Emergency Response Coordinator (Oil Spill) oversees the audit and maintenance programs of its service providers through regular reporting requirements and any third-party assurance activities, including:

- The deployment readiness and capability of AMOSC's oil spill response equipment and resources in Geelong, Fremantle, Exmouth and Broome is audited every 2 years under the direction of AMOSC's participating members. The intent is to assure Santos and associated members about AMOSC's ability to respond to an oil spill incident as per the methods and responsibilities defined in OPEPs and AMOSC's Service Level Statement.
- The deployment readiness and capability of OSRL's oil spill response equipment and personnel is audited every 2 years by the Oil Spill Response Coordinator. The intent is to assure 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 Barossa GEP Operations (NT waters) activities. Of the credible spill scenarios identified in the Barossa GEP Coastal Waters OEMP (BAS-210 0224; Section 7) and Barossa GEP Internal Waters OEMP (BAS-210 0313; Section 7), a subset have been selected to represent worst-case spills from a response perspective, taking into account these characteristics:

- they represent all hydrocarbon types that could be spilt during Barossa GEP Operations (NT waters) 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, because these are the key factors contributing to response
- proximity to sensitive receptors, shorelines, Territory and Commonwealth boundaries etc.

The worst-case credible spill scenarios identified are presented in Table 6-1.

The Barossa GEP Coastal Waters OEMP (BAS-210 0224; Section 7.5) and Barossa GEP Internal Waters OEMP (BAS-210 0313; Section 7.6) details how these maximum credible spills were derived.

Appendix A describes the characteristics and behaviour associated with hydrocarbons that may unintentionally be released.

Table 6-1: Maximum credible spill scenarios for Barossa GEP Operations (NT waters) activities

Worst-case credible spill scenario	Hydrocarbon type	Maximum credible volume released (m^3)	Release duration	Locations	OEMP
Vessel collision	MDO	300	Instantaneous	• KP23 (Boundary between NT and Commonwealth waters)	Barossa GEP Coastal Waters OEMP (BAS-210 0224)
				• KP91.5 (Darwin Harbour Management Boundary) • KP114 (Central Darwin Harbour)	Barossa GEP Internal Waters OEMP (BAS-210 0313)

6.2 Response planning thresholds

Environmental impact assessment thresholds are addressed in Section 7.5.5 of the OEMPs. In addition to these impact assessment thresholds, response thresholds have been developed for response planning to determine the conditions under which response strategies would be effective. These thresholds are provided as a guide for response planning and are based on case studies that have demonstrated some response strategies require certain oil spill thicknesses and conditions to be effective.

For example, 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 <50 g/m^2.

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50–100 g/m^2 on the sea surface. European Maritime Safety Agency (EMSA) (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes Bonn Agreement Oil Appearance Codes (BAOAC) 1–3 (EMSA, 2010).

Table 6-2 lists the response planning thresholds.

Table 6-2: Surface and shoreline hydrocarbon thresholds for response planning

Hydrocarbon concentration (g/m²)	Description
≥1	Used (in part) for OSM planning, as described in the Santos Northern Australia OSM-BIP (7715-650-ERP-0003)
≥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

6.3 Stochastic spill modelling results

The selected worst-case spill scenarios were modelled for Barossa GEP Operations (NT waters) activities using a stochastic approach. For spill response preparedness, outputs relating to floating oil and oil accumulated on the shoreline are most relevant (i.e. oil that can be diverted, contained, collected or dispersed by using spill response strategies) for allocating and mobilising spill response resources. Therefore, these are the results presented in this OPEP for primary consideration.

Stochastic oil spill modelling was performed using a three-dimensional spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program). This model is designed to simulate the drifting, spreading, weathering and fate of specific oil types under the influence of changing meteorological and oceanographic forces.

A stochastic modelling approach was followed for each of the scenarios. The stochastic model involves the repeated application of SIMAP (100 simulations for each season; summer, transitional and winter) to simulate the defined spill scenarios using different start-date samples of current and wind data from a historical metocean dataset. The model results were then combined to provide a stochastic summary of each season.

The stochastic modelling outputs do not represent the potential behaviour of a single spill (which would have a much smaller area of influence) but provides an indication of the probability of any given area of the sea surface being contacted by hydrocarbons above impact exposure values in the unlikely event of a worst-case spill.

The worst-case floating oil exposure and probability (percentage) of total contact at ≥1 g/m² for each scenario for all environmental value areas is presented in Table 6-3, Table 6-5 and Table 6-7. The shoreline oil accumulation for environmental values for each scenario is presented in Table 6-4, Table 6-6, and Table 6-8. For each modelled scenario, these results represent the worst-case loading or floating oil contact probability for each receptor from all stochastic modelling runs (300 simulations) across all seasons.

Refer to Section 7.5.5 of the OEMPs for dissolved and entrained thresholds and Section 7.5.7 for potential impacts to receptors.

Table 6-3: Worst-case spill modelling results for floating oil resulting from a vessel collision of 300 m³ at KP23 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters – Coastal Waters OEMP) activities

Location	Total contact probability (%) floating oil ≥1 g/m²	Minimum arrival time floating oil ≥1 g/m² (days:hours)	Total contact probability (%) floating oil ≥10 g/m²	Minimum arrival time floating oil ≥10 g/m² (hours)	Total contact probability (%) floating oil ≥50 g/m²	Minimum arrival time floating oil ≥50 g/m² (hours)
Afghan Shoal*	0.33	2 days: 18 hours	NC	NC	NC	NC
Shepparton Shoal*	2.00	0 days: 7 hours	0.67	0 days:15 hours	NC	NC

NC: No contact to receptor predicted for specified threshold

** Submerged receptor*

Source: RPS, 2024

Table 6-4: Worst-case spill modelling results for shoreline contact and accumulation resulting from a vessel collision of 300 m³ at KP23 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters – Coastal Waters OEMP) activities

Location	Total probability (%) shoreline oil accumulation ≥10 g/m²	Minimum arrival time shoreline oil accumulation ≥10 g/m² (days:hours)	Total probability (%) shoreline oil accumulation ≥100 g/m²	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline (km) with concentrations ≥100 g/m²	Maximum accumulated volume (m³) along this shoreline
Tiwi Islands	0.33	9 days: 14 hours	NC	NC	NC	NC
Vernon Islands CR	1.67	10 days: 21 hours	NC	NC	NC	NC

NC: No contact to receptor predicted for specified threshold

** Submerged receptor*

Source: RPS, 2024

Table 6-5: Worst-case spill modelling results for floating oil resulting from a vessel collision of 300 m³ at KP91.5 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters - Internal Waters OEMP) activities

Location	Total contact probability (%) floating oil ≥1 g/m²	Minimum arrival time floating oil ≥1 g/m² (hours)	Total contact probability (%) floating oil ≥10 g/m²	Minimum arrival time floating oil ≥10 g/m² (hours)	Total contact probability (%) floating oil ≥50 g/m²	Minimum arrival time floating oil ≥50 g/m² (hours)
Restricted Area 5*^	1.00	1 day: 5 hours	NC	NC	NC	NC
East Arm^	0.67	3 days: 18 hours	NC	NC	NC	NC
Outer Harbour East^	0.67	3 days: 18 hours	NC	NC	NC	NC
Outer Harbour West^	3.00	0 days: 16 hours	0.33	1 day: 5 hours	NC	NC
West Arm^	0.33	1 day: 8 hours	NC	NC	NC	NC

Location	Total contact probability (%) floating oil ≥1 g/m²	Minimum arrival time floating oil ≥1 g/m² (hours)	Total contact probability (%) floating oil ≥10 g/m²	Minimum arrival time floating oil ≥10 g/m² (hours)	Total contact probability (%) floating oil ≥50 g/m²	Minimum arrival time floating oil ≥50 g/m² (hours)
Water quality (WQ) Zone 5 -Middle Harbour*^	1.00	2 days: 9 hours	NC	NC	NC	NC

NC: No contact to receptor predicted for specified threshold

** Submerged receptor*

^ Location is within Darwin Harbour (which lies within the Santos-defined receptor 'Beagle Gulf – Darwin Coast') receptor extents. Additional detail provided to aid assessment.

Source: RPS, 2024

Table 6-6: Worst-case spill modelling results for shoreline contact and accumulation resulting from a vessel collision of 300 m³ at KP91.5 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters - Internal Waters OEMP) activities

Location	Total probability (%) shoreline oil accumulation ≥10 g/m²	Minimum arrival time shoreline oil accumulation ≥10 g/m² (days:hours)	Total probability (%) shoreline oil accumulation ≥100 g/m²	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline (km) with concentrations ≥100 g/m²	Maximum accumulated volume (m³) along this shoreline with concentrations ≥100 g/m²
East Arm^	1.33	3 days: 9 hours	0.67	3 days: 21 hours	4	9
Outer Harbour East^	2.67	2 days: 12 hours	0.67	3 days: 19 hours	3	10
Outer Harbour West^	10.67	0 days: 18 hours	4.00	0 days: 20 hours	6	44
West Arm^	2.33	1 day: 8 hours	0.67	1 day: 11 hours	1	2

NC: No contact to receptor predicted for specified threshold

^ Location is within Darwin Harbour receptor extents. Additional detail provided to aid assessment.

Source: RPS, 2024

Table 6-7: Worst-case spill modelling results for floating oil resulting from a vessel collision of 300 m³ at KP114 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters - Internal Waters OEMP) activities

Location	Total contact probability (%) floating oil ≥1 g/m²	Minimum arrival time floating oil ≥1 g/m² (hours)	Total contact probability (%) floating oil ≥10 g/m²	Minimum arrival time floating oil ≥10 g/m² (hours)	Total contact probability (%) floating oil ≥50 g/m²	Minimum arrival time floating oil ≥50 g/m² (hours)
Restricted Area 1*^	0.67	1 day: 21 hours	NC	NC	NC	NC
Restricted Area 4*^	17.00	0 days: 6 hours	10.00	0 days: 8 hours	0.67	0 days: 12 hours
Restricted Area 6*^	26.00	0 days: 4 hours	12.33	0 days: 5 hours	3.33	0 days: 7 hours

Location	Total contact probability (%) floating oil ≥1 g/m²	Minimum arrival time floating oil ≥1 g/m² (hours)	Total contact probability (%) floating oil ≥10 g/m²	Minimum arrival time floating oil ≥10 g/m² (hours)	Total contact probability (%) floating oil ≥50 g/m²	Minimum arrival time floating oil ≥50 g/m² (hours)
East Arm^	34.33	0 days: 3 hours	20.00	0 days: 3 hours	5.67	0 days: 4 hours
Middle Arm^	0.67	2 days: 0 hours	NC	NC	NC	NC
West Arm^	21.33	0 days: 5 hours	11.00	0 days: 6 hours	2.00	0 days: 8 hours
Wickham Point^	16.67	0 days: 6 hours	3.67	0 days: 7 hours	0.33	0 days: 10 hours
WQ Zone 1 -Elizabeth River Estuary*^	0.67	2 days: 2 hours	NC	NC	NC	NC
WQ Zone 2 - East Arm*^	25.00	0 days: 5 hours	9.00	0 days: 6 hours	0.33	0 days: 13 hours
WQ Zone 3 - Middle Arm*^	0.33	2 days: 11 hours	NC	NC	NC	NC
WQ Zone 4 -West Arm*^	15.67	0 days: 7 hours	8.67	0 days: 8 hours	0.33	0 days: 14 hours
WQ Zone 6 - Outer Harbour*^	4.00	0 days: 12 hours	0.67	0 days: 13 hours	NC	NC

NC: No contact to receptor predicted for specified threshold

** Submerged receptor*

^ Location is within Darwin Harbour receptor extents. Additional detail provided to aid assessment.

Source: RPS, 2024

Table 6-8: Worst-case spill modelling results for shoreline contact and accumulation resulting from a vessel collision of 300 m³ at KP114 (instantaneous release, annualised results) for the Barossa GEP Operations (NT waters - Internal Waters OEMP) activities

Location	Total probability (%) shoreline oil accumulation ≥10 g/m²	Minimum arrival time shoreline oil accumulation ≥10 g/m² (days:hours)	Total probability (%) shoreline oil accumulation ≥100 g/m²	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline (km) with concentrations ≥100 g/m²	Maximum accumulated volume (m³) along this shoreline with concentrations ≥ 100 g/m²
East Arm^	60.33	0 days: 4 hours	26.33	0 days: 5 hours	11	152
Middle Arm^	2.67	1 day: 17 hours	0.33	2 days: 10 hours	1	3
Outer Harbour East^	3.67	1 day: 6 hours	NC	NC	NC	NC
West Arm^	45.00	0 days: 7 hours	24.00	0 days: 8 hours	9	149

Location	Total probability (%) shoreline oil accumulation ≥10 g/m²	Minimum arrival time shoreline oil accumulation ≥10 g/m² (days:hours)	Total probability (%) shoreline oil accumulation ≥100 g/m²	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline (km) with concentrations ≥100 g/m²	Maximum accumulated volume (m³) along this shoreline with concentrations ≥ 100 g/m²
Wickham Point^	41.33	0 days: 8 hours	17.33	0 days: 8 hours	10	111

NC: No contact to receptor predicted for specified threshold

^ Location is within Darwin Harbour receptor extents. Additional detail provided to aid assessment.

Source: RPS, 2024

6.4 Evaluation of applicable response strategies

Based on the nature and scale of the credible spill scenarios outlined in Section 6.1 and spill modelling results (Section 6.3) the following spill response strategies were assessed as potentially applicable for combatting a spill from the Barossa GEP Operations (NT waters) activities (Table 6-9).

Note: The information contained in Table 6-9 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 Territory waters, the NT Control Agency will ultimately determine the strategies and controls implemented for most Territory waters activities, with Santos providing resources and planning assistance.

Table 6-9: Evaluation of applicable response strategies

OSR strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy	Considerations
Source control	Spill kits	✓ 1	Relevant for containing spills that may arise onboard a vessel.
	Secondary containment	✓ 1	Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment onboard a vessel. 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 hydrocarbons draining into the marine environment.
	SOPEP	✓ 1	MARPOL requirement for applicable vessels. If a vessel hydrocarbon storage tank is ruptured, applicable strategies for reducing the volume of hydrocarbon releases will be documented in the vessel SOPEP. This may include securing fuel via transfer to another storage area onboard the vessel, transfer to another vessel, or by pumping water into the 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.
In situ burning	Controlled burning of oil spill	×	Not applicable to MDO spills due to inability to contain MDO making it very difficult to maintain necessary slick thickness for ignition and sustained burning. In addition, in situ burning is not normally considered an acceptable response strategy due to the atmospheric emissions created.
Monitor and evaluate plan	Vessel surveillance	✓ 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	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). Provides information on the effectiveness of response strategies. Informs implementation of other response strategies.
	Tracking buoys	✓ 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	Can be implemented rapidly. Predictive – estimates where the oil may go, which can be used to prepare and implement other responses.

OSR strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy	Considerations
			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	Can work under a large range of weather conditions (e.g. night-time, cloud cover, etc.). Mobilisation restricted to image availability. Requires processing. May return false positives.
Chemical dispersion	Vessel application	×	MDO has low persistent fractions (10%) and has high natural spreading, dispersion and evaporation rates in the marine environment. Surface chemical dispersants are most effective on hydrocarbons that are 50–100 g/m^2 thick on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant, including surface slicks with BAOAC 1–3. MDO would rapidly spread and thin out on the sea surface, so is unlikely to reach this required thickness. Additionally, dispersant use is not advised on light distillate fuels such as MDO as these oils will evaporate and naturally disperse quite rapidly under most conditions (IPIECA-IOGP, 2016a). Chemical dispersant application is not recommended as a beneficial option because: • It has a low additional benefit of increasing the dispersal rate of MDO spills. • MDO has high natural evaporation and entrainment rates (MDO – up to 95% of the mass after 24 hours in variable wind conditions). • It introduces more chemicals into the marine environment for limited environmental benefit, whilst potentially increasing localised toxicity in the water column. • The low volatile and persistent components contained within MDO will have a strong tendency to physically entrain beneath the surface under conditions that generate moderate wind waves (i.e. >12 knots) but can refloat to the surface if these energies abate; this will also lower the effectiveness of dispersant.
	Aerial application	×	
Offshore containment and recovery	Use offshore booms/ skimmers or other collection techniques deployed from vessel/s to contain and collect oil	×	Not suitable for MDO given its rapid weathering nature. MDO spreads quickly to a thin film, making recovery via skimmers difficult and ineffective. The ability to contain and recover rapidly weathering hydrocarbons on the sea surface is extremely limited due the very low viscosity of MDO.
Mechanical dispersion	Vessel propeller washing	✓ 2	Safety is a key factor and slicks with potential for high Volatile Organic Compound (VOC) emissions are not suitable for mechanical dispersion. 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.

OSR strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy	Considerations
			Mechanical dispersion will entrain surface oil into the top layer of the water column. The aim of this tactic is to reduce the concentration of oil floating at the surface that could potentially contact receptors at the sea surface (e.g. seabirds) or shoreline receptors (e.g. mangroves). Once dispersed in the water column, the smaller droplet sizes enhance the biodegradation process. MDO is a light hydrocarbon that can be easily dispersed into the water column by running vessels through the plume and using propeller turbulence to break up the slick. Mechanical dispersion may be considered for targeted small breakaway patches of crude oil but may have limited effectiveness. The potential disadvantage of mechanical dispersion is that it could temporarily increase the concentration of entrained and dissolved oil near submerged shallow water receptors (e.g. corals, seagrasses, macroalgae). This is most likely in shallow water 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 oil 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 Emergency Commander / IMT or by the relevant Control Agency. It is unlikely that vessels would be specifically allocated for mechanical dispersion but support vessels in the field undertaking primary strategies may be used opportunistically.
Protection and deflection	Booming in nearshore waters and at shorelines	✓ 1	Modelling shows moderate probability of shoreline contact, above impact and response thresholds for the MDO release at KP114, inside Darwin Harbour (Table 6-8). The other two release scenarios predict no, or very low probabilities of contact (≤5%) at shoreline receptors (Table 6-4 and Table 6-6). 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 are 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. *Note: This strategy may not be executed in certain sensitive areas due to the propensity of MDO to evaporate and disperse naturally, and the risk of damage from spill responders entering these sensitive areas. Therefore, this strategy would only be carried out in these areas for this hydrocarbon type if operational NEBA shows a clear benefit.*
Shoreline clean-up	Activities include physical removal, surf washing, flushing,	✓ 1	Modelling shows moderate probability of shoreline contact, above impact and response thresholds for the MDO release at KP114, inside Darwin Harbour (Table 6-8). All other scenarios predict no, or very low probabilities of contact (≤5%) at shoreline receptors (Table 6-4 and Table 6-6). 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

OSR strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy	Considerations
	bioremediation, natural dispersion		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 hydrocarbon 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. *Note: This strategy may not be executed in certain sensitive areas due to the propensity of MDO to evaporate and disperse naturally, and the risk of damage from spill responders entering these sensitive areas. Therefore, this strategy would only be carried out in these areas for this hydrocarbon type if operational NEBA shows a clear benefit.*
OWR	Activities include hazing, pre-emptive capture, oiled wildlife capture, cleaning and rehabilitation	✓ 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 affect animals (e.g. stress, disturb important behaviours such as nesting or foraging). Permitting requirements for hazing and pre-emptive capture.
OSM	Monitor the effectiveness and potential impacts of response strategies; and monitor environmental receptors to determine the level of impact from the oil spill and associated response activities that is sufficient to inform any remediation activities	✓ 1	Operational monitoring activities include: • hydrocarbon properties and weathering behaviour • water and sediment quality assessment • chemical dispersant effectiveness and fate assessment • rapid marine fauna surveillance • shoreline clean-up assessment Scientific monitoring activities include: • water and sediment quality assessment • intertidal and coastal habitat assessment • seabirds and shorebirds assessment • marine megafauna assessment • benthic habitat assessment • marine fish and elasmobranch assemblages assessment

OSR strategy	Tactic	Applicability and Designated Primary (1) or Secondary (2) Response Strategy	Considerations
			• fisheries assessment • heritage features assessment • social impact assessment. The type and extent of OSM will depend upon the nature and scale of hydrocarbon contact to sensitive receptor locations. Pre-defined initiation criteria exist for OSM plans.

6.5 Identification of priority protection areas and initial response priorities

When dealing with oil spills in remote environments, it is not always realistic or feasible to protect all receptors. Therefore, prioritising receptors helps identify where available resources (for response and/or monitoring) should be directed for the best effect. It enables the control agency to make informed decisions, and ultimately in the development and execution of an effective response strategy.

Combined spill modelling results were used to predict the EMBA for Barossa GEP Operations (NT waters) activities (refer to Section 3.1.1 of the Barossa GEP Coastal Waters OEMP [BAS-210 0224] and Barossa GEP Internal Waters OEMP [BAS-210 0313]). The EMBA is the largest area within which effects from hydrocarbon spills associated with this activity, could extend. Within the EMBA, Santos has determined Hot Spots (key areas of high environmental value [HEV] that have the greatest potential to be impacted by a Barossa GEP Operations [NT waters] spill) for which detailed oil spill risk assessment has been conducted (refer to Section 7.5 of the OEMPs).

From these Hot Spot areas, priority protection areas (PPAs) for spill response have been identified. In the spill response preparedness strategy, it is not necessary for all Hot Spots to have detailed planning. For example, wholly submerged Hot Spots may only be contacted by entrained oil, and the response would be largely to implement monitoring to determine impact and recovery. Determining priority monitoring areas is detailed in the Northern Australia OSM-BIP (7715-650-ERP-0003).

Hot Spots with emergent features (i.e. coastal areas and islands) are considered during the PPA selection process, as they are the receptors that would be targeted by nearshore spill response operations, such as protection and deflection and shoreline clean-up.

This final determination of PPAs is based on the worst-case estimate of floating oil concentration, shoreline accumulation and minimum contact time at response threshold concentrations. Table 6-10 details the PPAs from the list of contacted receptors from a surface release of MDO. Rationale is included in the table when a hotspot is included, or not included, as a PPA.

Table 6-10: Determination and rationale for the priorities for protection

Hotspots	Type	Hotspot	PPA	Rationale
East Arm (Darwin Harbour)	Emergent	Y	Y	• 5 hours until shoreline accumulation • Volume of shoreline accumulation predicted to be 152 m^3
West Arm (Darwin Harbour)	Emergent	Y	Y	• 8 hours until shoreline accumulation • Volume of shoreline accumulation predicted to be 149 m^3
Wickham Point (Darwin Harbour)	Emergent	Y	Y	• 8 hours until shoreline accumulation • Volume of shoreline accumulation predicted to be 111 m^3

Table 6-11 lists the key sensitivities and associated locations within the PPA identified for a surface loss of hydrocarbons. The ranking of these sensitivities (also referred to as receptors) are listed, which is consistent with the rankings in Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 1: Kimberley (Advisian 2018). Using a combination of sensitivities, and their associated rankings; together with the modelled maximum total volumes ashore and minimum time to shoreline contact, an initial response priority is provided in Table 6-11. This information is designed to aid decision making in the preliminary stages of the response operation, so that initial resources are used for best effect.

Table 6-11: Initial response priorities – Barossa GEP Operations (NT waters – Internal Waters OEMP) – spill scenario surface release of MDO at KP114 (within Darwin Harbour)

Protection priority area	Key sensitivities	WA DoT ranking (floating oil)[21]	WA DoT ranking (dissolved oil)	Key locations	Relevant key periods	Peak volume ashore (m^3)	Minimum arrival time shoreline oil accumulation ≥10 g/m^2 (days:hours)	Initial response priority
Darwin Harbour (Including East Arm, West Arm and Wickham Point)	Mangroves	3	3	Gunn Point Tree Point Mickett Creek Buffalo Creek Charles Darwin National Park Wickham Point	N/A	East Arm: 152 West Arm: 149 Wickham Point: 111	East Arm: 5 hours West Arm: 8 hours Wickham Point: 8 hours	Medium
	Seagrass	3	3	Casuarina Coastal Reserve Mindil Beach Fannie Bay West Arm	-			Medium
	Wetlands of National Importance	4	4	Port Darwin and Shoal Bay – Mickett Creek	-			High
	Saltwater Crocodile	2	1	Widespread	-			Low
	Shorebirds	3	2	Refer to Table 14-3	-			Medium
	Marine mammal • Australian Snubfin Dolphin • Indo-Pacific Humpback Dolphin • Indo-Pacific Bottlenose Dolphin • Dugong	4	3	-	-			Low

[21] *Adapted from Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 1: Kimberley (Advisian, 2018).*

Protection priority area	Key sensitivities	WA DoT ranking (floating oil)[21]	WA DoT ranking (dissolved oil)	Key locations	Relevant key periods	Peak volume ashore (m^3)	Minimum arrival time shoreline oil accumulation ≥10 g/m^2 (days:hours)	Initial response priority
	Turtles • Flatback • Olive Ridley • Green • Hawksbill	4	3	Refer to Table 14-3	-			Medium
	Cultural heritage	3	3	-	-			Medium
	Recreational fishing, boating and tourism	3	2	-	-			Low
	Shipwrecks	1	1	-	-			Low

6.6 Net environmental benefit analysis

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 implemented.

The Environment Unit Leader will use the information in Section 6.5 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, plume direction 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. If different activities are controlled by different IMTs, as in a cross-jurisdictional response between Santos and the NT Control Agency, consultation will be required during the NEBA process to ensure 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 the spill scenarios, with the benefit or potential impact to each sensitivity identified (refer to Table 6-12).

In the event of a spill, NEBA is applied with supporting information collected as part of Operational Monitoring (Section 16) to:

- identify sensitivities within the area potentially affected by a spill at that time of the year (Note: The sensitivity of some key receptors, such as birdlife and turtles, varies seasonally)
- help prioritise and allocate resources to sensitivities with a higher protection and response priority (Table 6-12)
- help determine appropriate response strategies using 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 Unit Leader folder on the Santos ER SharePoint site. To complete the operational NEBA:

- record all ecological and socioeconomic sensitivities identified within the spill trajectory area
- assess the potential effects of response strategies on each sensitivity in terms of their benefit or otherwise to the socioeconomic sensitivities
- consider all people involved and data inputs 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 6-12: Strategic NEBA matrix – Barossa GEP Operations (NT waters) – spill scenario surface release of MDO at KP114 (within Darwin Harbour)

Priority protection area	No controls	Source control	Monitor and evaluate	Mechanical dispersion	Shoreline protection & deflection	Shoreline clean-up	OWR	OSM
Darwin Harbour (including East Arm, West Arm and Wickham Point)								
Mangroves								
Seagrass							N/A	
Wetlands of National Importance								
Saltwater Crocodile								
Shorebirds								
Marine mammals • Australian Snubfin Dolphin • Indo-Pacific Humpback Dolphin • Indo-Pacific Bottlenose Dolphin								
Turtles • Flatback								
Cultural heritage								
Recreational fishing, boating and tourism								
Shipwrecks							N/A	
Key:								
	Beneficial impact							
	Possible beneficial impact depending on the situation (e.g. timeframes and metocean conditions)							
	Negative impact							
N/A	Not applicable for the environmental value or not applicable for hydrocarbon type							

6.7 Oil spill response ALARP 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 B details the ALARP assessment framework and the results of the ALARP assessment conducted to inform the control measures and performance standards contained within this OPEP.

7. External notifications and reporting requirements

For oil spill incidents, the Emergency Commander / Vessel Master will notify the Perth-based IMT to delegate further notifications to relevant regulatory authorities and stakeholders, and to request further spill response assistance for Level 2/3 spills.

7.1 Regulatory and stakeholder notification and reporting

The Incident Commander delegates the regulatory and stakeholder reporting requirements. Typically, the delegated party is the Planning Section Chief.

Contact details for the regulatory agencies and stakeholders outlined in Table 7-1 are listed in the Incident Response Telephone Directory (7700-650-PLA-0016.20), which contains a more detailed list and contact details for incident response support. This directory is updated every 6 months; up-to-date revisions are available in the IMT room and online (SharePoint Procedures and Emergency Response pages).

Table 7-1 outlines the external reporting requirements specifically for oil spill incidents outlined in this OPEP in national and Territory jurisdictions (Note: Regulatory reporting may apply to smaller Level 1 spills that can be responded to using on-site resources as well as larger Level 2/3 spills). There are additional requirements for vessel masters to report oil spills from their vessels under relevant marine oil pollution legislation (e.g. MARPOL), including, where relevant, reporting oil spills to AMSA (RCC) and the NT Government.

Table 7-1: Regulatory and stakeholder notification and reporting requirements (Commonwealth, Territory and Darwin Port waters)

Regulator / stakeholder	Type of notification / timing	Legislation / guidance	Reporting requirements	Responsible person / group	Forms
Reporting requirements for Commonwealth water spills					
NOPSEMA (Incident Notification Office)	Verbal notification within 2 hours Written report as soon as practicable, but no later than 3 days	*Petroleum and Greenhouse Gas Storage Act 2006* Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations (2024)	A spill associated with the activity in Commonwealth waters that has the potential to cause moderate to significant environmental damage[1]	Notification by Planning Section Chief (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
National Offshore Petroleum Titles Administrator (NOPTA) (Titles Administrator)	Written report to NOPTA within 7 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 Planning Section Chief (or delegate)	Provide same written report as provided to NOPSEMA
AMSA RCC[2]	Verbal notification within 2 hours of incident Written POLREP form, within 24 hours on request from AMSA	MARPOL 73/78	Santos to notify AMSA of any marine pollution incident[1]	Notification by Planning Section Chief (or delegate)	https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (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 if there is death or injury to a protected species	Notification by Planning Section Chief (or delegate)	Not applicable
Parks Australia (24-hour Marine Compliance Duty Officer)	Verbal notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	An oil spill that occurs within a marine park or is likely to impact an Australian Marine Park (AMP)	Notification by Planning Section Chief (or delegate)	Not applicable, but this 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

Regulator / stakeholder	Type of notification / timing	Legislation / guidance	Reporting requirements	Responsible person / group	Forms
					• Confirmation of providing access to relevant monitoring and evaluation reports when available • Details of the relevant contact person in the IMT
Australian Fisheries Management Authority (AFMA)	Verbal phone call notification within 24 hours of incident	For consistency with DPIRD Fisheries notification	Reporting marine oil pollution[1] Fisheries within the EMBA Consider a courtesy call if not in exposure zone	Notification by Planning Section Chief (or delegate)	Not applicable
Reporting requirements for NT waters					
NT Regional Harbourmaster	Verbal notification Follow up with POLREP as soon as practicable after verbal notification	NTOSCP As per Territory legislation (i.e. *Marine Pollution Act 1999*)	All actual or impending spills in Darwin Harbour waters, regardless of source or quantity	Notification by IMT Planning Section Chief (or delegate)	Email POLREPs to rhm@nt.gov.au (Regional Harbourmaster) Instructions for submitting POLREPs (including a POLREP Template – refer to Appendix C) are provided on the NT Government webpage: https://nt.gov.au/marine/marine-safety/report-marine-pollution
DEPWS (Pollution Response Hotline; Environmental Operations) Territory Emergency Controller (NT Police Commissioner or Delegate)	Verbal notification as soon as practicable Written report to be provided as soon as practicable after the incident, unless otherwise specified by the Minister	NTOSCP As per Territory legislation (i.e. *Marine Pollution Act 1999*)	All actual or impending spills in NT waters Notify if spill has the potential to impact wildlife in Territory waters (to activate the Oiled Wildlife Coordinator)	Notification by IMT Planning Section Chief (or delegate)	Email POLREPs to pollution@nt.gov.au (Environmental Operations) Instructions for submitting POLREPs (including a POLREP Template – refer to Appendix C) are provided on the NT Government web page : https://nt.gov.au/marine/marine-safety/report-marine-pollution https://ntepa.nt.gov.au/make-a-report
NT Department of Primary Industry and Fisheries (DPIF)	Verbal notification, timing not specified	Not applicable	Fisheries within the EMBA Consider a courtesy call if not in exposure zone	Notification by Planning Section Chief (or delegate)	Not applicable
Darwin Port					
Darwin Port	Verbal notification Follow up with POLREP as soon as practicable after verbal notification	Darwin Port Oil Spill Contingency Plan	All actual or impending spills in Darwin Port waters, regardless of source or quantity	Notification by IMT Planning Section Chief (or delegate)	Email POLREPs to pollution@nt.gov.au (Environmental Operations) and Duty Manager (AMSA) A copy of the Darwin Port POLREP is provided in Appendix 1 of the Darwin Port

Regulator / stakeholder	Type of notification / timing	Legislation / guidance	Reporting requirements	Responsible person / group	Forms
					OSCP: https://darwinport.com.au/sites/default/files/editors/Emergency%20and%20Cyclone%20management/Oil%20Spill%20Contingency%20Plan.pdf
Stakeholders (including Relevant Persons)					
Tiwi Resources (Ranger Coordinator), Tiwi Land Council and the delegated Clan Trustees	Verbal phone call notification within 8 hours of incident being identified Follow up with email outlining details of incident	Not applicable	All spills heading towards the Tiwi Islands	Notification by Planning Section Chief (or delegate)	Not applicable
First Nation Consultative Committees (as agreed through the post acceptance consultation implementation process)	Verbal phone call notification within 8 hours of incident being identified Follow up with email outlining details of incident	Not applicable	All spills heading towards relevant parties' interests	Notification by Planning Section Chief (or delegate)	Not applicable
Other First Nation groups (as agreed through the post acceptance consultation implementation process and through the Northern Land Council)	Verbal phone call notification within 8 hours of incident being identified Follow up with email outlining details of incident	Not applicable	All spills heading towards relevant parties' interests	Notification by Planning Section Chief (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 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 OEMP.

2: Only Santos reporting requirements are listed. For oil spills from vessels, vessel masters also have obligations to report spills from their vessels to AMSA RCC; and in NT waters the NT Pollution Response Hotline and the DEPWS.

7.2 Activation of external oil spill response organisations and support agencies

Table 7-2 outlines notifications that should be made to supporting agencies to assist with spill response activities outlined in this plan. This list contains key OSROs 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 with an oil spill response.

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 Officer	As soon as possible but within 2 hours of incident being identified	Verbal Service Contract	Santos is a Participating Member of 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, shoreline clean-up, absorbent, oiled wildlife and communications equipment. Equipment is located in Geelong (Victoria), Fremantle, Exmouth and Broome (all in WA)	**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 to mobilise spill response resources consistent with the AMOSPlan. **Step 3.** Email confirmation and a phone call to AMOSC will be required for mobilising response personnel and equipment. Only a Santos call-out authority (registered with AMOSC) can activate AMOSC—they will be required to supply their credentials to AMOSC. A signed service contract note must also be completed by the Santos call-out authority and returned to AMOSC before mobilisation.	Planning Section Chief (or delegate) will notify AMOSC (upon approval from Incident Commander)
Aviation service provider	Within 2 hours of incident being identified	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place	Phone call	Logistics Section Chief (or delegate)
Duty Officers/ Incident Commanders (Woodside, Chevron, Jadestone)	Within 2 hours of incident being identified	Verbal	Mutual aid resources (through AMOSC mutual aid arrangement)	Phone call	Incident Commander (or delegate)
Toll – freight & logistics	Within 2 hours of incident being identified	Verbal	Assistance with mobilising equipment and loading vessels	Phone call	Logistics Section Chief (or delegate)
Waste service provider/s	As required for offshore and shoreline clean-up activities	Verbal	Santos has contract arrangements in place with waste service providers 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.	Logistics Section Chief (or delegate)
OSM services provider	OSM Plan initiation criteria are met (Tables 9-1 and 9-2 of the Joint Industry OSM Framework [APPEA, 2021])	Verbal and written	Santos is a member of OSRL's OSM Supplementary Service, providing access to personnel and equipment for OSM	**Refer to Northern Australia OSM-BIP (7715-650-ERP-0003) for full activation instructions** **Step 1.** Obtain approval from Incident Commander to activate OSM services provider.	Environment Unit Leader (or delegate)

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
				Step 2. Verbally notify OSM services provider followed by submitting the Call-off Order Form. **Step 3**. OSM services provider commences activation process.	
Intertek Geotech (WA) Environmental Services and Ecotoxicology	When Operational Monitoring Plan (OMP): Hydrocarbon Properties and Weathering Behaviour at Sea is activated (Section 18)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting	Phone call	Planning Section Chief (or delegate)
OSRL, OSRL Duty Manager	Within 2 hours of incident being identified	Verbal OSRL Mobilisation Authorisation Form	Santos has an SLA with OSRL, which includes providing support functions, equipment and personnel to meet a wide range of scenarios At a 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 completing the OSRL incident notification form, OSRL will plan and place resources on standby. **Step 4.** Mobilisation of personnel (beyond 5 technical advisors x 5 days) and equipment requires signed mobilisation form by designated call-out authorities	Designated call-out authorities (including Incident Commanders)
TRG	As soon as possible but within 2 hours of incident being identified	Verbal and written	Santos has arrangements with TRG for providing trained field response personnel	Contact TRG duty officer	Designated call-out authorities (including Incident Commanders)
RPS Group	As soon as possible but within 2 hours of incident being 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	Environment Unit Leader (or delegate)

7.3 Environmental performance

Table 7-3 lists the environmental performance outcome, control measures, performance standards and measurement criteria for external notifications and reporting.

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 [EPS ID]**	**Measurement criteria**
External notifications and reporting plan	**Response preparedness**		
	Santos Incident Response Telephone Directory (7700-650-PLA-0016.20)	[EPS-RP-001] Incident Response Telephone Directory is revised every 6 months	Incident Response Telephone Directory Document revision history
	OPEP communications test	[EPS-RP-002] OPEP contact details for regulatory and service provider notifications are checked annually	OPEP communications test records
	Response implementation		
	External notifications and reporting tables	[EPS-RP-003] External notification and reporting undertaken as per Table 7-1 and Table 7-2	Incident log

8. Incident action planning

The incident action planning process comprises these phases:

1. Understand the situation.
2. Establish incident priorities, objectives and tasks.
3. Develop a plan (IAP).
4. Prepare and disseminate the plan.
5. Implement, evaluate and revise the plan for the next operational period.

The Santos IMT will use the incident action planning process to determine and document the appropriate response priorities, objectives, strategies and tasks to guide the incident response; these are reviewed and updated as more information becomes available. The IMT will use an IAP for each operational period following the initial first-strike assessments, notifications, and activations.

When acting as the support agency, Santos may be requested by the Control Agency to develop or support the development of an IAP to help guide the incident response.

The Santos incident action planning process is built on the phases described in Figure 8-1.

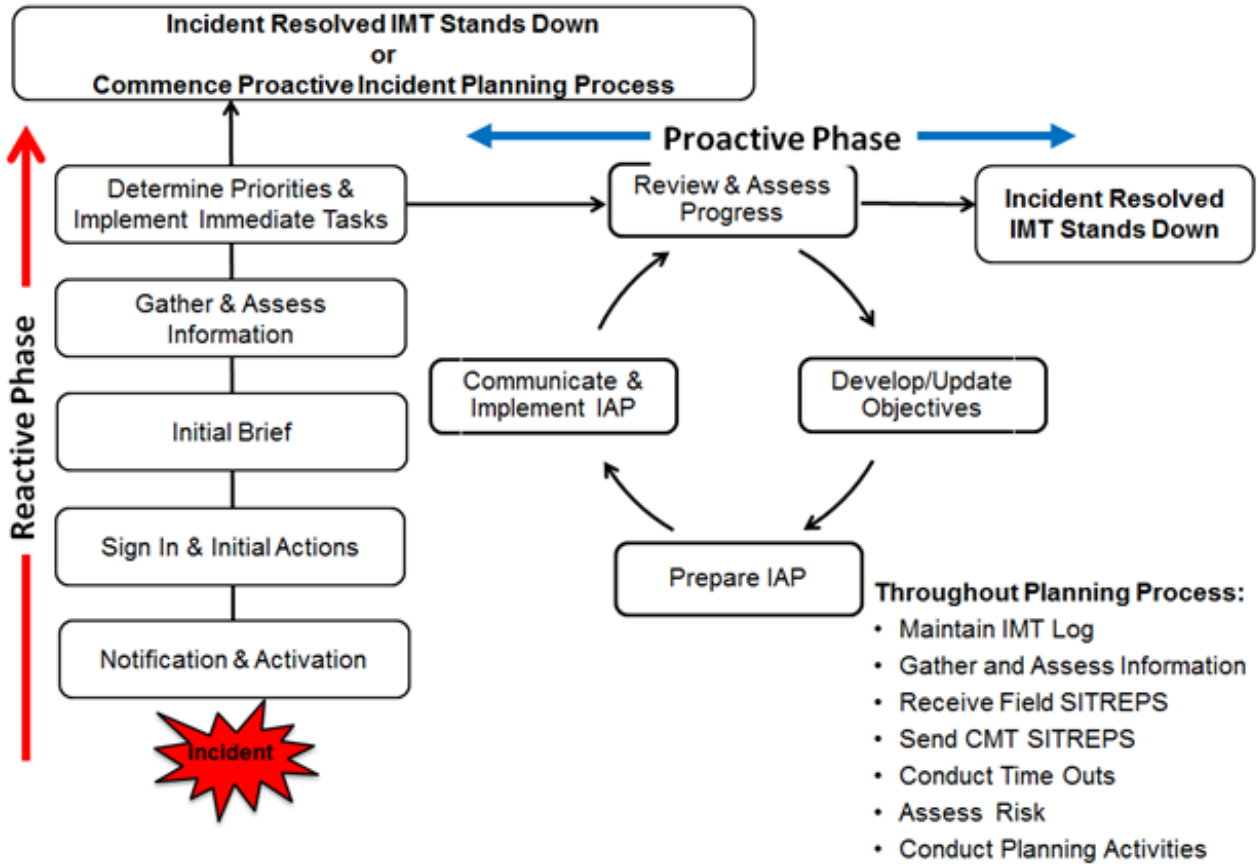

Figure 8-1: Incident action planning process

8.1 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 progressively established from reports coming in from the field. During this phase there is no formal IAP to follow (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, which also provides links to relevant oil spill strategy sections in the OPEP that contain a more detailed list of implementation actions and considerations as well as statements of performance (performance 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-strike response actions have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic NEBA (also referred to as a SIMA). This planning is included in Section 6. During the reactive phase, the strategic NEBA is reviewed and, using the specific information gathered from the spill, becomes an operational NEBA. This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the incident response.

8.2 Developing an incident action plan

At the end of the reactive phase and once 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 carrying out the actions specified in the IAP. The next operational period is nominally a daily period but for long-running incidents it may be extended further once 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 the next IAPs. Response strategies that are effective are continued or increased, and ineffective strategies are scaled back or stopped.

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 help formulate the next 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 by those (e.g. surveillance personnel, team leaders, laboratory chemists) who report on the effectiveness of the response strategies.

IAP forms and processes are documented in the Santos SharePoint Oil Spill Response Tile and in the Santos Offshore ER Documentation SharePoint site. Subfolders list all forms required to conduct incident action planning. Each functional position within the IMT has subfolders that contain forms and processes unique to the functional position on the Oil Spill Tile.

8.3 Environmental performance

Table 8-1 lists the environmental performance outcome, control measures, 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 planning process		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Incident action planning	**Response preparedness**		
	IMT Exercise and Training Plan	[EPS-RP-005] Incident action planning and NEBA is practiced by the IMT during exercises	Exercise records
	Response implementation		
	IAP	[EPS-RP-006] IAP is completed for each operational period and approved by the Incident Commander	Incident log IAP(s)
		[EPS-RP-007] Monitor effectiveness of response strategies being implemented and use information in the development of IAPs	Incident log IAP(s)
	NEBA	[EPS-RP-008] An operational NEBA will be undertaken for each operational period of the incident	NEBA IAP

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	IMT activation and de-escalation	[EPS-RP-009] IMT will be activated immediately once notified of a Level 2/3 spill (to Incident Commander)	IAP
		[EPS-RP-010] The decision to de-escalate the IMT will be made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other statutory authorities that play an advisory role	NEBA IAP
	TRPs	[EPS-RP-011] If operational monitoring shows that shoreline contact of Protection Priority Areas is likely, TRPs will be developed or sought from other titleholders/ regional industries prior to shoreline contact	TRP

9. Source control

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

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

The sections below provide an outline of source control activities noting that the Vessel SOPEP, where applicable, will provide a higher level of detail for specific incidents.

9.1 Vessel collision – fuel tank rupture

Table 9-1 provides the environmental performance outcome, initiation criteria and termination criteria for source control response to a fuel tank rupture. 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 9-1: Vessel collision – source control environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome.	Implementation of source control methods to stop the release of hydrocarbons into the marine environment
Initiation criteria	Notification of a spill
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons.

9.1.1 Implementation guidance

Implementation guidance is summarised in Table 9-2. In the event MDO is released from a vessel due to a tank rupture, the relevant vessel-specific procedures will be applied. For support vessel collisions, the vessel's SOPEP will be followed to control the source, reduce the loss of hydrocarbons and prevent escalation of the incident. Table 9-3 lists the environmental performance standards and measurement criteria for this strategy.

Table 9-2: Implementation guidance – fuel tank rupture

Action		Consideration	Responsibility	Complete
Initial actions	The vessel's SOPEP, as applicable under MARPOL, or procedure for responding to a ruptured tank will be followed, as applicable.	Notwithstanding vessel-specific procedures for source control, the following activities would be evaluated immediately for implementation, providing it is safe to do so: • Reduce the head of fuel 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 fuel inventory loss. • If the affected tank is not easily identified, reduce the level of the fuel in the tanks in the vicinity of the suspected area if stability of the vessel will not be compromised. • Evaluate the transfer of fuel to other vessels. • Trim or lighten the vessel to avoid further damage to intact tanks. • Attempt repair and plugging of hole or rupture.	Vessel Master	☐

9.2 Environmental performance

Table 9-3 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 9-3: 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 [EPS ID]**	**Measurement criteria**
Response preparedness			
Source control – vessel collision spill control	Vessel Spill Response Plan (SOPEP/ shipboard marine pollution emergency plan [SMPEP])	[EPS-SC-001] Activity/support vessels have a SOPEP or SMPEP that outlines procedures to combat spills	Audit records Inspection records
		[EPS-SC-002] Spill exercises on activity/support vessels are conducted as per the vessels' SOPEP or SMPEP	Spill exercise close-out reports
Response implementation			
Source control – vessel collision spill control	Vessel Spill Response Plan (SOPEP/SMPEP) implemented	[EPS-SC-003] Actions to control spill associated with a vessel incident followed in accordance with SOPEP or SMPEP	Vessel logs

10. Monitor and evaluate

Understanding the behaviour and likely trajectory of an oil spill is critical for evaluating the appropriate response strategy. Several methods can be used to monitor and evaluate, including:

- vessel surveillance
- aerial surveillance
- tracking buoys
- oil spill trajectory modelling
- satellite imagery.

10.1 Vessel surveillance

Table 10-1 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 10-1: Vessel surveillance – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making
Initiation criteria	Notification of a Level 2/3 spill – may be deployed in a Level 1 incident (to be determined by OSC)
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	• 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

Direct observations from field support or other vessels can be used to assess the location and visible extent of the hydrocarbon incidents, and to verify modelling predictions and trajectories. Due to the proximity of observers to the water's surface, vessel surveillance is limited in its coverage compared to aerial surveillance and may also be compromised in rough sea state conditions or where fresh hydrocarbons at the surface pose safety risks.

10.1.1 Implementation guidance

Table 10-2 provides guidance to the IMT on the actions and responsibilities to be considered when selecting this strategy. Table 10-3 lists resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to start initial vessel surveillance operations are listed in Table 10-4. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-2: Implementation guidance – vessel surveillance

Action		Consideration	Responsibility	Complete
Initial actions	Notify nearest available support vessel to commence surveillance.	Current Santos on-hire vessels or vessels of opportunity (VOO) can be used. Automatic Identification System (AIS) vessel tracking is available through Santos' ER SharePoint page.	On-Scene Commander Operations Section Chief	☐
	Source additional contracted vessels for assistance, if required.	Refer to Santos Vessels for Oil Spill Response (7110-650-ERP-0001) for the vessel monitoring process and guidance on vessel types.	Logistics Section Chief	☐
	Record surface slick location and extent, weather conditions, and marine fauna. Complete vessel surveillance forms (Appendix E) and provide to OSC (Level 1 spills) or IMT (Level 2/3 spills).	Photos are to be taken where possible and included with surveillance forms. Trained observers will not be available immediately – photos and locations will provide initial information that can be interpreted by IMT.	Vessel Observers	☐
	Relay surveillance information (spill location, weather conditions, marine fauna sightings and visual appearance of the slick) to the IMT within 60 minutes of completing vessel surveillance.	Initial reports to the IMT may be verbal (followed by written transmission) if the vessel is out of range or has no facilities for transmitting forms.	Vessel Master and/or On-Scene Commander	☐
Ongoing actions	Review surveillance information to validate spill fate and trajectory.	-	Planning Section Chief / GIS	☐
	Use available data to conduct operational NEBA and confirm that pre-identified response options are appropriate.	-	Environment Unit Leader	☐
	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required.	Surveillance data are useful in updating the Common Operating Picture in the IMT.	Planning Section Chief	☐

Table 10-3: Vessel surveillance resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Contracted vessels and VOOs	Santos-contracted vessel providers VOOs identified through AIS vessel tracking	Availability depends on Santos and vessel contractor activities	Vessels mobilised from Darwin, Varanus Island (VI), Exmouth or offshore location Locations verified through AIS vessel tracking software	Pending availability and location. Expected within 12 hours.

Table 10-4: Vessel surveillance – first-strike response timeline

Task		Time from IMT call-out
IMT begins sourcing Santos-contracted vessel or VOO for on-water surveillance		<90 minutes
VOO on site for surveillance		<12-24 hours (daylight dependent)
Minimum resource requirements		
One vessel. No specific vessel or crew requirements.		
Approximate steam time		
Deployment location	**Approximate distance to outer extent of operational area[22] (nm)**	**Approximate steam time[23] (hours)**
Darwin Port	53	5

[22] *Outer extent of operational area is KP23 at the NT / Commonwealth boundary*

[23] *At average rate of 10 knots*

10.2 Aerial surveillance

Table 10-5 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 10-5: Aerial surveillance – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making
Initiation criteria	Notification of a Level 2/3 spill
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	• 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 and size of the hydrocarbon spill at surface as well as other environmental observations including weather conditions, marine fauna and sensitive receptors in the area. Aerial surveillance provides superior coverage over vessel surveillance for estimating the spatial extent of a spill but is generally required only for larger Level 2/3 spills.

10.2.1 Implementation guidance

Table 10-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 10-7 lists resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial aerial surveillance operations are listed in Table 10-8. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-6: Implementation guidance – aerial surveillance

Action		Consideration	Responsibility	Complete
Initial actions	Contact contracted aviation provider – provide details of incident and request mobilisation to spill site for initial surveillance	If aviation asset is available near spill location, use where possible to gather as much information about the spill. If aviation asset is not available at spill location, IMT is to seek available resources through existing contractual arrangements. The initial surveillance flight may not include a trained aerial surveillance observer. Initial flights can be conducted using a standard crew—initial surveillance should not be delayed waiting for trained personnel. Ensure all safety requirements are met before deployment. During initial surveillance, attempt to obtain this data: • name of observer, date, time, aircraft type, speed and altitude of aircraft • location of slick or plume (global positioning system [GPS] positions, if possible) • spill source • size of the spill, including approximate length and width of the slick or plume • visual appearance of the slick (e.g. colour) • edge description (clear or blurred) • general description (windrows, patches etc.) • wildlife, habitat or other sensitive receptors observed • basic metocean conditions (e.g. sea state, wind, current) • photos/videos.	Operations Section Chief Logistics Section Chief	☐
	Source available Santos aerial observers, arrange accommodation/logistics and deploy to FOB/airbase location	Santos aerial observer list available from First-strike Resources on Santos' ER SharePoint page	Operations Section Chief Logistics Section Chief	☐
	Develop flight plan (frequency and flight path) to meet IMT expectations and considering other aviation operations. Expected that 2 overpasses per day of the spill area are completed.	Flight plan to confirm with OSC that aircraft are permitted in the vicinity of the spill. Flights are only to occur during daylight and in weather conditions that do not pose significant safety risks.	Operations Section Chief / Aviation Superintendent	☐
	Pre-flight briefing	-	Aerial Observers Contracted aircraft provider / pilots	☐
	Aerial observers to commence surveillance	Consider procedure for interacting with marine fauna	Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
	Determine spill extent by completing Aerial Surveillance Log (Appendix F) and Aerial Surveillance Surface Slick Monitoring Template. Calculate volume of oil (Appendix G). Take photos and/or video of the slick.	Thickness estimates are to be based on the BAOAC (refer to Appendix F)	Aerial Observer	☐
	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (Appendix H)	Provide a copy of completed Record Sheets to OSM Management Team / Monitoring Branch	Aerial Observer	☐
	Record shoreline habitat type and degree of oiling by completing the Aerial Surveillance Shoreline Observation Log (Appendix I)	Thickness estimates are to be based on the BAOAC (refer to Appendix F)	Aerial Observer	☐
	Relay all surveillance records: logs, forms, photos, videos to the IMT	Where possible, consider providing a verbal report of relevant information via radio/telephone en-route if the aircraft has long transits from the spill location to base	Aerial Observer Planning Section Chief Operations Section Chief	☐
Ongoing actions	Update flight schedule for ongoing aerial surveillance as part of broader Aviation Sub-plan of IAP	Frequency of flights should consider information needs of IMT to help maintain the Common Operating Picture and determine ongoing response operations	Operations Section Chief / Aviation Superintendent Planning Section Chief	☐
	Mobilise additional aircraft and trained observers to the spill location to undertake ongoing surveillance activities	-	Logistics Section Chief	☐
	Update Common Operating Picture with surveillance information and provide updates to spill trajectory modelling provider	-	Planning Section Chief GIS Team Leader	☐

Table 10-7: Aerial surveillance resource capability

Equipment type / personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Rotary-wing aircraft and flight crew	Santos-contracted provider/s	2 contracted (1 primary + 1 backup) + additional as required	Darwin Karratha	Wheels up within 1 hour for ER Spill surveillance <10 hours (daylight dependent)
Aerial surveillance crew	Santos-trained aerial observers	7 Santos staff	Perth and VI (Santos aerial observers)	24 hours – available from Day 2 of the incident
	AMOSC / industry mutual aid	6 AMOSC staff 2 AMOSC Core Group personnel available Additional trained industry mutual aid personnel	Australia-wide	24 hours – available from Day 2 of the incident
Drones and pilots ** secondary response to assist vessel-based surveillance	AMOSC	Drones available 24/7 through AMOSC sub-contract 1 pilot	Fremantle	Response via Duty Officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment mobilisation times vary according to stockpile location (refer to Table 10-12)
	OSRL – third-party unmanned aerial vehicle (UAV) provider	2 qualified remote pilots; however, response is on best endeavours basis	Australia / international	Depends on port of departure, 1–2 days if within Australia
	Local WA hire companies	10+	Perth and regional WA	-

Table 10-8: Aerial surveillance – first-strike response timeline

Task		Time from IMT call-out
Aircraft activated for aerial surveillance		<3 hours
Aircraft on site for aerial surveillance		<10 hours (daylight dependent)
Trained aerial observers mobilised to airbase (Darwin)		<24 hours (daylight dependent)
Minimum resource requirements		
• Santos-contracted helicopter and pilots (based in Darwin) • Santos-trained aerial observers		
Approximate flight time		
Airport	**Approximate distance (nm) to outer extent of operational area[24]**	**Approximate flight time[25] (hours: minutes)**
Darwin	50	0:25

[24] *Outer extent of operational area is KP23 at the NT / Commonwealth boundary*

[25] *At average flight speed of 120 knots*

10.3 Tracking buoys

Table 10-9 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 10-9: Tracking buoys – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making
Initiation criteria	Notification of a Level 2 or 3 spill May be deployed for a Level 1 spill if deemed beneficial by the OSC
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	• 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

10.3.1 Implementation guidance

Table 10-10 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 10-11 lists resources that may be used to implement this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented. Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-10: Implementation guidance – tracking buoys

	Action	Consideration	Responsibility	Complete
Initial actions	Mobilise tracking buoys from Darwin Supply Base and for onloading to available vessel	Personnel and vessel safety is the priority Current Santos on-hire vessels or VOOs can be used. AIS vessel tracking is available through Santos' ER SharePoint page	OSC / Operations Section Chief	☐
	Deploy 2 tracking buoys at leading edge of slick	Note deployment details and weather conditions in incident log	Emergency Commander / Vessel Master	☐
	Inform IMT that tracking buoys have been deployed and provide deployment details Monitor movement of tracking buoys	Tracking buoy monitoring website on Santos' ER SharePoint site	OSC Planning Section Chief / GIS	☐
	Use tracking buoy data to maintain Common Operating Picture in the IMT	Data tracked online	Planning Section Chief / GIS	☐
	Relay information to spill fate modelling supplier for calibrating trajectory modelling	-	Planning Section Chief / GIS	☐
Ongoing actions	Assess the need for additional tracking buoys in the spill scenario and identify/nominate preferred deployment locations	IAP to provide guidance regarding any additional tracking buoy deployments	Planning Section Chief	☐
	Mobilise additional tracking buoys if required from other Santos operations (As at August 2024, Santos has 12 tracking buoys located on the North West Shelf [NWS]) or from AMOSC stockpiles	-	Logistics Section Chief	☐
	Organise vessel to deploy additional tracking buoys if required	For continuous releases over multiple days, use rolling deployment/collection of tracking buoys to provide better coverage of plume direction	Operations Section Chief	☐
	Deploy tracking buoys	-	Emergency Commander / Vessel Master	☐
	Monitor movement of tracking buoys	-	Planning Section Chief /GIS	☐
	Relay information to spill trajectory modelling supplier for calibrating trajectory modelling	-	Planning Section Chief /GIS	☐

Table 10-11: Tracking buoy resource capability

Equipment type / personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Tracking buoys	Santos	2	Darwin	<24 hours to site pending vessel availability
		4	Dampier	Dampier/VI buoys – 48–72 hours to site depending on vessel availability
		4	VI	
AMOSC tracking buoys	AMOSC	4	Fremantle	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 (refer to Table 10-12).
		4	Geelong	

Table 10-12: AMOSC equipment mobilisation timeframes

	Perth	Darwin	Dampier
Geelong (Victoria)	40 hours / 3,395 km	44 hours / 3,730 km	70 hours / 4,840 km
Perth	N/A	48 hours / 4,040 km	19 hours / 1,530 km
Exmouth	15 hours / 1,250 km	38 hours / 3,170 km	7 hours / 555 km
Broome	27 hours / 2,240 km	22 hours / 1,870 km	11 hours / 855 km

Table 10-13: Tracking buoy – first-strike response timeline

Task	Time from IMT call-out
Tracking buoys deployed from Darwin using VOOs	12-24 hours to site, depending on vessel availability
Minimum Resource Requirements	
2 tracking buoys for initial deployment	

10.4 Oil spill trajectory modelling

Table 10-14 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 10-14: Oil spill trajectory modelling – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making
Initiation criteria	Notification of a Level 2 or 3 spill
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	• 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

Oil spill trajectory modelling uses computer modelling (e.g. OILMAP, SIMAP) to estimate the movement, fate and weathering potential of spills. Santos has engaged RPS Group to provide forecast spill fate modelling. RPS Group use SIMAP and OILMAP modelling systems that comply with Australian Standards (ASTM Standard F2067-22 'Standard Practice for Development and Use of Oil Spill Trajectory Models'). RPS Group also provide the capacity for forecast air quality monitoring to assess potential health and safety risks associated with VOCs released from a surface slick.

A particular advantage of spill trajectory modelling is that the transport and weathering of spilled hydrocarbons can be forecast—at all times of the day and night, at any location, and under any type of metocean conditions. By

contrast, aerial surveillance and vessel-based monitoring are constrained to daytime use and are limited by the operating environment. However, aerial surveillance and vessel-based monitoring are essential for model validation, verification and calibration of any modelling or initial surveillance predictions.

10.4.1 Implementation guidance

Table 10-15 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 10-16 lists resources that may be used to implement this strategy. The Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-15: Implementation guidance – oil spill trajectory modelling

Action		Consideration	Responsibility	Complete
Initial actions	Initiate oil spill trajectory modelling (OSTM) by submitting an oil spill trajectory modelling request form (Santos' ER SharePoint). Request 3-day forecast trajectory modelling	-	Environment Unit Leader	☐
	Determine requirement for gas/VOC modelling and request initiation	Hydrocarbon releases have human health and safety considerations for responders (VOCs). This to be considered for any tactics that monitor/recover oil, especially close to the release site	Safety Officer Environment Unit Leader	☐
	Operational surveillance data (aerial, vessel, tracking buoys) to be given to modelling provider to verify and adjust fate predictions of the spill and improve predictive accuracy	-	Planning Section Chief /GIS	☐
	Log in to the RPS Group data sharing website and maintain connection. Download modelling results	Data should be stored digitally and backed up onto independent digital storage media. All datasets should be accompanied by a metadata summary and documented quality assurance and control procedures	Planning Section Chief /GIS	☐
	Place RPS Group modelling data into GIS/Common Operating Picture	RPS Group 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	Planning Section Chief /GIS	☐
	If chemical dispersants are considered an applicable strategy for spill scenario, request modelling provider to model how dispersant addition affects the distribution and concentration of floating oil, subsea oil and shoreline loading	Planning and Operations to provide inputs for modelled simulation based on potential/planned dispersant operations Outputs from dispersant addition modelling to inform NEBA	Planning Section Chief Operations Section Chief	☐
	Identify location and sensitivities at risk (based on the trajectory modelling) and inform IMT. Conduct operational NEBA on proposed response strategies	-	Environment Unit Leader	☐
Ongoing actions	Request spill trajectory modelling be provided daily throughout the duration of the response and integrate data into Common Operating Picture in the IMT	-	Planning Section Chief / GIS	☐
	Use results from other monitor and evaluate activities, and/or data derived from hydrocarbon assays of the source hydrocarbon or from other reservoirs in the region (that may be available) as input data (if or when available) to improve model accuracy	-	Planning Section Chief / GIS	☐

Table 10-16: Oil spill trajectory modelling resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
RPS oil spill trajectory (OST) modellers and software	RPS under direct contract to Santos, also available through AMOSC	Daily OSTM reports	Perth – digital	2–4 hours from activation

Table 10-17: Oil spill trajectory modelling – first-strike response timeline

Task	Time from IMT call-out
RPS OSTM activated by IMT	<2 hours
OSTM provided to IMT	<4 hours
Minimum resource requirements	
• Contracted OST modellers and software • OSTM Activation Form	

10.5 Satellite imagery

Table 10-18 lists the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-18: Satellite imagery – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics to provide situational awareness to inform IMT decision-making
Initiation criteria	Notification of a Level 2 or 3 spill
Applicable hydrocarbons	**MDO**
	✓
Termination criteria	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; use 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 and visible imagery may both be of value. Availability of satellite images for a specific location will depend on several factors including satellite current position and availability/tasking, and weather conditions (e.g. cloud cover obscures images).

10.5.1 Implementation guidance

Table 10-19 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-20 lists resources that may be used to implement this strategy. The Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 10-21 lists the environmental performance standards and measurement criteria for this strategy.

Table 10-19: Satellite imagery implementation guide

Action		Consideration	Responsibility	Complete
Initial actions	Assess requirement for satellite imagery	-	Planning Section Chief	☐
	Notify AMOSC and OSRL Duty Officer to initiate request for available satellite imagery	Formal written activation of resources from AMOSC and OSRL by designated call-out authorities (Santos Duty Managers/Incident Commanders) is required	Planning Section Chief	☐
	Assess suitability and order imagery	-	Planning Section Chief	☐
	Integrate satellite imagery into Common Operating Picture in the IMT and provide to trajectory modelling provider for model validation	-	GIS Team Leader Planning Section Chief	☐
Ongoing actions	Review surveillance information to validate spill fate and trajectory	-	Planning Section Chief	☐
	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required	Use surveillance data when updating the Common Operating Picture in the IMT	Planning Section Chief	☐

Table 10-20: Satellite imagery resource capability

Equipment type / personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Satellite Imagery	KSAT – activated through AMOSC MDA – activated through OSRL	Depends on overpass frequency (to be confirmed on activation)	Digital	If satellite images are required, Santos to notify provider within 12 hours

10.6 Environmental performance

Table 10-21 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 10-21: Environmental performance – monitor and evaluate

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision-making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Monitor and evaluate – vessel and aerial surveillance	**Response preparedness**		
	Maintenance of master service agreements (MSAs) with multiple vessel providers for surveillance vessel capability	[EPS-ME-001] Santos maintains MSAs with multiple vessel providers as specified in Table 10-3.	MSAs with vessel providers
	Minimum specifications list for surveillance vessels	[EPS-ME-002] Maintain minimum specifications list for surveillance vessels to aid in rapid vessel selection	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Track location of potential surveillance vessels	[EPS-ME-003] Santos maintains access to Automatic Identification System (AIS) Vessel Monitoring System to track potential surveillance vessel locations	AIS live tracking portal

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision-making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	MSA with aviation supplier for aerial surveillance capability	[EPS-ME-009] MSA in place with helicopter/aircraft provider throughout activity	MSA with aviation supplier
	Trained aerial observers available through Santos personnel	[EPS-ME-010] Santos maintains a pool of trained aerial observers	Exercise records Training records
	Trained aerial observers available through mutual aid arrangements facilitated by AMOSC	[EPS-ME-011] Maintenance of AMOSC contract to facilitate mutual aid arrangements for access to trained aerial observers	AMOSC Participating Member contract
	Access to certified UAV providers	[EPS-ME-012] Maintenance of contract for access to UAV providers	List of certified UAV providers AMOSC Participating Member contract OSRL Associate Member contract
	Aircraft charter companies for fauna observations	[EPS-ME-013] Maintain a list of aircraft charter companies that could potentially provide fauna observation services	List of providers
	Response implementation		
	Vessel surveillance first-strike capability mobilised	[EPS-ME-004] First-strike is mobilised in accordance with details and timings as specified in Table 10-4	Incident log
	Vessel surveillance daily observation reports	[EPS-ME-007] Daily observation reports submitted to IMT until termination criteria are met	Incident log
	Vessels and chartered surveillance aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003)	[EPS-ME-006] 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 risk of collision with marine fauna	Vessel contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure Completed vessel statement of conformance
		[EPS-ME-014] Chartered surveillance 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 first-strike capability mobilised	[EPS-ME-015] First strike is mobilised in accordance with details and timings as specified in Table 10-8	Incident log
	Aerial surveillance – 2 passes per day	[EPS-ME-016] Following initiation of aerial surveillance, 2 passes per day of spill area by observation aircraft provided	Incident log IAP

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision-making		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	Aerial surveillance trained aerial observers	[EPS-ME-017] Trained aerial observers supplied from day 2 of response	Incident log
	Aerial surveillance flight schedules	[EPS-ME-019] Flight schedules are maintained throughout response	IAP
	Aerial surveillance observer log	[EPS-ME-020] Observers completed aerial surveillance observer log following completion of flight	Completed Aerial Surveillance Observer Logs
Monitor and evaluate – tracking buoys	**Response preparedness**		
	Tracking buoys available	[EPS-ME-023] Maintenance of 12 tracking buoys throughout the activity	Computer tracking software Tracking buoy tests
	Response implementation		
	Tracking buoy first-strike capability mobilised	[EPS-ME-024] First strike is mobilised in accordance with details and timings as specified in Table 10-11	Incident log
Monitor and evaluate – oil spill modelling	**Response preparedness**		
	Maintenance of contract for emergency response modelling	[EPS-ME-027] Maintenance of contract for forecast spill trajectory modelling services throughout activity	Modelling services contract
	Maintenance of access to additional emergency response modelling	[EPS-ME-028] Access to additional spill modelling capability to ensure redundancy	Membership in place with OSRL
	Response implementation		
	Oil spill modelling provider first contact	[EPS-ME-029] Oil spill modelling provider will be contacted within 2 hours upon notification of a Level 2 or 3 spill	Incident log
	Oil spill modelling provider output minimum timings	[EPS-ME-030] Modelling delivered to IMT within 2 hours of request to service provider	Incident log
Monitor and evaluate – satellite imagery	**Response preparedness**		
	Satellite imagery and analysis capability	[EPS-ME-032] Satellite imagery and analysis accessed through third-party provider activated through AMOSC and/or OSRL	AMOSC Participating Member contract OSRL Associate Member contract
	Response implementation		
	Satellite imagery and analysis provided to IMT	[EPS-ME-033] Data incorporated into Common Operating Picture and provided to spill modelling provider	Incident log IAP

11. Mechanical dispersion

Table 11-1 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 11-1: Mechanical dispersion – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion
Initiation criteria	Monitor and Evaluate data identifies thin oil patches at the sea surface that are not naturally dissipating in sea surface and are posing risks to wildlife and shorelines by remaining on the surface
Applicable hydrocarbons	**MDO**
	✓ 2
Termination criteria	• There is no longer a noticeable reduction of surface oil resulting from the activity, or • NEBA is no longer being achieved, or • Unacceptable safety risks associated with gas and VOCs at the sea surface, or • Agreement is reached with Jurisdictional Authorities to terminate the response

11.1 Overview

This response strategy assists with the natural dispersion process—it creates mixing through physical agitation by using a vessel's propellers and wake, which encourages the oil to break into smaller particle sizes that are more easily biodegraded. The 2 common activities associated with mechanical dispersion are:

- manoeuvring a vessel through the slick, using propeller wash and vessel wake to create mixing in the water body
- spraying water from the vessel's fire hose and moving the vessel through the water body to create additional mixing and breakup of the slick.

11.2 Implementation guidance

Table 11-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 11-3 lists resources that may be used to implement this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 11-2: 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 and sea state Possible impacts to sensitive shorelines and/or wildlife This activity is to be conducted during daylight hours only and requires a safety plan to be developed before implementation	Operations Section Chief Environment Unit Leader Planning Section Chief	☐
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls)	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	☐
	Notify vessel-based responders to trial mechanical dispersion	-	Operations Section Chief	☐
	Response personnel on vessels to evaluate the effectiveness of using mechanical dispersion operations to reduce the volume of oil on the water surface. Communicate the information to the IMT Operations Section Chief for inclusion in operational NEBA	-	Emergency Commander Santos AMOSC Core Group Responders	☐

Table 11-3: Mechanical dispersion resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Vessels undertaking other activities Vessel(s) can be specifically contracted for the strategy if required (refer to Santos Vessel Requirements for Oil Spill Response document [7710-650-ERP-0001])	Santos-contracted vessel providers	Availability dependent upon Santos and vessel contractor activities	Vessels mobilised from Darwin; locations verified through AIS vessel tracking software	Varies subject to availability and location

11.3 Environmental performance

Table 11-4 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 11-4: Environmental performance – mechanical dispersion

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion		
Response strategy	**Control measures**	**Performance standard [EPS ID]**	**Measurement criteria**
Mechanical dispersion	**Response preparedness**		
	Mechanical dispersion capability in place	[EPS-MD-001] Mechanical dispersion capability in place based on Santos-contracted vessels availability	Existing MSAs with multiple vessel providers
	Response Implementation		
	Mechanical dispersion procedures in place to ensure safe and effective execution	[EPS-MD-002] Mechanical dispersion to be conducted as per the Mechanical Dispersion Plan	Mechanical Dispersion Plan IAP Incident Log
	Operational NEBA to determine net environmental benefit	[EPS-MD-003] Operational NEBA confirms suitability and environmental benefit	Incident Log IAP

12. Shoreline protection and deflection plan

Table 12-1 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 12-1: Shoreline protection and deflection – objectives, initiation and termination criteria

Environmental performance outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities
Initiation criteria	• Level 2 or Level 3 spills where shorelines with identified or potential protection priorities will potentially be contacted • Approval has been obtained from the relevant Control Agency to initiate the response strategy
Applicable hydrocarbons	**MDO**
	✓ 2
Termination criteria	• NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s • Agreement is reached with Jurisdictional Authorities and/or Control Agency to terminate the response strategy

12.1 Overview

Protection and deflection tactics are used to divert hydrocarbons away from sensitive shoreline receptors and are more effective if they are deployed ahead of spill contact. They are typically used to protect smaller, high priority sections of shoreline.

The effectiveness of this response will depend on spill characteristics, hydrocarbon type, and the operating environment. Deployment is subject to safety constraints such as the potential grounding of vessels.

Protection and deflection is part of an integrated nearshore/shoreline response to be managed by the relevant Control Agency. If Santos is not the Control Agency (refer to Table 4-2), it will undertake first-strike protection and deflection activities as required. In this circumstance, the relevant Control Agency 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 (SCAT surveys) carried out under its control (refer Northern Australia OSM-BIP [7715-650-ERP-0003]).

In the event of a spill with the potential for shoreline contact where Santos is not the Control Agency, the ongoing response objectives, methodology, deployment locations and resource allocation will be controlled by the relevant Control Agency and therefore may differ from that included below.

Information gathered during monitor and evaluate activities and operational monitoring (including shoreline clean-up assessments) and assessed through an operational NEBA will guide the selection of protection and deflection locations and techniques.

Shoreline protection and deflection techniques include:

- nearshore booming, which can involve different booming arrangements, including:
  - exclusion booming: boom acts as a barrier to exclude the spill from areas requiring protection
  - diversion booming: booms divert the spill to a specific location where it may be removed (e.g. sandy beach)
  - deflection booming: booms deflect the spill away from an area requiring protection.
- berms, dams and dykes – uses sandbags or embankments to exclude oil from sensitive areas
- shoreside recovery – uses nearshore skimmers to collect oil corralled by nearshore booms (also used during shoreline clean-up)
- passive recovery – uses sorbent booms or pads to collect oil and remove it from the environment. This can be used as a pre-impact tactic where sorbents are laid ahead of the spill making contact with the shoreline
- non-oiled debris removal – removes debris from the shoreline before it is impacted to reduce overall waste volumes from shoreline clean-up.

The effectiveness of these techniques will depend on local bathymetry, sea state, currents/tides and wind conditions and the available resources.

12.2 Implementation guidance

Table 12-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 12-3 lists resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial protection and deflection operations, unless directed otherwise by the relevant Control Agency, are listed in Table 12-4. The Incident Commander of the Control Agency's IMT (once they assume control) is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 12-2: Implementation guidance – shoreline protection and deflection

Action		Consideration	Responsibility	Complete
Initial Actions	Ensure initial notifications to the relevant Control Agency have been made.	Refer to Section 7 for reporting requirements.	Planning Section Chief	☐
	Collect and provide monitor and evaluate information, operational monitoring data and existing sensitivity information/mapping to Control Agency for confirming priority protection areas and NEBA.		Environment Unit Leader Planning Section Chief	☐
	Actions below are indicative only and are at the final determination of the relevant Control Agency.			
	Conduct operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit using information from shoreline clean-up assessments (refer Northern Australia OSM-BIP [7715-650-ERP-0003]).	TRPs are available on the Santos ER SharePoint page[26].	Environment Unit Leader	☐
	If NEBA indicates that there is an overall environmental benefit, develop a Shoreline Protection Plan (IAP Sub-Plan) for each deployment area.	Shoreline Protection Plan may include: • priority nearshore and shoreline areas for protection (liaise with Control Agency for direction on locations) • locations to deploy protection and deflection equipment • permits required (if applicable) • protection and deflection tactics to be employed for each location • list of resources (personnel and equipment) required • logistical arrangements (e.g. staging areas, accommodation, transport of personnel) • timeframes to undertake deployment • access locations from land or sea • frequency of equipment inspections and maintenance (noting tidal cycles) • waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes • no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first)	Operations Section Chief Planning Section Chief Environment Unit Leader	☐

[26] *Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, NTOWRP and Western Australia Marine Oil Pollution Risk Assessment (WAMOPRA).*

Action		Consideration	Responsibility	Complete
		• shift rotation requirements		
	If required identify vessels with relevant capabilities (e.g. shallow draft) for equipment deployment in consultation with Control Agency.	Ensure vessels have shallow draft and/or a suitable tender (with adequate towing capacity and tie-points) if they are required to access shorelines.	Operations Section Chief Logistics Section Chief	☐
	Deploy shoreline protection response teams to each shoreline location selected and implement response.	If passive recovery and/or non-oiled debris removal has been selected as a tactic, ensure deployment activities prioritise their implementation before hydrocarbon contact.	Operations Section Chief On-Scene Commander	☐
Ongoing Actions	Conduct daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct shoreline protection and deflection activities.	-	Environment Unit Leader	☐
	Report to the Operations Section Chief on the effectiveness of the tactics employed.	-	Shoreline Response Program Manager – AMOSC Core Group responder	☐
	Response teams to conduct daily inspections and maintenance of equipment.	Shoreline protection efforts will be maintained through the forward operation(s) facilities set-up at mainland locations under direction of the Control Agency. Response crews will be rotated on a roster basis, with new personnel procured on an as needs basis from existing human resource suppliers.	Shoreline Response Program Manager	☐

Table 12-3: Shoreline protection and deflection – resource capability

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
AMSA nearshore boom/skimmer equipment	AMSA	Canadyne inflatable Total – 10	Darwin – 5 Karratha – 5	Access to National Plan equipment[27] through AMOSC[28]. Equipment mobilisation times vary according to stockpile location.
		Structureflex inflatable Total – 34	Darwin – 9 Karratha – 10 Fremantle – 15	
		Versatech zoom inflatable Total – 28	Darwin – 10 Karratha – 5 Fremantle – 13	

[27] *Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations*

[28] *Santos will enter a contractual arrangement with AMSA to access the National Plan resources*

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
		Slickbar – solid buoyancy Total – 2	Karratha – 2	
		Structureflex – solid buoyancy Total – 13	Karratha – 3 Fremantle – 10	
		Structureflex – land sea Total – 69	Darwin – 9 Karratha – 30 Fremantle – 30 other locations around Australia	
		LWS 500 weir skimmer Total – 8	Fremantle – 4 Karratha – 4	
		Desmi termite skimmer Total – 3	Fremantle – 1 Karratha – 1 Darwin – 1	
		Lamor 15 ton disc skimmer Total – 6	Darwin – 2 Karratha – 4	
		Lamor 50 ton weir skimmer Total – 3	Darwin – 1 Karratha – 2	
AMOSC nearshore boom and skimming equipment	AMOSC	Beach Guardian shoreseal boom (25 m lengths) Total – 89	Broome – 4 Exmouth – 20 Fremantle – 19 Geelong – 46	Response via duty officer within 15 minutes of first call; AMOSC personnel available within one hour of initial activation call. Equipment logistics varies according to stockpile location[29] For mobilisation timeframes refer to Table 10-12
		Zoom Boom (25 m lengths) Total – 185	Broome – 6 Exmouth – 19 Fremantle – 34 Geelong – 126	
		Lamor HDB 1300 Boom (200 m) on reel Total – 2	Broome – 2	
		Lamor HDB 1500 Boom (100 m on reel) Total – 3	Fremantle – 1 Geelong – 2	

[29] *Updated AMOSC equipment listings are available through AMOSC Members Hub - https://amosc.sharepoint.com/sites/HUB/SitePages/CollabHome.aspx*

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
		Lamor SFB-18 GP Solid Flotation Curtain Boom (30 m lengths) Total – 58	Fremantle – 18 Geelong – 40	
		Minimax 12 brush skimmer Total – 5	Broome – 1 Exmouth – 1 Fremantle – 2 Geelong – 1	
		Komara 12k disc skimmer Total – 4	Exmouth – 1 Fremantle – 1 Geelong – 2	
		Komara 20k disc skimmer Total – 1	Fremantle – 1	
		Komara 30k disc skimmer Total – 2	Geelong – 2	
		Passive weir skimmer Total – 3	Exmouth – 1 Fremantle – 1 Geelong – 1	
		Ro-vac vacuum skimmer Total – 4	Exmouth – 1 Geelong – 3	
		Desmi GT 185 brush/weir skimmer Total – 2	Exmouth – 1 Geelong – 1	
		Desmi Ro-mop 240 oil mop skimmer Total – 2	Exmouth – 1 Geelong – 1	
		Desmi Ro-mop 260 oil mop skimmer Total – 2	Fremantle – 1 Geelong – 1	
		Skimmer-Lamor Rock Cleaner-Brush Total – 4	Fremantle – 2 Geelong – 2	
		Skimmer-Lamor LWS500-brush/weir skimmer Total – 6	Fremantle – 3 Geelong – 3	
		Desmi 250 weir skimmer Total – 1	Geelong – 1	

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
		Canadyne multi head-brush/disc/drum Total – 1	Geelong – 1	
		Versatech multi head-brush/disc/drum Total – 1	Geelong – 1	
		Egmopol barge with brush skimmer Total – 1	Geelong – 1	
Industry Mutual Aid nearshore boom and skimming equipment	Facilitated by AMOSC	Nearshore boom and skimmers	WA/NT	Access to Industry Mutual Aid through AMOSPlan and facilitated by AMOSC
OSRL nearshore boom/skimming equipment (Note: further booms are available; the listed items are shown as an example). Guaranteed access to 50% of stockpile by equipment type. Access to more than 50% on a case-by-case basis.	OSRL	Air-skirt boom 10 m: 228 Air-skirt boom 20 m: 658 Air-skirt boom 200 m: 4 Beach sealing boom 10 m: 154 Beach sealing boom 15 m: 65 Beach sealing boom 20 m: 113 Inshore recovery skimmers: 126 Range of ancillaries to support above equipment	OSRL global stockpiles at base locations: • UK • Singapore • Bahrain • Fort Lauderdale (United States [US])	Response from OSRL Duty Manager within 10 minutes. Equipment logistics varies according to stockpile location.
Personnel (field responders) for OSR strategies	AMOSC staff	Total – 12	Fremantle – 5 Geelong – 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel depends on location of spill and transport to site
	AMOSC Core Group (Santos)	Total – 16	Perth/North West (NW) Australia facilities – 14 Port Bonython (South Australia) – 2	From 24 hours <48 hours to NT locations
	Santos IMO1 personnel (Darwin)	6	Darwin	<24 hours to deployment port location
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility location across Australia	Location dependent. Confirmed at time of activation

Table 12-4: Shoreline protection and deflection – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, confirm if protection of shoreline sensitivity/s is required and begins sourcing resources	<4 hours
Santos Core Group mobilised to deployment port location	<24 hours
Protection booming equipment mobilised to deployment port location	<24 hours
Waste storage equipment mobilised to deployment port location	<24 hours
Boom deployment vessel mobilised to deployment port location	<24 hours
AMOSC staff and Industry Core Group mobilised to deployment port location	<48 hours
Protection/deflection operation deployed to protection location	<60–72 hours (weather/daylight dependent)
Minimum resource requirements	
Note: Resource requirements for protection and deflection will be situation/receptor specific. TRPs are held by Santos and have been developed for various locations and are available on the Santos ER SharePoint page[30]. Indicative first-strike resources for a single site protection area are: • 1 small vessel suitable for boom deployment • Shoreline (e.g. Canadyne / Structureflex inflatable) and nearshore booms (e.g. Zoom Boom) plus ancillary equipment (e.g. anchors, stakes) sufficient for protecting shoreline resources • 1 skimmer appropriate for oil type • Waste storage equipment • 1 Protection and Deflection Team • Personal Protective Equipment (PPE)	

12.3 Worst-case resourcing requirements

Protection and deflection resourcing requirements have been determined from deterministic modelling for affected shorelines. Deterministic run #96 (MDO scenario - spill at KP114) was selected to guide resourcing estimates for protection and deflection given it was the simulation that represented the shortest time to the arrival of accumulated shoreline loading ≥100 g/m^2 and was the simulation with the maximum volume of oil ashore ≥100 g/m^2 (MDO scenario - spill at KP114).

This deterministic run does not include all possible spill scenarios; a single spill may contact other receptors and at different volumes, as presented in Section 6.3. However, the selection of this run will provide the worst-case shoreline loading scenario on which to base protection and deflection response preparedness arrangements.

Resource requirements for protection and deflection will be situation-/receptor-specific.

Table 12-5: Shoreline protection and deflection resource requirements (based on deterministic simulation #96 for MDO scenario - spill at KP114)

Location	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline oiled (km) ≥100 g/m²	Estimated No. of required protection and deflection teams to set up and monitor (and remarks)
East Arm	8 hours	8	1–2 teams (small length of shoreline predicted to be impacted; 1–2 teams considered sufficient to protect shoreline receptors)
Total estimated Protection and Deflection Teams required			**1–2 teams**

Source: RPS, 2024

[30] *Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, NTOWRP and WAMOPRA.*

A typical shoreline protection and deflection team would comprise 12 personnel as a minimum:

- 1 Incident Commander/Site Supervisor
- 1 Shallow draft vessel skipper
- 1 Shallow draft vessel deck-hand
- 9 Protection and deflection operatives.

The resourcing requirements will be determined based on feedback from SCAT activities, on operational NEBA, and in consultation with the NT Control Agency. Shoreline effort will likely comprise a combination of protection and deflection and clean-up, with resources often working together and/or in parallel.

12.4 Environmental performance

Table 12-6 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 12-6: 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 [EPS ID]**	**Measurement criteria**
Shoreline Protection and Deflection	**Response preparedness**		
	Access to Santos protection and deflection equipment and personnel	[EPS-PD-001] Santos personnel and equipment stored and maintained / available as per Table 12-3	Santos oil spill response team database; Santos equipment register; Exercise reports
	Access to protection and deflection equipment and personnel	[EPS-PD-002] Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity as per Table 12-3.	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG arrangements
	Protection and deflection small vessel providers for nearshore booming operations are identified	[EPS-PD-004] Maintenance of a list of small vessel providers operating in the Darwin region that could be used for nearshore booming	List of small vessel providers
	Response implementation		
	First strike capability mobilised	[EPS-PD-005] First strike is mobilised in accordance with details and timings as specified in Table 12-4 unless directed otherwise by Control Agency	Incident log
	IMT and Control Agency to agree protection priorities	[EPS-PD-007] Santos IMT to confirm protection priorities in consultation with Control Agency	IAP Incident Log
	Prepare operational NEBA to determine if shoreline protection and deflection activities are likely to result in a net environmental benefit	[EPS-PD-008] Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing. Operational NEBA to be undertaken each operational period. Ensure NEBA considers waste management and the possibility of secondary contamination.	Operational NEBA Incident Log IAP
	IAP Protection and Deflection Sub-plan is developed to ensure effective execution and	[EPS-PD-006] IAP Shoreline Protection and Deflection Sub-plan including shoreline/nearshore	Incident Log IAP Shoreline Protection and Deflection Sub-plan

Environmental performance outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
	environmental impacts from response are minimised	habitat/bathymetry assessment and waste management is developed to provide oversight and management of shoreline protection and deflection operation, prior to shoreline protection and deflection operations commencing	
	Use of shallow draft vessels for shoreline and nearshore operations	[EPS-PD-009] Shallow draft vessels are used for shoreline and nearshore operations, unless directed otherwise by the designated Control Agency	Vessel specifications documented in IAP.
	Conduct rapid shoreline/nearshore habitat/bathymetry assessment	[EPS-PD-010] Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities	IAP records; Assessment records

13. Shoreline clean-up plan

Table 13-1 lists the environmental performance outcome, initiation and termination criteria for this strategy.

Table 13-1: Shoreline clean-up – environmental performance outcome, initiation and termination criteria

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
Initiation criteria	• 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 • Approval has been obtained from the Control Agency (where applicable) to initiate response strategy
Applicable hydrocarbons	**MDO**
	✓ 2
Termination criteria	• NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s • Agreement is reached with Jurisdictional Authorities and/or Control Agency to terminate the response strategy

13.1 Overview

Shoreline clean-up aims to remove hydrocarbons from shorelines and intertidal habitat to achieve a net environmental benefit. Removing these hydrocarbons helps reduce hydrocarbon remobilisation and contamination of wildlife, habitat and other sensitive receptors. Shoreline clean-up is often a lengthy and cyclical process, requiring regular shoreline clean-up assessments (refer Northern Australia OSM-BIP [7715-650-ERP-0003]) to monitor the effectiveness of clean-up activities and assess if they are resulting in any adverse impacts.

Shoreline clean-up is part of an integrated nearshore/ shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to Table 4-2), it will undertake first-strike activations as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline clean-up. The information obtained from monitoring and evaluation tactics (refer to Section 10) and operational monitoring (Section 16), will be used by the IMT in developing the operational NEBA to inform the most effective clean-up tactics (if any) to apply to individual sites. Intrusive shoreline clean-up techniques have the potential to damage sensitive shorelines. The appropriateness of clean-up tactics will be assessed against natural attenuation for sensitive sites. Selection of shoreline clean-up methods and controls to prevent further damage from the clean-up activities are to be undertaken in consultation with the Control Agency and selected based on NEBA.

Spill modelling indicates the MDO vessel collision scenario in Darwin Harbour (spill at KP114) would be the worst-case spill for shoreline contact from Barossa GEP Operations (NT waters) activities. Shoreline contact is predicted as a result of this scenario and therefore clean-up of shorelines may be required, if a NEBA indicates there would be an overall benefit. However, MDO is likely to be difficult to remove given its light nature, low residual fractions and high weathering potential (Appendix A). MDO can be readily washed from sediments by wave and tidal flushing. The likely waste products from shoreline clean-up of a MDO spill would be contaminated sand and debris.

Shoreline clean-up techniques include:

- **Shoreline Clean-up Assessment** – uses assessment processes (refer to Appendix O and Northern Australia OSM-BIP [7715-650-ERP-0003]) to assess shoreline character, assess shoreline oiling and develop recommendations for response. Typically, this should be the first step in any shoreline clean-up response
- **Natural Recovery** – oiled shorelines are left untreated and the oil naturally degrades over time
- **Manual and Mechanical Removal** – removes oil and contaminated materials using machinery, hand tools, or a combination of both
- **Washing, Flooding and Flushing** – uses water, steam, or sand to flush oil from impacted shoreline areas
- **Sediment Reworking and Surf Washing** – uses various methods to accelerate natural degradation of oil by manipulating the sediment.

13.2 Implementation guidance

Table 13-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 13-3 lists resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial shoreline clean-up operations, unless directed otherwise by the relevant Control Agency, are listed in Table 13-4. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 13-2: Implementation guidance – shoreline clean-up

Action		Consideration	Responsibility	Complete
Initial Actions	**Actions below are indicative only and are at the final determination of the Control Agency**			
	Initiate Shoreline Clean-up Assessment (if not already activated).	Refer to Northern Australia OSM-BIP (7715-650-ERP-0003) for additional information. UAVs may be necessary for some sensitive environments and where personnel safety is at risk (e.g. dangerous fauna in remote locations).	Environment Unit Leader	☐
	Using results from Shoreline Clean-up Assessment, conduct operational NEBA to assess shoreline clean-up suitability and recommended tactics for each shoreline location.	Shoreline Clean-up Assessment Teams are responsible for preparing field maps and forms detailing the area surveyed and make specific clean-up recommendations. The condition of affected shorelines will be constantly changing. Results of shoreline surveys should be reported as quickly as possible to the IMT to help inform real-time decision-making. Engage a Heritage Advisor if spill response activities overlap with potential areas of cultural significance.	Environment Unit Leader	☐
	If operational NEBA supports shoreline clean-up, prepare a Shoreline Clean-up Plan for inclusion in the IAP.	Shoreline Clean-up Plan may include: • clean-up objectives • clean-up end points (may be derived from Shoreline Clean-up Assessment) • clean-up priorities (may be derived from Shoreline Clean-up Assessment) • assessment and location of staging areas and worksites (including health and safety constraints, zoning) • utility resource assessment and support (to be conducted if activity is of significant size in comparison to the size of the coastal community) • permits required (if applicable) • chain of command for on-site personnel • list of resources (personnel, equipment, personal protective equipment) required for selected clean-up tactics at each site • details of accommodation and transport management • security management • waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes • establish no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first) • shift rotation requirements.	Environment Unit Leader Planning Section Chief Operations Section Chief	☐

Action		Consideration	Responsibility	Complete
		Refer to IPIECA guide: A Guide to Oiled Shoreline Clean-up Techniques (IPIECA-IOGP, 2016b) for additional guidance on shoreline clean-up planning and implementation.		
	In consultation with the Control Agency, procure and mobilise resources to a designated port location for deployment, or directly to location via road transport.	-	Logistics Section Chief Supply Unit Leader	☐
	Deploy shoreline clean-up response teams to each shoreline location to begin operations under direction of the Control Agency.	Each clean-up team to be led by a Shoreline Response Team Leader, who could be an AMOSC Core Group Member or trained member of the AMSA administered National Response Team. Clean-up teams and equipment will be deployed and positioned as per those observations by the Shoreline Clean-up Assessment Teams in consultation with the Control Agency. Team members will verify the effectiveness of clean-up, modifying guidelines as needed if conditions change.	Operations Section Chief Logistics Section Chief	☐
Ongoing Actions	Shoreline Response Team Leader shall communicate daily reports to the IMT Operations Section Chief to inform of effectiveness of existing tactics and any proposed tactics and required resources.	Where possible, maintain some consistency in personnel within Shoreline Response Teams. If the same personnel are involved in Shoreline Clean-up Assessment and clean-up, they will be better placed to adapt their recommendations as the clean-up progresses and judge when the agreed end points have been met.	Shoreline Response Program Manager Operations Section Chief	☐
	The IMT Operations Section Chief shall work with the Planning Section Chief to incorporate recommendations into the IAPs for the following operational period, and ensure all required resources are released and activated through the Supply Unit Leader and Logistics Section Chief.	-	Operations Section Chief Planning Section Chief	☐
	Monitor progress of clean-up efforts and report to the Control Agency.	-	Operations Section Chief On-Scene Commander Deputy OSC (Control Agency FOB)	☐

Table 13-3: Shoreline clean-up – resource capability

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
Manual clean-up tools (shovels, rakes, wheelbarrows, bags, etc.)	AMOSC shoreline kits	Boom Accessories-Beach Guardian Deployment Kit Total – 14	Fremantle – 2 Geelong – 9 Broome – 1 Exmouth - 3	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; equipment logistics varies according to stockpile location (Table 10-12)
	Hardware suppliers	As available	Karratha / Exmouth / Perth	-
Shoreline flushing (pumps/hoses)	AMOSC	Shoreline flushing kit 3″ Total – 2	Fremantle –1 Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12
		Shoreline flushing kit 4″ Total – 1	Geelong – 1	
		Shoreline impact lance kit Total – 1	Geelong – 1	
Nearshore booms/ skimmers	AMOSC AMSA Industry Mutual Aid	Refer to Protection and Deflection (Table 12-3)	-	-
Decontamination/staging site equipment	AMOSC	Decontamination kit (PPE) Total – 3	Broome –1 Exmouth –1 Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12
		Decontamination kit Locker Total – 3	Exmouth – 1 Fremantle – 1 Geelong – 1	
		Decontamination – vehicle washdown trailer Total – 2	Fremantle – 1 Geelong – 1	
		Decontamination – Decon. Support trailer Total – 1	Geelong – 1	

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
	AMSA	Decontamination station Total – 5	Darwin – 1 Karratha –2 Fremantle – 2	Access to National Plan equipment[31] through AMOSC[32]. Equipment mobilisation times vary according to stockpile location.
	Oil spill equipment provider (e.g. Global Spill., PPS)	As available	Perth	Subject to availability
Waste storage (including temporary storage and waste skips and tanks for transport)	AMOSC temporary storage	Fast tanks (9,000 L and 3,000 L) Total – 8	Geelong – 4 Fremantle – 2 Exmouth – 2	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call For mobilisation timeframes see Table 10-12.
		Vikotank (13,000 L) Total – 2	Broome – 1 Geelong – 1	
		Lamor (11,400 L) Total – 4	Fremantle – 4	
		Intermediate Bulk Containers (IBC) (1 m^3) Total – 18	Geelong – 18	
	AMSA temporary storage	Fast tanks – (10 m^3) Total – 22	Darwin – 2 Karratha – 2 Fremantle – 4 Adelaide – 1 Brisbane – 2 Devonport – 2 Melbourne – 1 Sydney – 4 Townsville – 4	Access to National Plan equipment through AMOSC. Equipment mobilisation times vary according to stockpile location.
		Structureflex – (10 m^3) Total – 3	Brisbane – 1 Adelaide – 2	
		Vikoma – (10 m^3) Total – 20	Darwin – 2 Adelaide – 1	

[31] *Updated AMSA Equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal - https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations*

Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment type/ personnel required	Organisation	Equipment specifications / total quantity available	Location / quantity available	Mobilisation timeframe
			Brisbane – 1 Devonport – 2 Fremantle – 4 Fremantle – 3 Melbourne – 2 Sydney – 2 Townsville – 4	
	Santos Waste Management Service Provider	Refer to Waste management (Section 15)	Perth, Karratha	<12 hours
Personnel (field responders) for OSR strategies	AMOSC staff	Total – 12	Fremantle – 5 Geelong – 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel depends on location of spill and transport to site
	AMOSC Core Group (Santos)	Total – 16	Perth/NW Australia facilities – 14 Port Bonython (South Australia) – 2	12+ hours <48 to NT locations
	Santos IMO1 personnel (Darwin)	6	Darwin	<24 hours to deployment port location
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility location across Australia	Location dependent. Confirmed at time of activation
	Santos-contracted workforce hire company (e.g. Dare)	As per availability (up to 2,000)	Australia-wide	Subject to availability (indicatively 72+ hours)

Table 13-4: Shoreline clean-up – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, confirms applicability of strategy and begins sourcing resources.	<4 hours
Santos Core Group mobilised to deployment port location.	<24 hours
Clean-up equipment mobilised to deployment port location.	<24–48 hours
Waste storage equipment mobilised to deployment port location.	<24 hours
Remote island transfer vessel (if required) mobilised to deployment port location.	<24 hours
AMOSC staff, Industry Core Group and Labour Hire mobilised to site/deployment port location.	<48 hours
Clean-up operation deployed to clean-up area under advice from Shoreline Assessment Team.	<60–72 hours (weather/daylight dependent)
Minimum resource requirements	
Note: Resource requirements for shoreline clean-up will be situation/receptor specific. TRPs are held by Santos and have been developed for various locations and are available on the Santos ER SharePoint page[33] Indicative minimum requirements for one Santos activated shoreline clean-up team are: • manual clean-up/shoreline flushing equipment kit • waste storage (bags, temporary storage tanks, skips as appropriate) • decontamination/staging equipment kit • personal protective equipment. One clean-up team comprises: • 1 team leader (AMOSC staff, Industry Core Group or Santos Core Group) • 10[34] shoreline clean-up responders (AMOSC Core Group, Santos-contracted labour hire personnel).	

13.3 Shoreline clean-up resources

Shoreline clean-up equipment available for use by Santos is a combination of Santos-owned, AMOSC, AMSA, and OSRL equipment as well as other industry resources available through the AMOSPlan mutual aid arrangements. Shoreline consumables are available through hardware, personal protective equipment (PPE) and specialist oil/chemical spill suppliers and mobile plant equipment is available through hire outlets in Darwin, Karratha, Broome, Perth and other regional centres. Where vessel deployments are required, Santos will leverage from existing contracted vessel providers in the first instance, and if required will source vessels from vendors that Santos already has a master service agreement with, or spot hiring vessels as needed. The Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) contains the specification for various types of vessel that may be required in an oil spill response, including vessels for shoreline clean-up support.

Shoreline clean-up personnel available to Santos is a combination of AMOSC staff, AMOSC Core Group Responders (comprising AMOSC trained Santos and Industry personnel), OSRL responders, Territory Response Team members and National Response Team members. Personnel for manual clean-up and mobile plant operation can be accessed through Santos' labour hire arrangements.

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. Deployment will be under the direction of the relevant Control Agency and the advice of shoreline clean-up specialists from AMOSC Core Group and National/Territory response teams. Shoreline clean-up assessments (refer to Northern Australia OSM-BIP [7715-650-ERP-0003]) will provide information to guide the clean-up strategy and deployment of resources.

[33] *Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, NTOWRP and WAMOPRA.*

[34] *Remote islands and ecologically sensitive locations will have reduced personnel numbers to reduce impacts from clean-up operations (Refer to Section 13.4.1)*

13.4 Worst-case resourcing requirements

Worst-case shoreline clean-up requirements have been determined for affected shorelines based on deterministic run #96 (MDO scenario - spill at KP114 in Darwin Harbour), which resulted in the highest volume of shoreline accumulation ≥100 g/m^2.

For the deterministic run with the predicted highest volume of hydrocarbons on any shorelines (deterministic run #96 at KP114), it is estimated that clean-up operations would require a maximum of 10 teams (110 personnel) during the peak of operations, noting that MDO is a light hydrocarbon, weathers rapidly and is difficult to clean-up on sandy beaches due to its ability to penetrate porous sediments.

Resourcing requirements for shoreline oil operations have been conservatively determined based on a manual clean-up rate of 1 m³ of oily waste per person per day. A bulking factor of 10 has been applied to manual clean-up activities (IPIECA-IOGP, 2016b). The resourcing estimate considers the size of a typical shoreline clean-up team (11 persons, comprising 1 Shoreline Clean-up Supervisor/ Incident Commander and 10 operatives).

Daily accumulation data from deterministic run #96 at KP114 has been used to inform calculations for resourcing requirements as presented in Table 13-5. Daily accumulation represents the net volume of oil remaining on the shoreline following any daily oil arrival and daily oil removed through natural processes.

Note: This does not include all possible spill scenarios and a single spill may contact other receptors and at different volumes, as presented in Section 6.3. The information presented in Table 13-5 is to demonstrate that Santos can obtain the resources to scale up to the worst-case shoreline accumulation volumes. In the event of an incident, Santos would use initial monitor and evaluate data (e.g. trajectory modelling and aerial surveillance) to determine where the available resources should be allocated for an effective clean-up response.

13.4.1 Operational and environmental considerations affecting resourcing

Tidal ranges in the EMBA are large (7–8 m) and whilst some locations predicted to be contacted within Darwin Harbour have some accessibility, much of the coastline is remote and inaccessible by road, making many shoreline clean-up techniques difficult and their use may result in greater environmental impacts than the oil itself. In addition, the remote nature, potential presence of dangerous fauna (i.e. saltwater crocodiles and Irukandji jellyfish) present significant safety risks to responders working in these environments.

Large-scale operations involving large numbers of personnel may cause adverse environmental impacts at many of these sensitive shoreline locations. The constant removal of oil, even via manual removal, can result in a removal of substrate (e.g. sand, pebbles). If intrusive clean-up is conducted frequently, over a long period and along contiguous lengths of coastline, this may result in geomorphological changes to the shoreline profile and adverse impacts to shoreline invertebrate communities that provide an array of ecosystem services (Michel et al., 2017).

Given the safety constraints and ecological sensitivities of these shorelines, shoreline clean-up operations should be conducted by smaller teams for a longer time period. Intermittent manual treatment (<20 visits/month) and use of passive recovery booms is likely to be more effective than intrusive methods (e.g. intrusive manual removal >20 visits/month). Although clean-up may take longer, it is considered that the benefits outweigh the impacts as smaller teams are more targeted, recovering more oil and less sand and debris, reducing trampling of oil into the shore profile, and minimising ecological impacts on the shorelines and their sensitive species.

The number of shoreline clean-up teams recommended to treat these shorelines (as shown in Table 13-5) is not based on extensive, intrusive and contiguous removal of oil and waste along all shorelines, but rather on the use of fewer, smaller teams and at lower frequency of visits. If shoreline based manual removal is safe and deemed advantageous by shoreline clean-up assessment teams and operational NEBA, this should be conducted via land access (if possible) or via suitable vessels. However, it should be noted that it is generally not feasible to move response equipment into and out of mangroves, tidal flats and delta environments without causing excessive damage. Even foot traffic must be minimised, either by laying down wooden walkways or relying on vessel-based activities as much as possible (API, 2020). Santos has considered the access limitations, safety issues and number of clean-up teams that may be able to operate in each of these environments. A summary of these findings is presented below.

Table 13-5: Requirements for shoreline clean-up for priority protection areas based on deterministic run #96 (MDO scenario - spill at KP114 in Darwin Harbour) (RPS, 2024)

Time (day)	Volume of oil ashore (m^3) at PPAs predicted to be contacted by run #96^	Potential maximum waste generated (m^3/week) – bulking factor of 10†	Number of shoreline clean-up teams recommended (max 10 personnel/ team)	Maximum volume collected (m^3/ week) by teams
	Darwin Harbour			
2	153	1,530	10	700
7	147	1,470	10	700
14	139.5	1,395	10	700
21	133	1,330	10	700
30	125.9	1,259	10	700*

^ Daily accumulation represents the predicted net volume of oil remaining on the shoreline following any daily oil arrival and daily oil removed through natural processes. It does not account for the volume of oil that may be removed by shoreline clean-up teams.

† It will not be possible to remove the maximum waste volume from the shorelines within the first few weeks – teams to remove in subsequent weeks.

** Teams to be retained following day 30 to help remove remaining volume of hydrocarbons that have not weathered or been removed by the previous weeks' clean-up activities.*

13.5 Shoreline clean-up decision guides

To help with planning, Appendix K provides guidance for selecting appropriate shoreline response strategies based on shoreline sensitivities.

Operational guidelines for shoreline response activities including worksite preparation, manual and mechanical oil removal and vessel access for remote shorelines are included in Appendix L.

The WA (DoT) Incident Management Plan – Marine Oil Pollution (WA DoT, 2023) also provides guidance on shoreline clean-up techniques.

13.6 Environmental performance

Table 13-6 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 13-6: 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 [EPS ID]**	**Measurement criteria**
Shoreline Clean-Up	**Response preparedness**		
	Access to shoreline clean-up equipment and personnel	[EPS-SCU-001] Access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG maintained throughout activity	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG Arrangements
	Access to Santos shoreline clean-up personnel	[EPS-SCU-002] Santos personnel available as per Table 13-3	Santos oil spill response team database
	Access to vessels suitable for remote island transfers of equipment, personnel and waste	[EPS-SCU-005] MSAs with multiple vessel providers maintained throughout activity	MSAs with multiple vessel providers Vessel details show suitability
	Vessel requirements for offshore island shoreline clean-up operations are identified	[EPS-SCU-006] Maintenance of vessel specification for remote island shoreline clean-up operations	Vessel Specifications within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Access to shoreline clean-up labour hire personnel	[EPS-SCU-003] Maintenance of contract with labour hire provider	Labour hire contract
	Onboarding procedure to access shoreline clean-up labour hire personnel	[EPS-SCU-004] Maintenance of an onboarding procedure for oil spill response labour hire	Onboarding procedure
	Response implementation		
	First-strike capability mobilised	[EPS-SCU-007] First strike is mobilised in accordance with details and timings as specified in Table 13-4 unless directed otherwise by the Control Agency	Incident Log
	IMT and Control Agency to agree protection priorities	[EPS-SCU-012] Santos IMT to confirm protection priorities in consultation with the Control Agency	IAP 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 [EPS ID]**	**Measurement criteria**
	Prepare operational NEBA to determine if shoreline clean-up activities are likely to result in a net environmental benefit	[EPS-SCU-013] Records indicate operational NEBA completed prior to shoreline activities commencing. Operational NEBA to be undertaken each operational period. Ensure NEBA considers waste management and the possibility of secondary contamination	Operational NEBA Incident Log IAP
	IAP Shoreline Clean-up Sub-plan is developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-015] IAP Shoreline Clean-up Sub-plan including waste management is developed to provide oversight and management of shoreline clean-up operation	Incident Log IAP Shoreline Protection and Deflection Sub-plan
	Shoreline clean-up operations will be implemented under the direction of the Control Agency to ensure effective and coordinated execution	[EPS-SCU-008] Clean-up strategies will be implemented under the direction of the Control Agency. Santos will make resources available to the Control Agency.	Incident Log
	Santos AMOSC Core Group responders available to the Control Agency for shoreline clean-up positions.	[EPS-SCU-016] Santos will make available AMOSC Core Group responders, or other appropriately trained responders, for shoreline clean-up team positions to the Control Agency.	Incident Log
	Equipment for shoreline clean-up made available to the Control Agency from Santos, AMOSC and OSRL stockpiles	[EPS-SCU-017] Santos will make available to the Control Agency equipment from AMOSC and OSRL stockpiles	Incident Log
	NEBA included in development of following operational period IAP	[EPS-SCU-014] Effectiveness of shoreline clean-up to be evaluated by team leaders and reported to IMT for inclusion in NEBA. 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 IAP	IAP Incident Log
	Access plans are developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-018] Access plans for shoreline operations will be developed. Unless directed otherwise by the Control Agency, Access plans will prioritise use of existing roads and tracks, establish demarcation zones to protect sensitive areas and select vehicles appropriate to conditions	IAP demonstrates requirement is met
	Soil profile assessment is undertaken prior to earthworks to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-020] Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks	Soil Profile Assessment IAP 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 [EPS ID]**	**Measurement criteria**
	Pre-cleaning and inspection of equipment (quarantine) is undertaken to minimise environmental impacts from response on offshore islands	[EPS-SCU-021] Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands	Quarantine documentation IAP Incident Log
	If spill response activities overlap with potential areas of cultural significance, a Heritage Advisor will be engaged	[EPS-SCU-022] In consultation with the Control Agency, engage a Heritage Advisor to provide advice on any sites of cultural significance that may be affected directly by the spill, or indirectly through implementation of spill response measures	Documented in IAP Incident Log
	Select forward staging areas in consultation with the Control Agency	[EPS-SCU-023] Any establishment of forward staging areas at shoreline areas done under direction or in consultation with the Control Agency	Incident Log IAP
	Establish demarcation zones in sensitive areas	[EPS-SCU-024] Unless directed otherwise by the Control Agency, demarcation zones are mapped out in sensitive habitat areas for vehicle and personnel movement, considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	IAP demonstrates requirement is met
	Operational restrictions of vehicle and personnel movement are established to limit erosion and compaction	[EPS-SCU-019] Unless directed otherwise by the designated Control Agency, operational restrictions on movement of personnel and vehicles, including vehicle types and traffic volumes, are established to minimise impacts from erosion and compaction	IAP demonstrates requirement is met
	Stakeholder consultation for deployments in coastal areas	[EPS-SCU-025] Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas	Consultation records

14. Oiled wildlife response

Note: The NT Control Agency is the Control Agency, and the NT DEPWS is the Jurisdictional Authorities for OWR within NT waters. Santos and AMSA are the Control Agencies for OWR within Commonwealth waters from facility and vessel spills respectively.

Table 14-1 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 14-1: Oiled wildlife response – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement tactics in accordance with the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife
Initiation criteria	Monitor and evaluate information and/or operational monitoring data shows that wildlife are contacted or are predicted to be contacted by a spill
Termination criteria	• Oiling of wildlife has 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

14.1 Overview

The short-term effects of hydrocarbons on wildlife may be direct such as the external impacts from coating or internal effects from ingestion and inhalation. OWR includes wildlife surveillance/reconnaissance, wildlife hazing, pre-emptive capture, and the capture, cleaning, treatment, and rehabilitation of animals that have been oiled. In addition, it includes the collection, post-mortem examination, and disposal of deceased animals that are found in the vicinity of an oil spill or are reasonably suspected of having succumbed to the effects of oiling.

Long-term effects of a spill on wildlife may be associated with loss/degradation of habitat, impacts to food sources, and impacts to reproduction. An assessment of such impacts is covered in Section 7.5.7 of the OEMP and post-spill via scientific monitoring (Section 16).

Table 14-2 provides guidance on the designated Control Agency and Jurisdictional Authority for OWR in Commonwealth and Territory waters. For a petroleum activity spill in Commonwealth waters, Santos act as the Control Agency and will be responsible for the wildlife response. The Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) will be referred to for guidance for coordinating an OWR when Santos is the Control Agency and for the OWR first-strike response, otherwise the relevant Territory OWR Plan will be referred to, as described below.

14.1.1 Northern Territory waters and shorelines

The NTOWRP (AMOSC, 2019) is the key plan for OWR in the NT and provides operational OWR guidance during an incident resulting from a marine-based hydrocarbon spill due to petroleum activities within the NTOWRP area of operation. The NTOWRP is primarily designed to be used by the Titleholder as an operational OWR plan, but the plan also aims to provide operational guidance to any relevant government and non-government agencies located throughout the NTOWRP area of operation. The plan was developed by AMOSC and was commissioned by Shell Australia, ConocoPhillips and INPEX, and is consistent with regional OWR plans produced by AMOSC, DBCA (WA) and the Department for Environment and Water (DEW), South Australia (SA) (AMOSC, 2019).

The Parks and Wildlife Commission of the Northern Territory (PWC) is the Territory Government agency responsible for administering the *Parks and Wildlife Commission Act 2013*, which has provisions for the protection, conservation and sustainable use of wildlife. For Level 1 spills in Territory waters, Santos will be the Control Agency, including for wildlife response. For Level 2/3 petroleum activity spills, Santos will conduct the initial first-strike response actions for wildlife and continue to manage those operations until the relevant NT Control Agency is activated as the lead agency for OWR and a formal handover occurs. Following formal handover, Santos will function as a support organisation for the OWR and will be expected to continue to provide planning and resources as required when requested by the relevant NT Control Agency for OWR.

Table 14-2: Jurisdictional and Control Agencies for oiled wildlife response

Jurisdictional boundary	Spill source	Jurisdictional Authority for OWR	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (3–200 nautical miles from territorial/state sea baseline)	Vessel	DCCEEW	AMSA		WAOWRP (DBCA, 2022a) WA OWR Manual (DBCA, 2022b)
	Petroleum activities		Titleholder		
NT waters (territorial sea baseline to 3 nautical miles and some areas around offshore atolls and islands)	Vessel	NT DEPWS	Vessel owner	NT IMT	NTOWRP (AMOSC, 2019)
	Petroleum activities		Titleholder[35]	NT IMT[36]	

14.2 Wildlife priority protection areas

For planning purposes, determining wildlife priority protection areas is based on stochastic modelling of the worst-case spill scenarios, the known presence of wildlife, and in consideration of the:

- presence of high densities of wildlife, threatened species, and/or endemic species with high site fidelity
- greatest probability and level of contact from floating oil and/or shoreline accumulation
- shortest timeframe to contact.

The wildlife priority protection areas for Barossa GEP Operations (NT waters) activities are outlined in Table 14-3 and align with the priority protection sites for spill response described in Section 6.6.

Depending on the timing of a potential hydrocarbon spill, certain species could be more impacted because of key seasonal biological activities such as breeding, mating, nesting hatching or migrating.

In Darwin Harbour there is low turtle nesting activity given there is limited suitable nesting beaches compared to other areas along the NT coastline (Chatto and Baker 2008). Low levels of turtle nesting have been recorded at Casuarina, Wagait and Mandorah Beaches (Chatto and Baker 2008; Pendoley Environmental 2023). Conversely, the Darwin area supports a high diversity of migratory shorebirds (Lilleyman 2016). Surveys of multiple sites within the Darwin Harbour region have documented 25 different migratory shorebird species. These birds typically start arriving in Darwin during August, with their numbers reaching their highest levels in September, October, and November. The northward migration begins in February and March, when the shorebirds commence their departure from the area (Lilleyman 2016).

Table 14-3: Wildlife priority protection areas

Wildlife priority protection area	Key locations	Key wildlife	Reference
Darwin Harbour (Including East Arm, West Arm and Wickham Point)	Lee Point to Tree Point Buffalo Creek Charles Darwin National Park	• Great Knot (*Calidris tenuirostris*), Greater Sand Plover (*Charadrius leschenaultii*), Bar-tailed Godwit (*Limosa lapponica*), Siberian Sand Plover (*Charadrius mongolus*), Red-necked Stint (*Calidris ruficollis*), various other shorebirds	Chatto (2003) Lilleyman (2016) AMOSC (2019)
	-	• Australian Snubfin Dolphin (*Orcaella heinsohni*) • Indo-Pacific Humpback Dolphin (*Sousa chinensis*) • Indo-Pacific/ Spotted Bottlenose Dolphin (*Tursiops aduncus*)	Groom et al. (2017) Griffiths et al. (2020)
	Casuarina Beach Lee Point Weed Reef	• Dugong (*Dugong dugon*)	(Cardno, 2015)
	Casuarina Beach Cox Peninsula Mandorah Beach	• Flatback Turtle (*Natator depressus*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*) and Olive Ridley Turtle (*Lepidochelys olivacea*)	Whiting (2003) AMOSC (2019)

[35] *Titleholder will be the control agency but will request approval of IAPs from the NT IC.*

[36] *NT IMT will be the control agency but will be supported by the titleholder (additional support from AMOSC if required).*

Wildlife priority protection area	Key locations	Key wildlife	Reference
	East Point Reserve Rapid creek Lee Point		Pendoley Environmental (2023)
	Common throughout Darwin Harbour	• Saltwater Crocodile (*Crocodylus porosus*)	Fukuda and Cuff (2013) DEPWS (2021)

14.3 Magnitude of wildlife impact

Given the distribution and behaviour of wildlife in the marine environment, a spill which does not result in shoreline contact is likely to result in limited opportunities to rescue wildlife. In such instances, continued wildlife reconnaissance, carcass recovery, sampling of carcasses that cannot be retrieved and scientific monitoring are more likely to be the focus of response efforts. In contrast, a spill which results in shoreline accumulation is likely to result in far greater wildlife impacts and opportunities to rescue wildlife.

The stochastic modelling for the worst-case spill scenarios for Barossa GEP Operations (NT waters) activities predicts that the greatest accumulation of oil could potentially occur along the shorelines of Darwin Harbour (East Arm, West Arm and Wickham Point) (Section 6.3); if shoreline impact occurs, it is predicted that medium to high wildlife impacts are possible (using the WAOWRP [DBCA, 2022a] Guide for Rating the Wildlife Impact of an Oil Spill [Table 14-4]).

Table 14-4: WAOWRP guide for rating the wildlife impact of an oil spill (DBCA, 2022a)

Wildlife impact rating	Low	Medium	High
What is the likely duration of the wildlife response?	<3 days	3–10 days	>10 days
What is the likely total intake of animals?	<10	11–25	>25
What is the likely daily intake of animals?	0–2	2–5	>5
Are threatened species, or species protected by treaty, likely to be impacted, either directly or by pollution of habitat or breeding areas?	No	Yes – possible	Yes – likely
Is there likely to be a requirement for building primary care facility for treatment, cleaning and rehabilitation?	No	Yes – possible	Yes – likely

14.4 Implementation guidance

Refer to Section 6 of the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for guidance on the tasks and responsibilities that should be considered when implementing an OWR when Santos is the Control Agency or before formal handover to the relevant Control Agency. The OWR First Strike Implementation Guide within the Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) includes:

- Record keeping
- Situational awareness
- Activation of Santos IMT Wildlife Branch
- Notifications
- Santos Oiled Wildlife Rapid Assessment Teams (RATs)
- Wildlife Reconnaissance
- Santos Oiled Wildlife Sample Collection Protocol
- Mobilisation of required resources
- Handover to external Control Agency (if relevant).

The OWR first-strike plan will focus on notifications, wildlife reconnaissance and response preparation (refer to Section 6.1 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]). Refer to Table 14-5 for an indicative timeframe for the OWR first-strike response and Appendix M for resource capability. Preventive actions, such as hazing, along with capture, intake and treatment require a higher degree of planning, approval

(licences) and skills and will be planned for and carried out under the wildlife portion of the IAP (refer to Section 6.2 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]).

Table 14-5: Oiled wildlife response – first-strike response timeline

Task	Time from oiled wildlife contact (predicted or observed)
IMT notifies regulatory authorities and AMOSC of oiled wildlife / potential for contact	<2 hours
Mobilise Santos personnel for oiled wildlife reconnaissance **this will be already occurring through Aerial Observer mobilisation**	<24 hours
Mobilisation of AMOSC oiled wildlife equipment and industry OWR team to forward staging area	<48 hours
Minimum resource requirements	
The requirements for OWR will be situation-specific and depend upon reconnaissance reports. First-strike resources: • Reconnaissance platforms (Refer to Santos Oiled Wildlife Framework Plan [7700-650-PLA-001] and Appendix M) • 6 trained industry OWR team personnel (AMOSC staff and contractors/ AMOSC Industry OWR group) Additional resources: • Refer to Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) • Refer to Appendix M for information on OWR capability and equipment	

14.5 Environmental performance standards

Table 14-6 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 14-6: Environmental performance – oiled wildlife response

Environmental performance outcome	Implement tactics in accordance with Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
OWR	**Response preparedness**		
	Access to OWR equipment and personnel	[EPS-OWR-001] Access to OWR equipment and personnel through Santos, AMOSC, AMSA National Plan and OSRL maintained throughout activity as per Appendix M	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract.
			OSRL Associate Member Contract.
	Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)	[EPS-OWR-005] Santos Oiled Wildlife Response Framework Plan provides guidance for coordinating an OWR when Santos is the Control Agency and outlined Santos's response arrangements	Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) Revision records
	Access to labour hire personnel	[EPS-OWR-003] Maintenance of contract with labour hire provider	Labour hire contract
	Labour hire onboarding procedure to access labour hire personnel	[EPS-OWR-004] Maintenance of an onboarding procedure for oil spill response labour hire	Onboarding procedure
	Access to Santos-trained OWR personnel	[EPS-OWR-002] Maintain Santos personnel trained on OWR and positioned at Perth and VI	Training records
	Response implementation		
	First strike capability mobilised	[EPS-OWR-006] First strike is mobilised in accordance with details and timings as specified in	Incident log

Environmental performance outcome	Implement tactics in accordance with Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
		Table 14-5 unless directed otherwise by relevant Control Agency	
	OWR Management	[EPS-OWR-007] OWR managed in accordance with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017)	Incident log
	Prepare operational NEBA prior to operations commencing	[EPS-OWR-008] Prepare operational NEBA to determine magnitude of wildlife impact and determine if OWR activities are likely to result in a net environmental benefit (particularly in relation to hazing and pre-emptive capture)	IAP Incident log
	IAP OWR Sub-plan developed, including waste management, to provide oversight and management of OWR operations	[EPS-OWR-009] IAP OWR Sub-plan is developed to ensure effective, coordinated execution with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017) and minimise environmental impacts from response	Incident log indicates IAP OWR Sub-plan prepared prior to OWR operations commencing
	Oiled Wildlife Sample Collection Protocol	[EPS-OWR-010] Oiled wildlife sample collection carried out in accordance with the Santos Oiled Wildlife Sample Collection Protocol	Incident log

15. Waste management

Table 15-1 lists the environmental performance outcome and initiation and termination criteria for this strategy.

Table 15-1: Waste management – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible	
Initiation criteria	Response activities that will be generating waste have been initiated	
Applicable hydrocarbons	**MDO**	
	✓	
Termination criteria	• 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	

15.1 Overview

The implementation of some spill response strategies will generate solid and liquid waste that will require rapid management, storage, transport and disposal. It is important that waste is collected and removed efficiently to ensure waste management does not create a bottleneck in response operations.

The type and amount of waste generated during a spill response will vary depending on the spill type/characteristics, volume released, and response strategies implemented. To account for this potential variability, waste management (including handling and capacity) needs to be scalable to allow a continuous response to be maintained.

Where Santos is the Control Agency, or at the request of the designated Control Agency, Santos will engage its contracted waste service provider (WSP) to provide sufficient waste receptacles to store collected waste and manage oily waste collection, transport and disposal associated with spill response activities. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to licensed waste management facilities. All transport will be undertaken via controlled-waste-licensed vehicles and in accordance with the *Waste Management and Pollution Control Act 1998* (NT). Santos' Oil Pollution Waste Management Plan (BAA-201_0027) provides detailed guidance to the WSP in the event of a spill in its Northern Australia operational areas.

15.2 Implementation guidance

Table 15-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. The Incident Commander is ultimately responsible for implementing the response, and therefore may determine that some tasks be varied, reassigned, or not be implemented.

Table 15-2: Implementation guidance – waste management

Action		Consideration	Responsibility	Complete
Initial actions	Contact WSP (Primary or Secondary Contact Person) and activate Waste Project Manager.	Refer to Incident Response Telephone Directory (7700-650-PLA-0016.20) for contact details.	Logistics Section Chief	☐
	Based on operational modelling and applicable response strategies communicate the type and quantity of empty liquid and solid waste receptacles required to support planned operations.	It is better to overestimate volumes and scale back resources then to underestimate waste volumes.	Logistics Section Chief Planning Section Chief	☐
	Using most recent monitor and evaluate data and any existing and future response activities, determine most suitable locations for waste receptacles to be positioned and for temporary storage locations to be established.	Shoreline waste collection points (temporary storage site) will be determined by the relevant Control Agency and will depend upon the location of shoreline clean-up activities and staging areas and the availability of vehicle access routes. Consideration would be given to positioning receptacles and locating temporary storage sites to ensure secondary contamination of sensitive receptors is avoided or minimised. The approval of temporary storage sites would be given through the NT DEPWS via the NT Environment Protection Authority for the NT jurisdiction.	Logistics Section Chief Planning Section Chief Environmental Unit Leader	☐
	For each receival location indicate the anticipated: • material types • material generation rates • material generation quantities • commencement date/time • anticipated clean-up duration • receptacle types required • logistical support requirements • any approvals required from Ports, Local Governments, Landowners, Territory Government Agencies (Refer to Oil Pollution Waste Management Plan (BAA-201_0027)).	Consider facilities for waste segregation at source.	Logistics Section Chief Planning Section Chief	☐
	Once the above information is obtained, ensure all necessary waste management information is included in the IAP.	Waste management should be done in accordance with Santos' Oil Pollution Waste Management Plan (BAA-201_0027); and where relevant, the *Waste Management and Pollution Control Act 1998* (NT); the respective Port, Port Operator and/or Ship Owner's waste management plan.	Logistics Section Chief (or delegate) Planning Section Chief WSP location Responsible Person or Operations Supervisor	☐
	Mobilise waste management resources and services to agreed priority locations.	-	WSP location Responsible Person or Operations Supervisor Logistics Section Chief	☐

Action		Consideration	Responsibility	Complete
Ongoing actions	Provide ongoing point of contact between IMT and WSP.	If NT IMT is the Control Agency then the NT IMT shall advise the point of contact between them and the WSP.	Logistics Section Chief	☐
	Ensure all waste handling, transport and disposal practices comply with legislative requirements.	Alert Logistics Section Chief (or delegate) if any non-compliance is anticipated or detected. Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (BAA-201_0027); and where relevant, the *Waste Management and Pollution Control Act 1998* (NT); the respective Port, Port Operator and/or Ship Owner's waste management plan.	WSP location Responsible Person or Operations Supervisor	☐
	Ensure records are maintained for all waste management activities, including but not limited to: • waste movements (e.g. types of receptacles, receival points, temporary storage points, final disposal locations) • volumes generated at each site (including total volume and generation rates) • types of waste generated at each site • approvals obtained (as required).	-	WSP location Responsible Person or Operations Supervisor	☐

15.3 Waste approvals

Site clean-up and removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (BAA-201_0027); and where relevant, the *Waste Management and Pollution Control Act 1998* (NT), and the respective port, port operator and/or ship owner's waste management plan. In addition, regulatory approval may be required for the temporary storage, transport, disposal and treatment of waste, through the NT Environment Protection Authority (EPA).

Whilst DEPWS administers the *Waste Management and Pollution Control Act 1998* (NT), the EPA is the relevant regulatory Authority for waste management approvals in the NT. The relevant Santos Oil Pollution Waste Management Plan (BAA-201_0027) provides detail on the regulatory requirements for each port/location likely to be used for waste management during any spill response operation associated with Santos' activities.

15.4 Waste service provider capability

Detailed guidance on Santos' WSP responsibilities for spill response waste management is provided in the Santos Oil Pollution Waste Management Plan (BAA-201_0027).

Key responsibilities of the WSP include:

- Maintain emergency response standby preparedness arrangements, including:
  - 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 exercises undertaken by Santos.
- Maintain 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 (managing personnel and equipment, reporting, liaising with relevant field-based spill responders).

15.5 Waste management resource requirements

The quantity of waste produced from a spill is influenced by several factors, principally the quantity spilt, the environmental fate and the clean-up strategy. Spills requiring shoreline clean-up generally create larger volumes of waste, significantly exceeding the original volume spilt.

Santos has access to capacity via its waste services provider to deliver storage receptacles, remove, transport and dispose of all waste material from oil spill response activities to disposal points.

The worst credible spill modelling results for Barossa GEP Operations (NT waters) activities indicates a maximum 60% probability of shoreline accumulation ≥100 g/m^2 across a maximum length of 11 km of shoreline, with a maximum accumulation volume along this shoreline of 152 m^3. Based on a spill to waste volume of ten, a maximum of 1,530 m^3 of waste could be generated as a result of the worst credible spill scenario, not accounting for weathering (refer to Table 13-5). Table 15-3 lists waste service provider capability for waste removal and storage, demonstrating the waste management capability exceeds the predicted waste generated from a worst-case scenario for this activity.

The waste products are likely to be transported by vessel from the response location to Darwin Port. Waste will be transported from Darwin Port to licensed waste disposal facilities by a dedicated waste contractor.

Table 15-3: NT waste service provider vehicle and equipment availability within Australia (as per Santos Waste Management Plan – Oil Spill Response Support [BAA-201_0027])

Plant and equipment	No. / No. of containers per week	Capacity	Functionality	Uses per week	Indicative waste stored/shifted per week (m^3)
Waste removal					
Oily waste					
Hook Lift Truck	3	Lift up to 10 tonne, 11.6 m^3 per service	Servicing of skip bins	6	208
Hook Lift Truck	6		Servicing of skip bins	7	487
Front Lift Trucks	3	28 m^3 body, 11.2 m^3 per service	Servicing of front lift bins	6	201
Front Lift Trucks	6		Servicing of front lift bins	7	470
Flat Bed Truck	3	12 pallet spaces, 14 m^3 per service	Servicing of bins	6	252
Flat Bed Truck	4		Servicing of bins	7	392
Liquid waste (storage and/or removal)					
Waste collection vessel	2	20 kL	On-board liquid waste storage tank (decanting capability)	1	400
Road tanker	2	25 kL	Collection of liquid waste at the port of reception	1	500
Waste storage					
Oily waste					
Mobile Garbage Bin (MGB)	46	660 L	Various waste streams	6	182 (36.4 @ 5:1 compacted)
Mobile Garbage Bin (MGB)	56	660 L	Various waste streams	7	259 (51.7 @ 5:1 compacted)
Front Lift Bin	15	3 m^3	Various waste streams	6	270 (54 @ 5:1 compacted)
Front Lift Bin	15	3 m^3	Various waste streams	7	315 (63 @ 5:1 compacted)
Marrel Skip Bin	6	6 m^3	Various waste streams	6	216
Marrel Skip Bin	12	6 m^3	Various waste streams	7	504
Liquid waste					
Liquid waste IBCs	24	1	Storage of liquid waste on site	7	168
Forklift	2	4 tonne	All areas	Continuous	
Weekly waste storage capacity					**1,746**
Weekly waste removal capacity					**2,010**
Weekly liquid oil removal capacity					**900**

15.6 Environmental performance

Table 15-4 lists the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 15-4: Environmental performance – waste management

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible		
Response strategy	**Control measures**	**Performance standards [EPS ID]**	**Measurement criteria**
Waste management	**Response preparedness**		
	Access to waste management equipment, personnel, transport and disposal facilities	[EPS-WM-001] Waste management sourced through contract with waste service provider. Contract with waste service provider to be maintained throughout activity.	Contract with WSP for emergency response services Annual desktop assurance report.
	Access to vessels for waste transport	[EPS-WM-002] MSAs with multiple vessel providers maintained throughout activity	MSAs with vessel providers
	Vessels requirements for containment and recovery waste transport are identified	[EPS-WM-003] Maintenance of vessel specification for waste storage and transport vessels for containment and recovery	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response implementation		
	Oil Pollution Waste Management Plan (BAA-201_0027)	[EPS-WM-004] WSP shall: • Appoint a Project Manager within 24 hours of activation • Track all wastes from point of generation to final destination • Provide monthly waste management reports and more regular situation reports during the response until termination criteria are met	Incident log Waste tracking records
		[EPS-WM-007] WSP to provide 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

16. Operational and scientific monitoring

OSM is a key component of the environmental management document framework for offshore petroleum activities, which includes activity EPs / OEMPs and OPEPs. Operational monitoring is instrumental in providing situational awareness of a hydrocarbon spill, enabling the IMT to mount a timely and effective spill response and continually monitor the effectiveness of the response. Scientific monitoring is also the principal tool for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and for informing resultant remediation activities.

Santos has developed a Northern Australia OSM-BIP (7715-650-ERP-0003), which describes a program of monitoring oil pollution that will be adopted in the event of a hydrocarbon spill incident (Level 2–3) to marine waters. It aligns with the Joint Industry Operational and Scientific Monitoring Framework (APPEA, 2021) and describes how this Framework applies to Santos activities and spill risks for the geographic extent of the Northern Australia OSM-BIP (7715-650-ERP-0003). The relationship between the Joint Industry OSM Framework and Santos environmental management framework is illustrated in Figure 16-1.

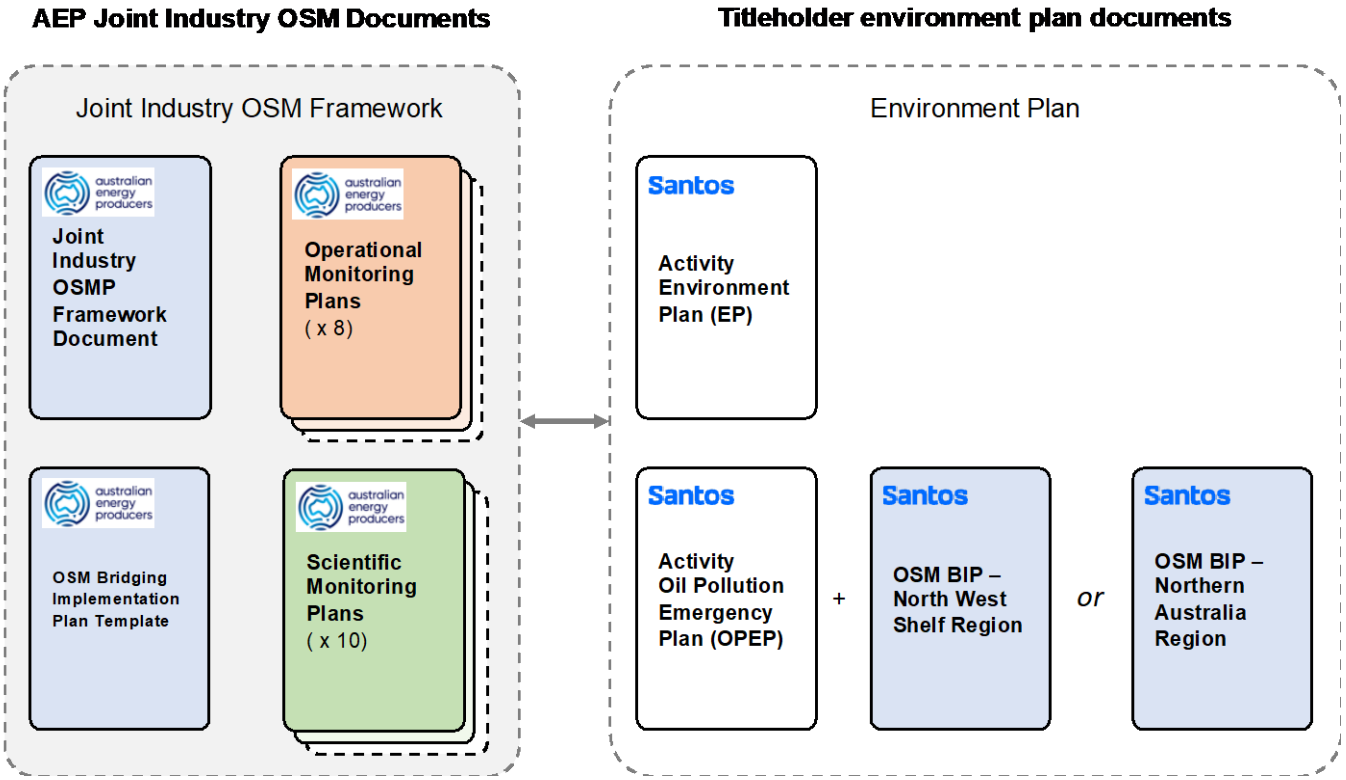

Figure 16-1: Relationship of Joint Industry and Titleholder OSM documentation

The Northern Australia OSM-BIP is structured so that it can provide a flexible framework that can be adapted to individual spill incidents. A series of Operational Monitoring Plans (OMPs) and Scientific Monitoring Plans (SMPs) form part of the Joint Industry OSM Framework and provide detail on monitoring design, standard operating procedures, data management, quality assurance and quality control and reporting.

There are 2 types of monitoring that would occur following a Level 2–3 spill event:

- **Operational Monitoring (OM** – which is undertaken during the course of the spill and includes any physical, chemical and biological assessments that may guide operational decisions such as selecting the appropriate response and mitigation methods and/or to determine when to terminate a response activity. This monitoring is additional to the activities (aerial/vessel surveillance, tracking buoys, oil spill trajectory modelling and satellite tracking) performed as part of the Monitor and Evaluate Strategy (Section 10). The design of operational monitoring requires judgements to be made about scope, methods, data inputs and outputs that are specific to the individual spill incident, balancing the operational needs of the response with the logistical and time constraints of gathering and processing information. Information needs to be collected and processed rapidly to suit response needs, with a lower level of sampling and accuracy needed than for scientific purposes. For details on initiation and termination criteria for OMPs refer to the Northern Australia OSM-BIP (7715-650-ERP-0003).
- **Scientific Monitoring (SM)** – which can extend beyond the termination of response operations. Scientific monitoring has objectives relating to attributing cause-effect interactions of the spill or associated response with changes to the surrounding environment. SM will be conducted on a wider study area, extending beyond the

spill footprint, will be more systematic and quantitative, and aim to account for natural or sampling variation. For further details on the SMPs refer to the OSM-BIP.

Table 16-1 lists the Joint Industry OMPs and SMPs that are relevant to Santos' Barossa GEP Operations (NT waters) activities.

The Northern Australia OSM-BIP (7715-650-ERP-0003) is tailored to Santos' activities in the Northern Australia Region. It includes details on priority locations for monitoring, resourcing requirements; and operational guidance including logistics, mobilisation and permitting; with the exception of capability requirements for OMP: Shoreline Clean-up Assessment. The capability requirements for OMP: Shoreline Clean-up Assessment are typically assessed for each activity, according to deterministic modelling for the worst-case scenario. Resourcing requirements for OMP: Shoreline Clean-up Assessment for the Barossa GEP Operations (NT waters) activity are provided in Appendix O.

The capability assessment for the remaining OMPs and SMPs is assessed against different deterministic modelling criteria, as described in the Northern Australia OSM-BIP (7715-650-ERP-0003). The Northern Australia OSM-BIP describes the methodology for assessing the worst-case OSM capability requirements for Santos activities in this region. In summary, Santos assessed the worst-case spill scenario for OSM capability as the scenario contacting the most receptors at the low thresholds at a probability >5% and within 7 days. Santos confirms that all the Barossa GEP Operations (NT waters) spill scenarios (Section 6.1) fit within the OSM combined EMBA and assessment criteria defined within Appendix A of the Northern Australia OSM-BIP (7715-650-ERP-0003). Further, receptors contacted are all included within the baseline priority list in Section 2.2 of the Northern Australia OSM-BIP (7715-650-ERP-0003). This assessment is detailed in Appendix N.

Santos will review the initiation criteria for OMPs and SMPs (provided in Table 9-1 [OMPs] and Table 9-2 [SMPs] of the Joint Industry Operational and Scientific Monitoring Framework (APPEA, 2021)) during the preparation of the initial IAPs, and subsequent IAPs. If any initiation criteria are met, then that relevant OMP and/or SMP will be activated via the OSM Services Provider.

Table 16-1: Joint industry OSM plans relevant to Barossa GEP Operations (NT waters)

Operational monitoring	Relevant for Barossa GEP Operations (NT waters)	Scientific monitoring	Relevant for Barossa GEP Operations (NT waters)
Hydrocarbon Properties and Weathering Behaviour at Sea	✓	Water Quality Impact Assessment	✓
Water Quality Assessment	✓	Sediment Quality Impact Assessment	✓
Sediment Quality Assessment	✓	Intertidal and Coastal Habitat Assessment	✓
Surface chemical dispersant effectiveness and fate assessment	×	Seabirds and Shorebirds Assessment	✓
Subsea chemical dispersant effectiveness and fate assessment	×	Marine Mega-fauna Assessment	✓
Rapid Marine Fauna Surveillance	✓	Benthic Habitat Assessment	✓
Shoreline Clean-up Assessment	✓	Marine fish and elasmobranch assemblages assessment	✓
Air quality modelling	✓	Fisheries Impact Assessment	✓
-	-	Heritage Features Assessment	✓
-	-	Social Impact Assessment	✓

16.1 Environmental performance

Table 16-2 lists the environmental performance outcome, control measures, performance standards and measurement criteria for OSM.

Table 16-2: Environmental performance – operational and scientific monitoring

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and 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**
	Response preparedness		
OSM – Preparedness	Maintenance of OSM Services Provider contract	[EPS-OSM-002] Maintain contracts with third-party provider/s to provide access to suitably qualified and competent personnel and equipment to assist in the implementation of monitoring	Contract with OSM Services Provider
	OSM Services Provider capability verified through regular capability reporting	[EPS-OSM-003] Obtain monthly capability reports from OSM Services Provider to demonstrate suitable resources are available throughout the activity	Monthly capability reports from OSM Services Provider
	Adequacy of existing baseline data sources across the Santos combined EMBA reviewed periodically	[EPS-OSM-004] Regular review of existing baseline data	Baseline data review report
	Water quality monitoring vessels	[EPS-OSM-006] Maintenance of vessel specification for water quality monitoring vessels within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Vessel specification
	Access to Santos oil sampling kits	[EPS-OSM-001] Oil sampling kits pre-positioned at Darwin. Equipment contents as per the Appendix C of the Santos Oil and Water Sampling Procedures (7710-650-PRO-0008)	Evidence of deployment to site
	OSM Services Provider testing and exercising	[EPS-OSM-005] Annual testing of OSM Services Provider arrangements and capability	Exercise and testing records
	OSM-BIP reviewed annually	[EPS-OSM-030] Annual review of OSM-BIP	Record of revision
	Pre-completed risk assessment for OSM activities	[EPS-OSM-016] Pre-completed and approved risk assessment is in place with the OSM Services Provider for OSM activities	OSM Services Provider pre-completed and approved risk assessment
	Response implementation		
OSM – Activation and Mobilisation	Activate OSM plans	[EPS-OSM-010] OMPs and SMPs will be activated in accordance with the initiation criteria provided in Table 9-1 and 9-2 of the	IAP and Incident Log confirm OMPs and SMPs are activated in accordance with the initiation criteria provided in Table 9-1 and 9-

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and 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**
		Joint Industry OSM Framework (APPEA, 2021)	2 of the Joint Industry OSM Framework (APPEA, 2021)
	Activation of OSM plans according to OMPs and SMPs initiation criteria	[EPS-OSM-009] Initiation criteria of OMPs and SMPs will be reviewed during the preparation of the initial IAP and subsequent IAPs; and if any criteria are met, relevant OMPs and SMPs will be activated	IAP(s); Incident log
	OSM-BIP	[EPS-OSM-025] Monitoring to be conducted in accordance with the Santos Northern Australia OSM-BIP (7715-650-ERP-0003)	Incident log; Monitoring records
	OSM implementation Minimum Standards	[EPS-OSM-026] Implementation of OSM will comply with the Minimum Standards listed in Appendix A of the Joint Industry OSM Framework (APPEA, 2021)	Incident log; Monitoring records
	OSM Services Provider to commence activation within specified time from initial notification	[EPS-OSM-011] OSM Services Provider shall commence activation process within 30 mins of initial Call-off Order Form being received from Santos	OSM Services Provider records
	Santos to provide support to OSM Services Provider	[EPS-OSM-012] Santos personnel to support OSM Services Provider through the provision of monitor and evaluate information and relative location of sensitive receptors to the spill	Incident log; OSM Services Provider records
	Mobilisation of appropriately specified monitoring vessels	[EPS-OSM-017] Source monitoring vessel(s) with specifications in accordance with Section 5.2 of Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Incident log
OSM – Water quality and dispersant amenability	Ecotoxicity testing of oil samples to take place	[EPS-OSM-007] Oil samples collected to be sent for laboratory ecotoxicity testing of oil	Incident log
	Ecotoxicity testing to derive species protection triggers	[EPS-OSM-008] 90, 95 and 99% Species protection triggers levels will be derived from ecotoxicity testing results (minimum 5 species' tests) within 24 hours of receiving all results	Ecotoxicity report from environmental contractor
	Dispersant amenability analysis of oil samples to take place	[EPS-OSM-029] If applicable (not MDO), oil samples sent to laboratory for dispersant amenability	Incident Log

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and 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**
OSM – Shoreline assessment and nearshore operations	Use of shallow draft vessels for shoreline and nearshore operations	[EPS-OSM-020] Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the relevant Control Agency	Vessel specification documentation contained in IAP
	Shoreline clean-up assessment direction and leadership	[EPS-OSM-018] OMP: Shoreline Clean-up Assessment will be implemented under the direction of the relevant Control Agency	Incident log
	SCAT Field Coordinator assessment/selection of vehicle appropriate to shoreline conditions	[EPS-OSM-021] SCAT Field Co-ordinator assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Conduct shoreline/ nearshore habitat/ bathymetry assessment	[EPS-OSM-022] Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities	IAP records Assessment records
	Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	[EPS-OSM-023] Unless directed otherwise by the designated Control Agency, 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	[EPS-OSM-024] Unless directed otherwise by the designated Control Agency, action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met
	Daily SCAT reports issued during SCAT operations	[EPS-OSM-019] Reports from OMP: Shoreline Clean-up Assessment will be provided to the IMT daily, detailing the assessed areas to maximise effective utilisation of resources	Incident log
OSM – Stand-down and termination	Stand-down, termination and post-spill activities	[EPS-OSM-027] Once post-spill SMP monitoring reports are drafted they will be peer reviewed by an expert panel	Monitoring records
	Stand-down, termination and post-spill activities	[EPS-OSM-028] OMPs and SMPs will be terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)	IAP and Incident Log confirm OMPs and SMPs are terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)

17. 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. 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
- an assessment of prevailing weather conditions that can increase risk to response teams or increase the efficacy in weathering hydrocarbon.

An operational NEBA will be conducted to inform the decision-making process. Termination criteria are defined within each section of contingency response activities defined in 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 the return of equipment
- arrange the refurbishment of consumed equipment
- investigate the cause of the incident and report to relevant authorities
- assess long-term environmental monitoring requirements.

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Appendix A Hydrocarbon characteristics and behaviour

Marine diesel oil (MDO)

MDO properties (Table A-2) classify it as Group 2 oil (light persistent) according to the AMSA (2023) and ITOPF (2024) classifications. In the marine environment, a 10% residual of the total quantity of MDO spilt will remain after the volatilisation and solubilisation processes associated with weathering. For full details on the properties of MDO, refer to Section 7.5.4 of the Barossa GEP Coastal Waters OEMP (BAS-210 0224) and Barossa GEP Internal Waters OEMP (BAS-210 0313).

In summary, in the marine environment MDO 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 MDO from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance
- Has a strong tendency to entrain into the upper water column (0 m–20 m) (and consequently reduce evaporative loss) in the presence of moderate winds (>10 knots) and breaking waves. However, it re-surfaces when the conditions calm.
- The MDO evaporation rate will increase in warmer air and sea temperatures such as those present around the area
- Diesel residues usually comprise heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

Generally, about 4.0% of the MDO mass should evaporate within the first 12 hours (Boiling point [BP] <180 °C); a further 32% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and an additional 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 10% (by mass) of MDO will not evaporate though will decay slowly over time.

Under constant winds (Figure A-3), ~36.1% of the MDO is expected to evaporate within 24 hours. Under variable winds (Figure A-4), where the winds are of greater strength on average, ~30% of the mass is predicted to evaporate, 65% is predicted to entrain and 2.6% remains on the water surface (RPS, 2024).

Table A-2: Properties of MDO (RPS, 2024)

Hydrocarbon type	Density (kg/m^3)	Dynamic viscosity at 25 °C (cP)	API	Component	Volatile (%)	Semi-volatile (%)	Low volatility (%)	Residual (%)
				BP (ºC)	<180	180–265	265–380	>380
MDO	890 at 15 °C	14.0	27.5	% of total	4	32	54	10

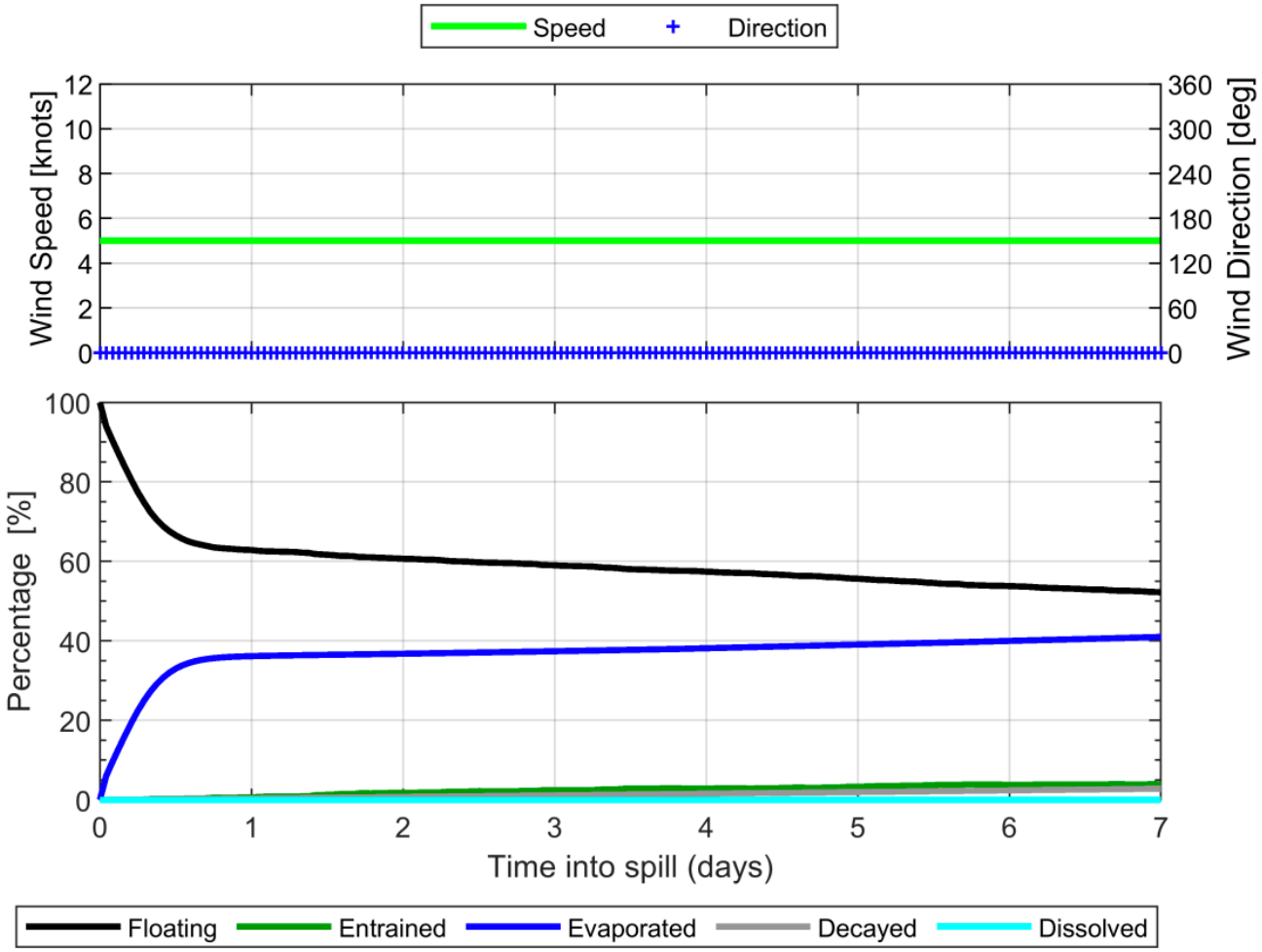


Figure A-3: Mass balance plot for an instantaneous surface release of MDO subjected to a constant 5 knot (2.6 m/s) wind, currents and 27 °C water temperature (RPS, 2024)

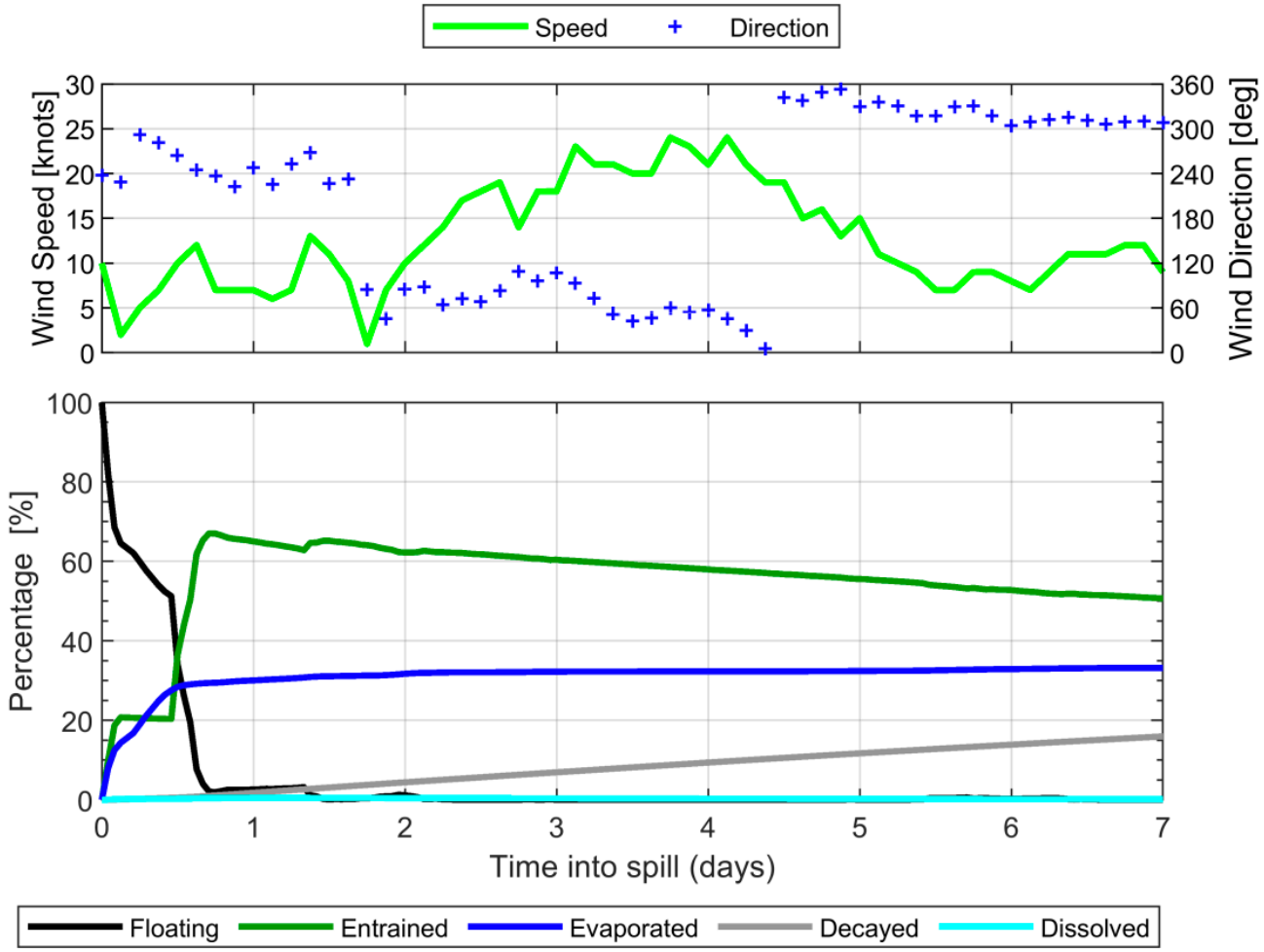


Figure A-4: Mass balance plot for an instantaneous surface release of MDO subjected to variable wind speeds (1–12 m/s or 2–23 knots), currents and 27 °C water temperature (RPS, 2024)

Appendix B Oil spill response ALARP framework & assessment

ALARP assessment framework

Rationale

As part regulatory approval requirements for petroleum activities, the OEMP and/or OPEP must demonstrate that by implementing 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 identify all existing and potential spill response control measures, the selection or rejection of which are supported by reasoned arguments.

Guidance documents

Guidance documents used in preparing this framework include:

- Oil Spill Risk Assessment and Response Planning Procedure SO-91-II-20003
- NOPSEMA Guidance Note ALARP N-04300-GN0166, 1 August 2022
- NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271, June 2020
- NOPSEMA Guideline Environment Plan Decision Making N-04750-GL1721, January 2024
- NOPSEMA Guidance Note Risk Assessment GN0165, 24 June 2020
- NOPSEMA Oil Pollution Risk Management GN1488, 7 October 2024.

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 B-1.

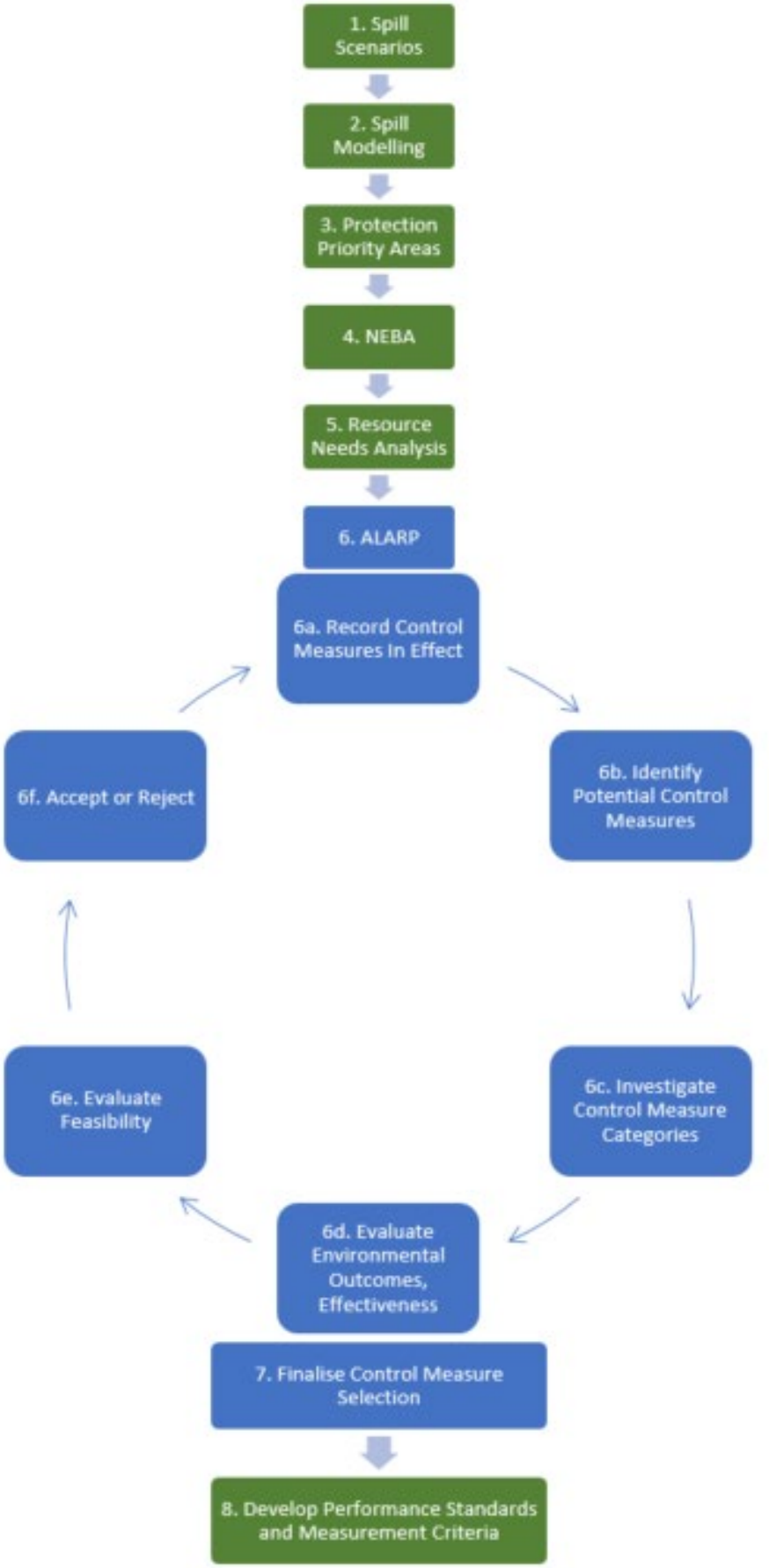


Figure B-1: ALARP assessment framework

In Figure B-1, Steps 1 to 5 (in GREEN) denote input information into the ALARP Assessment Framework. This information comprises:

1. **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.
2. **Spill Modelling**: A quantitative spill modelling assessment is conducted for the worst-case credible scenarios identified in Step 1.
3. **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 SO-91-II-20003
4. **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.
5. **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 B-1, Step 6 (in BLUE). Criteria and definitions used to evaluate control measures are shown in Table B-1.

6. **ALARP assessment**:

   6a) 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.

   6b) 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.

   6c) 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.

   6d) Evaluate Environmental Outcomes, Effectiveness: The environmental outcomes and effectiveness are assessed for all control measures identified and described through Steps 6a, b, and c.

   6e) Evaluate Feasibility: Time, cost and effort required for implementation are assessed for all control measures identified and described through Steps 6a, b, and c.

   6f) 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 practice 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 B-1, Steps 7 and 8 show the conclusion of the ALARP Assessment Framework:

7. **Finalised Control Measure Selection**: Outputs from the ALARP Assessment shown in Step 6 comprise finalised control measures (in BLUE).
8. **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 the performance standard or the control measure, as appropriate.

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 B-1.

Table B-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, January 2024
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 (Safety) 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 • 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 these criteria. **Functionality** • The functional performance of a control measure is what it is required to do. How does the control perform to achieve the required risk reduction? **Availability** • Probability that the control measure will be available when required and has not failed or is undergoing a maintenance or repair. **Reliability** • 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.

Column	Description
	Survivability • Whether a control measure can 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. However, some control measures, such as those involving equipment deployment from an FPSO would have low survivability in an incident that involves an FPSO explosion or fire. **Dependency** • 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. • Several control measures are reliant on equipment, people and vessels, hence have high dependence. **Compatibility** • Whether 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

ALARP assessment summaries

ALARP assessment summary
Source Control
Source control is limited to minimising potential volumes of MDO lost to the marine environment and no areas of improvement were identified. No additional Control Measures were identified and assessed. The key performance requirements are to follow the response actions listed in the respective vessel's SOPEP and conduct spill exercises in line with the vessels SOPEP. Performance Standards and Measurement Criteria that have been developed for the in-effect control measures are shown in Table 9-3.
Monitor and evaluate
For the monitor and evaluate strategy, various, independent inputs from multiple service providers are used to build a detailed Common Operating Picture (COP) during the incident. Four potential alternative/ additional control measures were identified and assessed. No additional control measures were accepted as reasonably practicable. Four additional / alternative control measures and all were assessed and rejected as being grossly disproportionate: • Purchase of oil spill modelling system and internal personnel trained to use system • Purchase of additional tracking buoys • Ensure trained aerial observers based at strategic locations such as Darwin • The 2 vessels that are in use by Santos servicing the Bayu-Undan operations could be used for surveillance purposes in response to a spill. Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted control measures are shown in Table 10-21.
Mechanical Dispersion
Mechanical dispersion is a secondary strategy that could be undertaken by vessels undertaking primary response strategies without the requirement for additional equipment. The use of mechanical dispersion as a response strategy would be assessed as part of an operational NEBA. No additional control measures were identified and assessed. Performance Standards and Measurement Criteria that have been developed for the in-effect control measures are shown in Table 11-4.

ALARP assessment summary
Shoreline protection and deflection
Various types of nearshore booms and skimmers from Darwin and Broome ensures that protection/deflection operations can be deployed to PPAs within 60–72 hours (weather/daylight dependent) in a wide range of metocean conditions. Trained regional Santos personnel can be quickly mobilised to appropriate locations using helicopter services, followed by AMOSC staff and AMOSC Core Group from Perth. These regional and state resources ensure that equipment and personnel are not a limiting factor in this response strategy. Three potential additional / improved control measures were identified and assessed. One additional/improved control measure was accepted as reasonably practicable. • Santos personnel trained to IMO Level 1 and located in Darwin. Two additional control measures were rejected as grossly disproportionate to the potential reduction in environmental risk. Rejected control measures were: • Santos to purchase additional shoreline and nearshore booms and ancillary equipment • Access to additional shallow draft boom tow vessels owned by Santos Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted control measures are shown in Table 12-6.
Shoreline clean-up
Darwin stockpiles and locally available supplies provide a range of shoreline clean-up equipment that can be accessed to suit most beach types / required clean-up operations. Additional equipment can be transported to Darwin via road or air from other Australian stockpile locations. Trained Santos personnel can be quickly mobilised to appropriate locations using helo. services or vessels, followed by AMOSC staff and AMOSC Core Group. Equipment and trained personnel are not expected to be limiting factors for this response strategy. Waste management may be a limiting factor for ongoing shoreline clean-up operations and further information is shown in the ALARP assessment for Waste Management. Seven potential additional/improved control measures were identified and assessed. One additional/improved control measure was accepted as reasonably practicable. The accepted control measures was: • Access to additional team leaders that are locally based at strategic locations (Darwin) and trained to IMO Level 1 Six additional/improved control measures were identified, evaluated, and rejected as grossly disproportionate to the potential reduction in environmental risk. Rejected control measures were: • Mechanical mobile plant equipment for clean-up pre-purchased and positioned at strategic locations (Darwin) • Prepurchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at strategic locations (Darwin) • Access to additional shallow draft vessels owned by Santos to transport personnel to key sensitive areas • Faster access to clean-up personnel via Darwin-/Perth-based labour hire contractor • Faster access to clean-up personnel via locally based labour hire companies or emergency response organisations • Faster access to clean-up personnel via Santos employment of local personnel Performance Standards and Measurement Criteria that have been developed for the in effect and accepted control measures are shown in Table 13-6.
Oiled wildlife
The earliest shoreline contact for all worst-case scenarios associated with the activity is 5 hours within Darwin Harbour (for the MDO vessel collision scenario at KP114 with Darwin Harbour). Oiled wildlife equipment including first-strike kits and containers can be mobilised to Darwin within 2–7 days. Further equipment is available through national or international resources to implement a timely and sustained response adequate for the scale of worst-case oiled wildlife operations identified in the OPEP. Potential control measures around additional responders through pre-hiring or contracts with additional service providers were investigated but were found to be not beneficial and/or the cost was grossly disproportionate to risk reduction. An additional area of improvement is clarity for how Santos will integrate with Control Agencies OWR. It has been identified that additional planning captured in the Santos Oiled Wildlife Response Framework is a practicable control measure to ensure that resources are deployed in a coordinated approach.. Two potential additional/alternative control measures were identified and assessed. No additional/alternative control measures were accepted as reasonably practicable. Two Control Measures were identified but were rejected as grossly disproportionate to the potential reduction in environmental risk. Rejected control measures were: • Pre-hire and/or prepositioning of staging areas and responders • Direct contracts with service providers. Performance Standards and Measurement Criteria that have been developed for the in-effect control measures are shown in Table 14-6.

ALARP assessment summary
Waste
The Santos contract with a waste service provider has provisions for waste management operations of the scale estimated to be required in worst-case scenarios detailed in the OPEP. Further detail is captured in Santos' Oil Pollution Waste Management Plan (BAA-201_0027). The waste service provider can mobilise waste receptacles to Darwin within 12–24 hours. Given the waste service provider arrangements and planning already undertaken, waste storage facilities, road transport and logistics are not expected to be limiting factors in the response. An area of improvement was identified regarding the availability of vessels required for waste transport at sea. Two potential control measures to address this area of improvement were identified and evaluated, one of which was accepted and the other rejected due to the cost being grossly disproportionate to the potential reduction in environmental risk. Four additional control measures were identified and assessed. One additional control measure was accepted as reasonably practicable: • Monitoring and hire of additional vessels located in the region, tracked via the Vessel Monitoring System (IHS Maritime Portal). Vessels contracted at the time of incident Three potential control measures were rejected as grossly disproportionate. Rejected control measures were: • Maintain contracts with multiple service providers • Procure temporary waste storage for Santos stockpile • Contract additional vessels on standby for waste transport. Performance Standards and Measurement Criteria that have been developed for the in-effect control measures are shown in Table 15-4.
Operational and scientific monitoring (OSM)
Oil spill OSM will be conducted on behalf of Santos by a contracted OSM Services Provider as detailed in the Santos Northern Australia OSM-BIP (7715-650-ERP-0003) and the relevant Joint Industry Operational and Scientific Monitoring Plans (OMPs/SMPs). An area of improvement identified was the availability of vessels in the initial stages of response. To address this area of improvement, a potential control measure around determining the required vessel specifications to aid with improved vessel tracking was assessed and accepted. Three additional potential Control measures were identified, but all were rejected due to the cost being grossly disproportionate in comparison to the reduction in risk. Four potential additional/alternative control measure were identified and assessed. One additional/improved control measures were accepted as reasonably practicable: • Determine required vessel specifications for OSM implementation to aid with improved vessel tracking through the Vessel Tracking System (IHS Maritime Portal). Three additional control measures were rejected as grossly disproportionate. The rejected control measure was: • Scientific monitoring personnel, plant and equipment on standby in Darwin • Trained monitoring specialists on standby at site • Ensure trained marine mammal/fauna observers based at strategic locations such as Darwin Performance Standards and Measurement criteria that have been developed for the in effect and accepted control measures are shown in Table 16-2. The key areas of effectiveness for the identified control measures, during times of preparedness, relate to maintaining access to equipment and personnel through contractual arrangements, regular reviews of OSM Services Provider capability and reviews of available baseline data. During response, a key area for effectiveness is the mobilisation of requirements to commence OSM and ensuring that relevant OSM plans are followed.

Appendix C Pollution report

Harmful Substances Report – oil (POLREP)

Marine Pollution Regulations 2003 s37(4)

This form is to be submitted to the NT Government **and** Australian Maritime Safety Authority:

NT Government

Email to:

- pollution@nt.gov.au and
- marinesafety@nt.gov.au and
- rhm@nt.gov.au

Australian Maritime Safety Authority

General Manager, Response
through Joint Rescue Coordination Centre (JRCC) Australia

Facsimile: +61 2 6230 6868
AFTN: YSARYCYX

Email: rccaus@amsa.gov.au

Note: sections of the ship reporting form that are not relevant should be omitted from the report. If there is insufficient space on this form, attach additional information.

A. **Name of Ship**

Call Sign

Ship's IMO

Flag State

Name of Ship's Master

Ship's Master contact details

B. **Date and time of event (time must be expressed as Coordinated Universal Time UTC)**

C. **Position: latitude and longitude**

or

D. **Position: true bearing and distance**

E. **True course (as a three digit group)**

F. Speed (in knots and tenths of a knot as a 3-digit group)

L. Route information (details of intended track)

M. Full details of radio stations and frequencies being guarded

N. Time of next report (time must be expressed as Coordinated Universal Time UTC)

P. Types and quantities of cargo and bunkers on board

Q. Brief details of defects, damage, deficiencies or other limitations (this must include the condition of the vessel and the ability to transfer cargo, ballast or fuel)

R. Brief details of actual pollution (this must include the type of oil, an estimate of the quantity discharged, whether the discharge is continuing, the cause of the discharge and if possible, an estimate of the movement of the slick)

S. Weather and sea conditions including wind force and direction, and relevant tidal or current details

T. Name, address, telephone and facsimile numbers of the vessel's owner and representative (manager, operator, or their agents)

Owner		**Representative**	
Company IMO		**Company IMO**	
Address		**Address**	
Telephone	**Facsimile**	**Telephone**	**Facsimile**

U. Details of length, breadth, tonnage and type of ship

Type of vessel	**Length**	**Breadth**	**Tonnage**

X. 1. Action being taken with regard to the discharge and movement of the ship

2. Assistance or salvage efforts which have been requested or which have been provided by others

3. The master of an assisting or salvaging vessel should report the particulars of the action undertaken or planned

Appendix D Situation report

Government of **Western Australia**
Department of **Transport**

Maritime Environmental Emergency Situation Report (SITREP)
MEER

When blank, this form is classed as **OFFICIAL**, when filled out, this form is classed as **OFFICIAL-SENSITIVE.**

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

MARITIME ENVIRONMENTAL EMERGENCY 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 DESCRIPTION

Incident Name: _____ Ref. No. _____

Incident Controller: _____

Incident Declaration Level: Please select _____ Controlling Agency: Please select _____

Priority ☐ Urgent ☐ Immediate ☐ Standard

Final SITREP? ☐ Yes ☐ No

Next SITREP on: _____

Date and Time of Incident (24 hr format): _____

POLREP or AMSA Form 18 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:_____

Maritime Environmental Emergency Situation Report (SITREP)		
Reporter's Signature:		
Name:	**Agency:**	**Role:**

Once you have completed the form please check that all relevant fields have been filled with accurate data.
Please email completed form to marine.pollution@transport.wa.gov.au

Appendix E Vessel surveillance observer log

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	

Timeline of observations:

Time	Description

Appendix F 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:

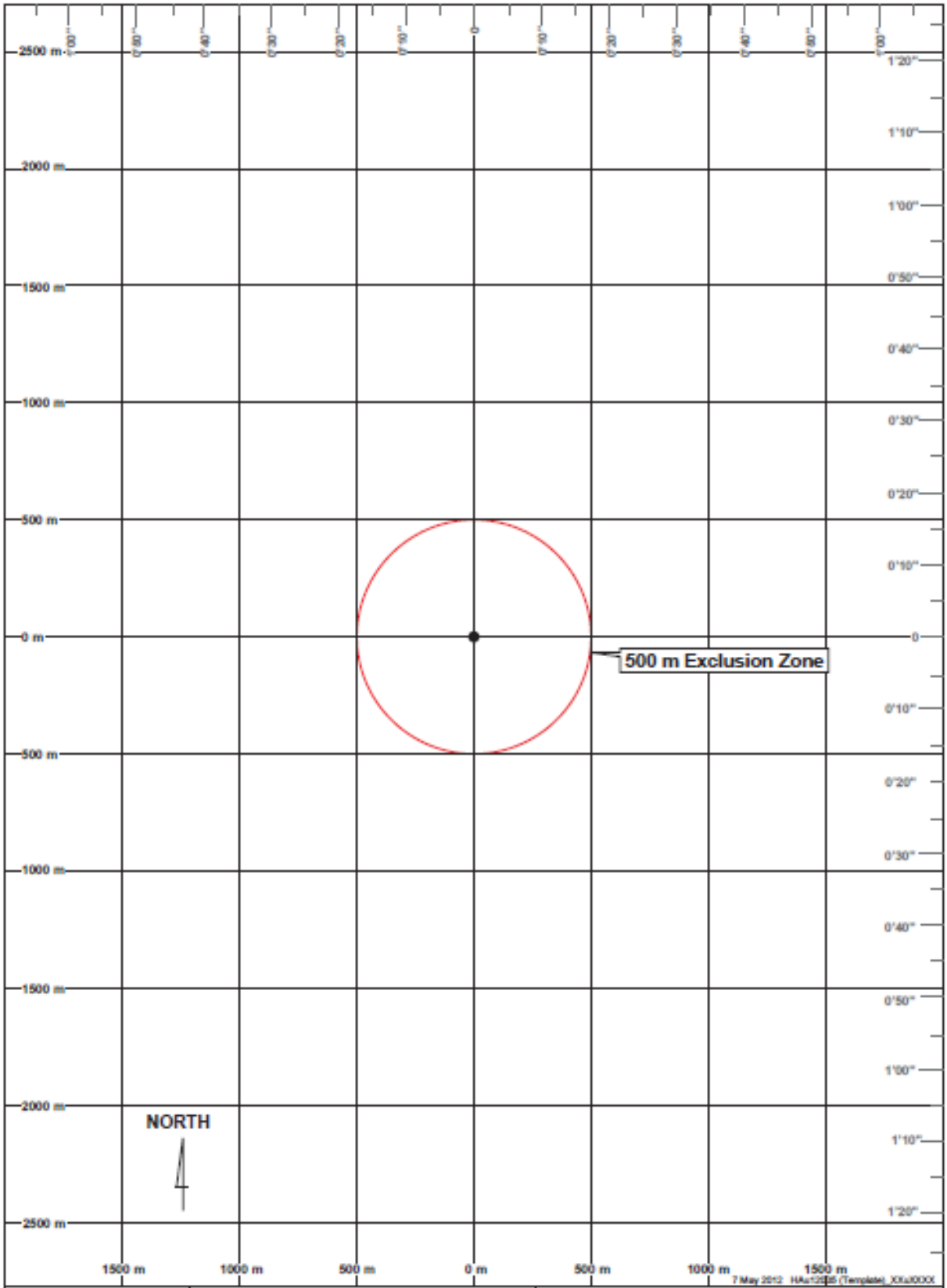
Weather Conditions	
Wind speed (knots)	Wind direction
Cloud base (feet)	Visibility
Time high water	Current direction
Time low water	Current speed (nM)

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 G Aerial surveillance surface slick monitoring template

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



	NAME:	VESSEL / AIRCRAFT:
	DATE / HOUR:	OTHER REFERENCE:

Appendix H Aerial surveillance marine fauna sighting record

Santos

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

○ Whale shark

○ Dugong

○ Hawksbill turtle

○ Loggerhead turtle

○ Green turtle

○ Flatback turtle

○ Bottlenose dolphin

○ Spinner dolphin

○ Dolphin species unknown

○ Leatherback turtle

○ Turtle species unknown

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					

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 I Aerial surveillance shoreline observation log

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 J Shoreline clean-up equipment

Table J-1: Recommended equipment for an initial deployment of a 6-person shoreline clean-up team

Shore clean-up Tools	Quantity
Disposal Bag Labelled, 140 cm x50cm x 100µm	1,000
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	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	1,000
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 (assorted 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	6
Folding Table 1	1
Shelter open side 1	1
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6
Boxes, Bin and Lid Storage/transport assorted	-
Optional items	
Inflatable tent 9 square metres	1

Table J-2: Recommended equipment list for a decontamination unit for a shoreline 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	4
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 100µm	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
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	-

Table J-3: Recommended equipment list for deployment of a 6-person team for shoreline flushing or recovery

Flushing Equipment	Quantity
Diesel self prime semi trash pump, 25-35 psi, 4.8hp	1
Perforated 2" lay flat hose, 20 m 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	1
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section 2 (50m)	2 (50m)
Towing Bridle 2	2
Danforth Sand Anchor Kit, 30m lines, 15m trip lines 3	3
Diesel Powered pump with hose 1	1
Manta Ray skimmer 1	1
Personal Protection Equipment (PPE) – Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Respirator dust/mist/fume and valve	40
Disposable box light nitrile gloves (100 box)	2
Ear Plugs (200 box)	1
Safety Glasses	18
Gum Boots (assorted sizes)	18
Hyflex Oil Restraint Gloves (assorted sizes)	18
Day/Night Vest	6
Storage Equipment	
Collapsible Bund 1.6m x1.2m	1
Misc sizes of ground sheets/tarps	6
Collapsible Tank 5,000 litres	2
Absorbents	
Absorbent Boom 'oil and fuel only' 3 or 6m x 180,mm	200 m
Absorbent Roll 'oil and fuel only' 40m x 9m	10
Absorbent Pad "oil and fuel only" 45cm x 45cm	1,000
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

Table J-4: Recommended equipment list for a 6-person team for near shore clean-up

Absorbents	Quantity
Absorbent Roll ‘oil and fuel only’ 40m x 9m	20
Absorbent Pad “oil and fuel only” 45cm x 45cm	2,000
Absorbent Boom “oil and fuel only” 3or6m z 180mm	200 m
Poly Mops (snags)	150
Poly Absorbent Wipes	20
Recovery Equipment	
Tidal Boom (shoreline boom) 25m lengths	4 (100 m)
Tidal Boom Accessories pack	2
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	8 (200 m)
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	
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	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 Protective Equipment (PPE) Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Disposable box light nitrile gloves (100 box)	2
Alpha Tec gloves (assorted sizes)	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 1.6 m x 1.2 m	2
Collapsible bund 4 m x 2.4 m	1
Collapsible Tank 5,000 litres	2
Alum box, Bin & lid Storage/transport cases	10
Misc. sizes of ground sheets/tarps	6
Additional Items	
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6

Appendix K Shoreline response strategy guidance

Guidance on response methods for sensitive coastal habitats is provided in Table K-1.

Guidance on applicable shoreline clean-up techniques based on shoreline substrate and degree of oiling are presented in Figure K-1 to Figure K-4.

Table K-1: Strategy Guidance for shoreline response at coastal sensitivities

Sensitive receptors	Strategy guidance
Mangroves	• All efforts should be mounted to prevent any oil from moving towards this area by using booms 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.
Mudflats	• All efforts should be mounted to prevent any oil from moving towards this area by using booms 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 channels filling/ draining mudflats. • Efforts to manually clean mudflats may result in further damage due to trampling of the oil into sediments which typically rich in biota and provide a food source for fish and birds. • Therefore, natural remediation may be the preferred approach and if removal is required, the flushing of oil into open water, if feasible, may be preferred to manual collection • The presence of wildlife (e.g. shorebirds) and sensitive flora (e.g. mangroves) which are often associated with mudflats needs to be considered in determining the best approach.
Sandy beaches	• Clean-up techniques will depend upon the degree of infiltration into sand or and degree of burial which will require surveying/mapping • Clean-up will also depend upon sensitivity of environment (existing ecological features), access to the beach and potential for additional erosion. • Oil and oiled sediments can be physically removed offsite, moved to surf zone for surf washing of sediment or assisted to move to water edge by ploughing of channels or flushing. • Recovery of oil can be by manual means (hand tools) or mechanical means (earth moving, pumping equipment). • The sensitivity of the environment is a key factor, with manual removal creating less waste and disturbance but more consuming in time and resources.
Seabirds, shorebirds and migratory waders	• All efforts should focus on deflecting oil away from this area or dispersing 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.
Turtle nesting beaches during or near nesting season	• All efforts should be mounted to prevent any oil from moving towards this area by 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	• Little can be done to protect coral reef beds along exposed sections of shoreline. • Floating oil would potentially coat living reef communities, which are usually slightly elevated and are consequently exposed at low tide.

Sensitive receptors	Strategy guidance
(Note: submerged coral reef communities are less susceptible to oiling)	• Natural recovery with a close monitoring program is the preferred clean-up technique. Clean-up of the reef itself by natural processes is expected to be rapid. • 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.
Macroalgal and seagrass beds	• All efforts should focus on deflecting oil away from this area, dispersing 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. • For small areas of contamination, rocky structure can be manually wiped with sorbent pads or scraped to remove oil.

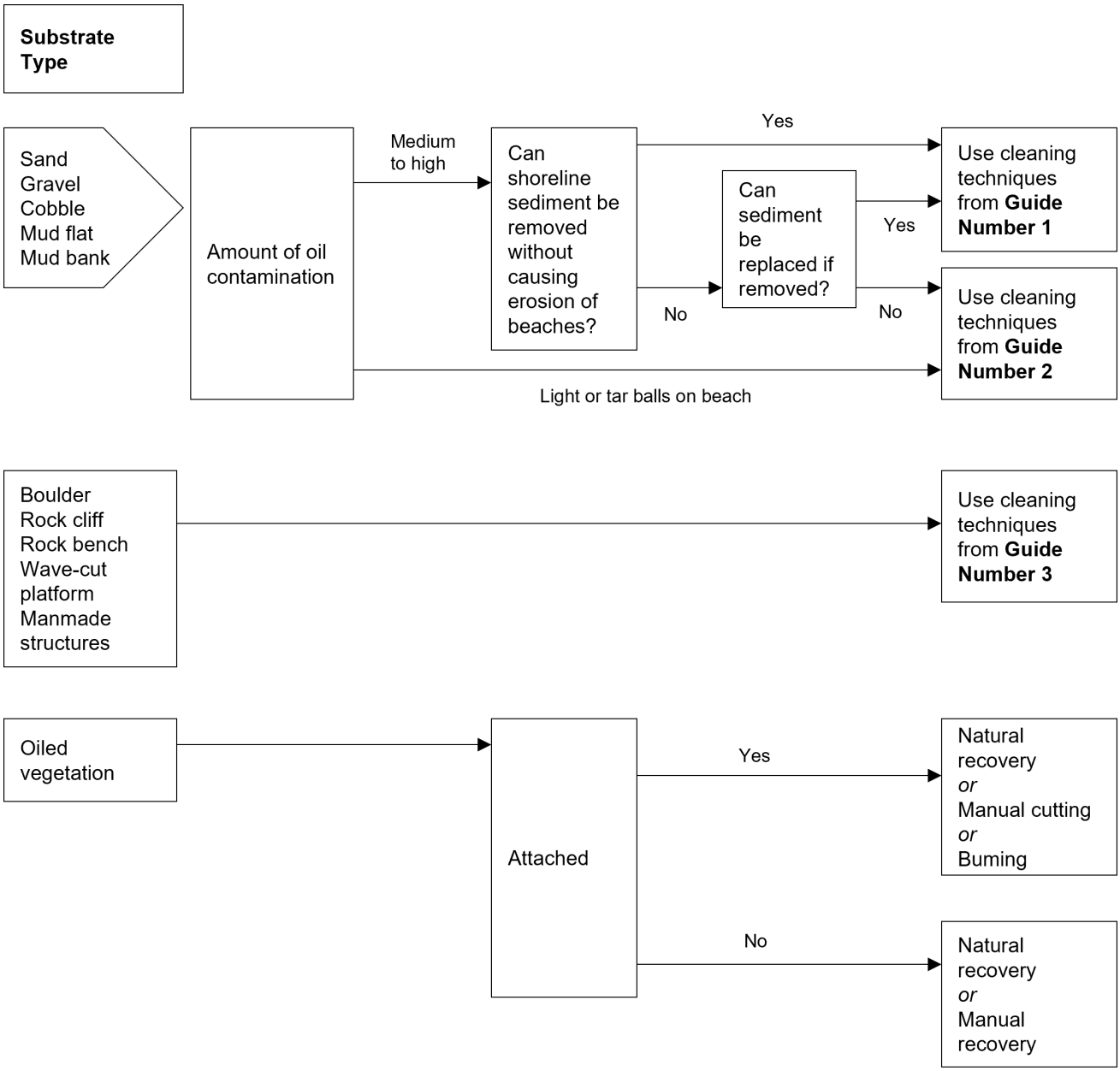


Figure K-1: Shoreline Clean-up Master Decision Guide

Trafficability		Substrate type	Depth of penetration	Clean-up techniques in order of preference	Access	
1. Can rubber-tyred equipment operate on beach?	→ Yes	Sand, Gravel. Mud	Less than 3 cm	Motor-grader and elevated scraper combination. Elevated Scraper, Motor-grader and Front-end loader (Rubber-tyred) combination.	**3. Is there access to beach for heavy equipment or can access be constructed?**	→ Yes ↓
			Greater than 3 cm	Elevated Scraper. Front-end loader (Rubber-tyred). Bulldozer and Front-end loader (Rubber-tyred) combination.		Select most preferable technique
		Cobble	Less than 30 cm	Front-end loader (Rubber-tyred).		
			Greater than 30 cm	Bulldozer and Front-end loader (Rubber-tyred) combination. Front-end loader (Rubber-tyred).		
		Mud bank	Not applicable	Backhoe. Front-end loader (Rubber-tyred).		
↓ No						
2. Can tracked equipment operate on beach?	→ Yes	Sand, Gravel, Mud, Cobble	Less than 30 cm	Front-end loader (Tracked). Bulldozer and Front-end loader (Tracked) combination.		
			Greater than 30 cm	Bulldozer and Front-end loader (Tracked) combination. Front-end loader (Tracked).		
↓ No					↓ No	
Use dragline or hydraulic grader or leave to natural recovery				Go to next Figure – Decision guide No. 2, Question 4.		

Figure K-2: Shoreline Clean-Up Decision Guide 1

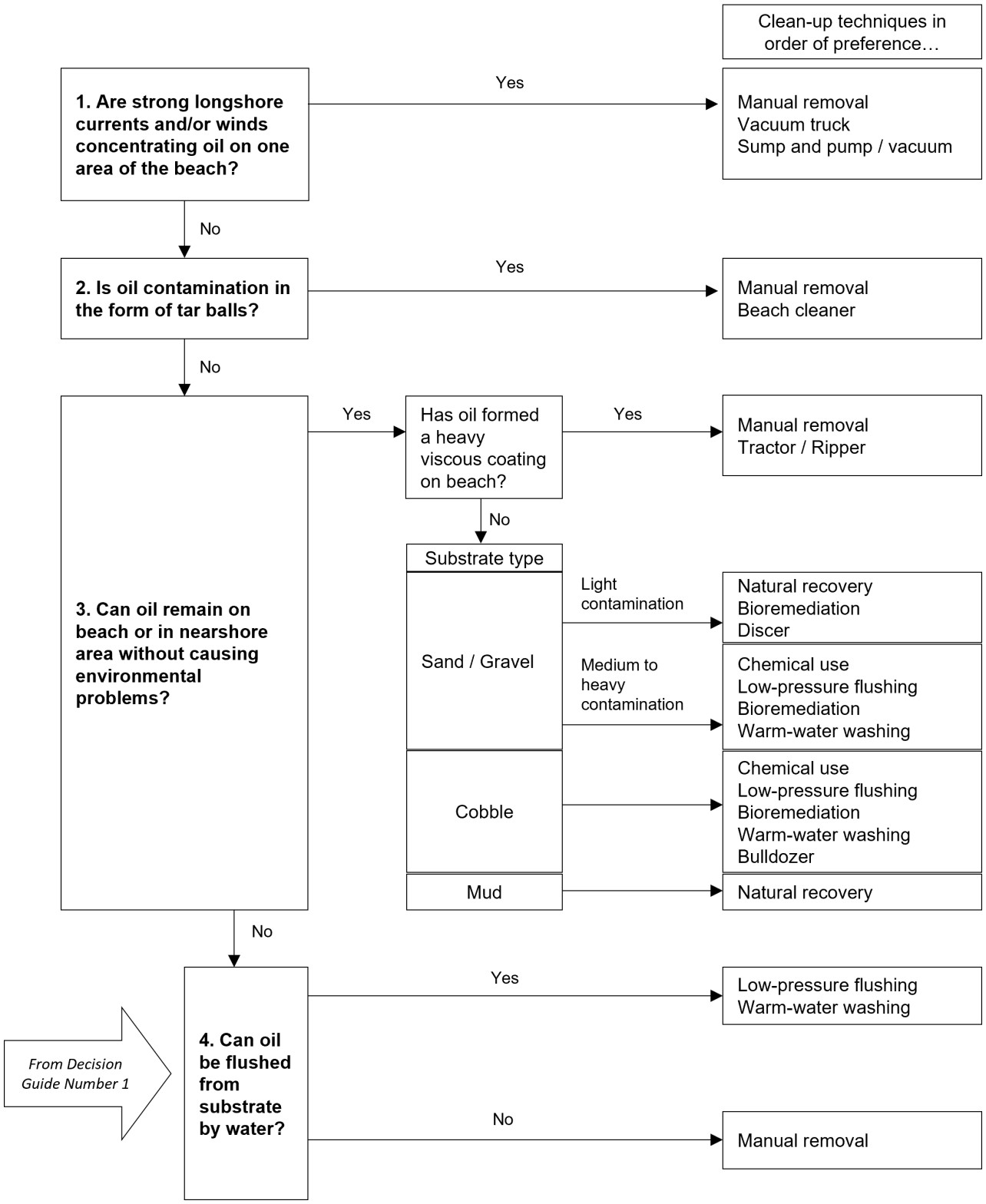


Figure K-3: Shoreline Clean-Up Decision Guide 2

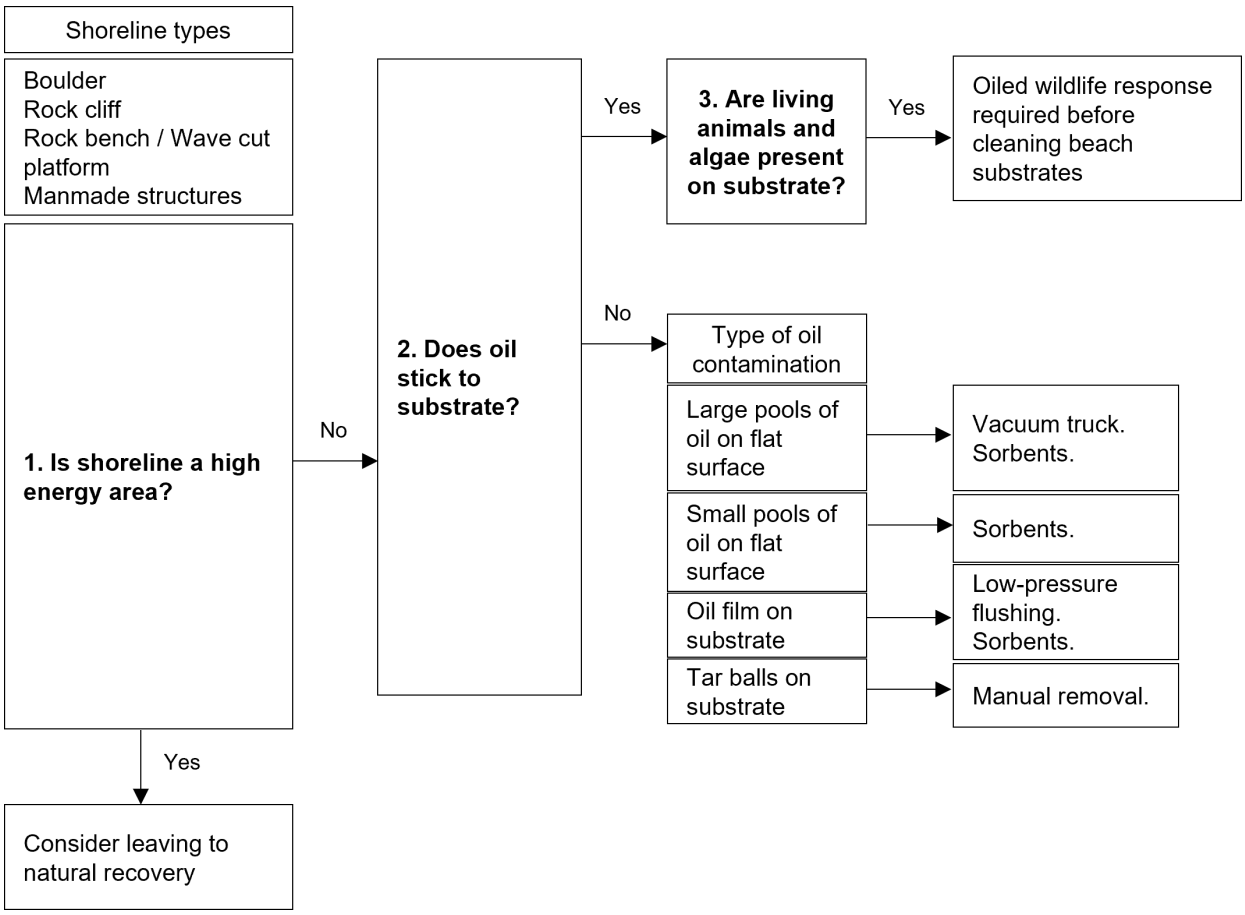


Figure K-4: Shoreline Clean-Up decision Guide 3

Appendix L Operational guidelines for shoreline response

L-1 Worksite preparation guidelines

The following provides guidelines for the preparation of staging areas supporting shoreline clean-up operations.

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.

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; and
- 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; and
- In some cases, botanical evaluations to define a plant cover restoration operation.

- Segregate the different types of waste
- Protect containers from rain water 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; and
- 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 rain water 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; and
- A rest area.

At base camp, operators must be provided with:

- A first aid kit; and
- Hot and cold beverages, meals.

Selection of the rest area must meet certain criteria:

- Close proximity to the clean-up site;
- Easy access; and
- 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; and
- 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 gasoline, 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 work day
- 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 (eg 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; and
- A flat area with enough space away from environmentally-sensitive areas.

Equipment

- Cabins;
- Hut;
- Maintenance equipment and tools; and
- Cleaning equipment.

L-2 Manual clean-up guidelines

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

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; and
- Site: all types sufficiently accessible and which tolerate intensive traffic.

Equipment

Basic Equipment:

- Scrapers (paint scrapers, long handle scrapers...), rakes, brushes, forks; and
- Landing nets, shovels, trowels.

Extra Equipment:

- Waste containers, big bags, bins, plastic bags; and
- 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; and
- 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 marshes. 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; and
- 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.

L-3 Mechanical clean-up guidelines

This technique consists of collecting the oil in order to facilitate its removal from the beach. Collection is carried out using a tractor, ATV or 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; and
- Site: accessible and sufficient load bearing capacity for earthmoving equipment, sufficiently large to allow vehicles to manoeuvre.

Equipment

Basic equipment:

- Backhoe loader;
- Grader/bulldozer;
- Tractor or loader with front blade; and
- Front-end loader or lorry (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; and
- May lead to reduction of beach stability and beach erosion/loss of beach area.

Minimum workforce required: 2 people per vehicle (1 drive + 1 assistant).

Waste: 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

L-4 Shoreline vessel access guidelines

There are numerous landing craft vessels available in the North West Shelf area. These vessels 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. The Santos Offshore - Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) describes the specifications for beach landing craft, and describes Santos vessel monitoring processes.

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

For shoreline clean-up of remote islands, the following guidelines will be considered 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 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 contamination impacts to flora and fauna by the clean-up teams;
3) Deployment of small clean-up teams 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 waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

Appendix M Oiled wildlife response 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 Santos Oiled Wildlife Response Framework Plan (SO-91-BI-20014) and WAOWRP.

This appendix outlines the current OWR equipment, personnel and services available to Santos through current arrangements.

Overall OWR capability per OWR strategy

The overall OWR capability of Santos is outlined in Table M-1. Santos has access to aircraft that could be used for wildlife reconnaissance within hours of a spill. This would be followed by further access to vessels and Santos personnel trained in OWR that could be mobilised within 24 hours for vessel and wildlife shoreline reconnaissance, demonstrating Santos' ability to mount a swift response that could also be sustained as long as required.

Santos has the capability to set up oiled wildlife field stations within 3–4 days of a spill through access to AMOSC equipment and equipment purchased at the time of a spill. Santos could also arrange the transport of wildlife from the field to a primary care facility.

The indicative personnel required for a high impact-rated response is 93 personnel (as per the WAOWRP) (DBCA, 2022a); however, depending on the number and species impacted, may require many more. Santos' current arrangements could support a large scale OWR (requiring >93 personnel) mainly through support staff, such as, non-technical wildlife support roles (management, logistics, planning, human resourcing, transporter, cleaners, trades persons, security etc.). These roles could be filled by Santos personnel and labour hire agencies that can provide workers that undergo an induction and basic training. In addition, many of the roles required for an OWR require technical expertise and Santos will need to activate OWR arrangements with AMOSC and OSRL to fulfil roles, as well as make contractor arrangements for accessing skilled wildlife personnel at the time of a spill.

Table M-1: Santos OWR capability per OWR strategy

OWR strategy	Considerations	Equipment/personnel	Location	Mobilisation timeframe
Reconnaissance	Identify opportunities to create synergies with surveys required for Monitor and Evaluate and Scientific Monitoring activities	Rotary-wing aircraft & flight Crew	Karratha Learmonth Onslow	Wheels up within 1 hour for Emergency Response.
		Drones and pilots	Local WA hire companies	1–2 days
		Contracted vessels and vessels of opportunity Santos-contracted vessel providers Vessels of opportunity identified through AIS Vessel Tracking	Vessels mobilised from Darwin. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 12 hours.
		Aerial surveillance crew Santos staff AMOSC staff AMOSC Core Group personnel available Additional trained industry mutual aid personnel available	Perth and Varanus Island (VI) (Santos aerial observers) Australia wide	Santos-trained personnel – next day mobilisation to airbase <24 hours
Preventive actions	Mainly effective for bird species Requires relevant NT licence approval	5 AMOSC wildlife fauna hazing and exclusion kits 1 AMOSC Breco buoy	4 Fremantle, 1 Geelong 1 Fremantle	Location dependent
Rescue and field processing	Wildlife handling and first aid should only be done by persons with appropriate skills and experience or under the direction of DBCA/ DEPWS	4 AMOSC oiled fauna kits (basic medical supplies, cleaning/rehab, PPE)	1 Exmouth, 1 Broome, 2 Geelong	Location dependent
		2 DBCA OWR trailers	1 Kensington NSW 1 Karratha WA	Location dependent
		50% of OSRL OWR response packages (Wildlife search and rescue kits / cleaning and rehabilitation kits, including field first aid)	5 Singapore, 2 Bahrain, 7 UK, 5 Fort Lauderdale	Location dependent
Transport	Transport of oiled animals by aeroplane or helicopter may be restricted due to Civil Aviation Safety Authority (CASA) regulations; such transport will depend on the level of oiling remaining on animals. Therefore, consultation with the air transport provider must take place before transport to ensure the safest and most efficient means	Contracted vessels and vessels of opportunity Santos-contracted vessel providers Vessels of opportunity identified through AIS Vessel Tracking	Vessels mobilised from Darwin. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 12 hours.
Primary care facility	OWR container could be placed on the deck of a suitably sized vessel for field	OWR container/mobile washing facility 2 AMOSC	AMOSC – 1 Fremantle, 1 Geelong	Location dependent

OWR strategy	Considerations	Equipment/personnel	Location	Mobilisation timeframe
	processing in remote locations (benefits associated with temperature regulation and access to water and electricity) An OWR container on a vessel could also be used to aide transport form offshore islands	4 AMSA 2 DoT	AMSA – 1 Dampier, 1 Darwin, 1 Devonport, 1 Townsville DoT – 1 Fremantle (AMOSC warehouse), 1 Sydney	
		AMOSC call-off contract with DWYERTech NZ – a facilities management group	New Zealand	Availability within 24 hours of call-off
Personnel	Untrained personnel would receive an induction, on-the-job training and work under the supervision of an experienced supervisor	Santos provides OWR training to staff, and to-date, ~16 personnel have received OWR training	Perth and Varanus Island	<48 hours
		Santos maintains labour hire arrangements for access to untrained personnel		
		1 AMOSC Oiled Wildlife Advisor	Perth, WA	<48 hours
		62 trained industry personnel (AMOSC OWR Strike Team members)	-	<48 hours
		AMOSC MoU with Phillip Island National Park (PINP) (best-endeavour availability)	Victoria, Australia	Best-endeavour availability
		AMOSC MoUs – WA organisations	WA	Best-endeavour availability
	Sea Alarm Via OSRL's contract with the Sea Alarm Foundation, 2 OWR technical advisors are on call to support Members. Sea Alarm staff act in a technical advisory role and do not engage in hands-on OWR activities but work impartially with all parties (Titleholder, local authorities, mobilised experts and local experts, and response groups), aiming to maximise the effectiveness of the wildlife response.	1 OWR Technical Advisor available for deployment in-field or at the Command Post (typically supporting the Wildlife Branch Director or the Planning and Operations sections) 1 OWR Technical Advisor available to support remotely.	Sea Alarm Belgium	Location dependent. Notification via existing OSRL notification and mobilisation process.
	GOWRS Oiled Wildlife Assessment Service Through OSRL's ongoing funding of the Global Oiled Wildlife Response Service (GOWRS) project, a wildlife assessment team of 4 wildlife experts can be mobilised in-field to provide an on-the-ground technical assessment of wildlife response needs and the professional capabilities of local responders.	4 wildlife experts can be mobilised in-field for up to 4 days. Access to additional oiled wildlife resources on a 'reasonable endeavours' only basis through the GOWRS partners	Various locations in northern and southern hemisphere	Location dependent. Notification via existing OSRL notification and mobilisation process.

Australian Maritime Safety Authority (AMSA)

AMSA maintains 4 x OWR containers/ mobile washing facilities in Dampier, Darwin, Devonport and Townsville. All resources under the National Plan (including the 4 OWR containers) are available to Santos through formal request to AMSA under the arrangements of the National Plan. The containers also include some limited PPE and fresh and wastewater pools.

Western Australia Department of Transport (DoT)

The WA DoT maintains 2 OWR containers/ mobile washing facilities (WA – Fremantle – AMOSC warehouse, and NSW Sydney), which are available through the WA DoT State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE) (WA DoT, 2024) and the AMSA National Plan on request.

Australian Marine Oil Spill Centre (AMOSC)

Santos is a Participating Member of AMOSC and as such has access to AMOSC's Level 2/3 oiled wildlife equipment and personnel as outlined in the AMOSPlan and the AMOSC OWR Stateboard.

Equipment

Table M-2 summarises the OWR equipment maintained by AMOSC.

Table M-2: AMOSC wildlife equipment

Location	Oiled fauna kits (basic medical supplies, cleaning/rehab, PPE)	Fauna hazing and exclusion equipment	Oiled wildlife washdown container (mobile washing facility)
Fremantle	-	4 fauna hazing & exclusion kit 1 Breco bird hazing buoy	1 oiled wildlife washdown container
Exmouth	1 Oiled fauna kit	-	-
Broome	1 Oiled fauna kit	-	-
Geelong	2 Oiled fauna kit	1 fauna hazing & exclusion kit	1 oiled wildlife washdown container
Total	**4 Oiled fauna kit**	**5 fauna hazing & exclusion kits** **1 Breco bird hazing buoy**	**2 oiled wildlife washdown containers**

Personnel

AMOSC currently has the following arrangements in place for OWR personnel:

- 1 AMOSC OWR Officer available to act as an Industry Oiled Wildlife Advisor (OWA)
- 62 trained industry personnel (AMOSC OWR Strike Team members)
  - Volunteer OWR trained industry personnel
- Wildlife Care Groups:
  - 35 introductory trained personnel
  - 24 completed management course
  - 16 completed Responder course
- AMOSC call-off contract with DWYERTech Response NZ
  - A facilities management group with availability within 24 hours of call-off – 2 personnel

AMOSC has the following MoUs in place:

- Phillip Island National Park (PINP; Victoria) (best-endeavour availability)
- ~50 PINP staff – collection/facility ops/rehabilitation
  - ~45 volunteers – collection/facility ops/rehabilitation
  - ~20 staff – animal feeding

- 6 PINP staff – wildlife emergency response including cetacean stranding/entanglement
- 17 PINP staff – wildlife team leaders
- 5 PINP staff – IMT Training

Oil Spill Response Limited (OSRL)

Through their associate membership, Santos has access to the following OWR equipment and personnel services from OSRL.

Equipment

OSRL maintains a Level 3 wildlife equipment stockpile. This equipment is stored across the OSRL base locations and is designed to support the first 48 hours of the response and to ensure availability of critical equipment items that may be difficult to source locally (Note: This equipment does not provide everything that will be required to successfully operate a primary care facility and is focused primarily on bird casualties [n=100]). Equipment is sorted according to search and rescue (including field first aid), medical, and cleaning and rehabilitation (Table M-3).

Table M-3: OSRL wildlife equipment (as per OSRL Equipment Stockpile Status Report, April 2024)

OWR Response Package	UK	Singapore	Bahrain	Fort Lauderdale
Wildlife Search and Rescue BHR	-	-	-	-
Wildlife Cleaning and Rehabilitation Part 1	2	1	1	1
Wildlife Cleaning and Rehabilitation Part 2	2	1	-	1
Wildlife Cleaning and Rehab. Medical	1	1	-	1
Wildlife Search and Rescue	1	1	1	1
Wildlife Search and Rescue Medical	1	1	-	1

Personnel

Through the OSRL SLA, Santos has access to 24/7 technical advice (remote or on-site) from the Sea Alarm Foundation, a small non-governmental organisation based in Brussels, Belgium that works to improve global preparedness and response for oiled wildlife incidents. Two Technical Advisors are available, with one providing remote support and the other available to be mobilised for on-site support, either in-field or at the Command Post (typically working with the Wildlife Branch Director or the Planning and Operations sections as appropriate). Sea Alarm staff will act in a technical advisory role at the incident management level and will work impartially with all parties (Titleholder, local authorities, mobilised experts and local experts, and response groups), with the aim of maximising the effectiveness of the wildlife response.

Through OSRL's ongoing funding of the GOWRS Project, a wildlife assessment team of 4 wildlife experts can be mobilised in-field for up to 4 days in addition to the Sea Alarm resources noted above. The GOWRS Oiled Wildlife Assessment Service is a ready-to-deploy 4-person team delivered by a network of 10 leading wildlife response organisations. The four-person team will initially deploy for 4 days to provide an on-the-ground technical assessment of wildlife response needs and the professional capabilities of local responders. The team will inform the client of the feasibility of a full-scale professional response and the details of the GOWRS expertise that is available to deliver to the scale of such a response. There is also access to additional oiled wildlife resources on a 'reasonable endeavours' only basis through the GOWRS partners.

In addition, through the SLA, Santos has the option to access OSRL's internal staff with OWR expertise (1 in the UK) as part of the 18 personnel commitment for any single incident.

Appendix N Operational and scientific monitoring capability

The Northern Australia OSM-BIP (7715-650-ERP-0003) defines the 3-step process for ensuring that OSM capabilities of each activity are adequately covered by the existing information described within the Northern Australia OSM-BIP (Section 1.1 and Appendix A of the Northern Australia OSM-BIP).

Step 1: Determine if the new activity EMBA fits within the Northern Australia OSM-BIP Combined EMBA

Comparison of the EMBA for Barossa GEP Operations (NT waters) activities (Figure 3-1 in the Barossa GEP Coastal Waters OEMP [BAS-210 0224] and Barossa GEP Internal Waters OEMP [BAS-210 0313]) shows that this fits within the Northern Australia OSM-BIP Combined EMBA (Figure 2-1 in the Northern Australia OSM-BIP).

Step 2: Determine the locations requiring a baseline review and whether these locations are currently included in the Northern Australia OSM-BIP

As per Section 2.2 of the Northern Australia OSM-BIP, receptors requiring a baseline data review were identified as those sensitive receptors contacted by hydrocarbons at the low threshold for floating (≥1 g/m^2), shoreline contact (≥10 g/m^2), entrained (≥10 ppb), and dissolved (≥10 ppb) within 7.0 days at a probability >5%.

The locations requiring a baseline data review for this activity are presented in Table N-1, and are included within Table 2-2 of the Northern Australia OSM-BIP.

Step 3: Determine whether the capability requirements and monitoring arrangements of the new activity exceed or are met by the capability requirements outlined in Section 8 and capability arrangements described in Sections 9 and 10 of the Northern Australia OSM-BIP

As per the criteria outlined in Appendix A of the Northern Australia OSM-BIP, only three emergent receptors are contacted within 7 days at a probability of >5% (refer to Table N-1; Vessel collision at KP114). Therefore, the OSM capability requirements for Barossa GEP Operations (NT waters) activities are met by the worst-case capability requirements presented in Section 8 of the Northern Australia OSM-BIP. Therefore, additional deterministic modelling for Barossa GEP Operations (NT waters) activities is not required to inform OSM first-strike capabilities.

Table N-1: Barossa GEP Operations (NT waters) modelling results for locations with a probability of contact ≥5% and <7 days

Scientific monitoring priority area	Probability (%) entrained oil at ≥10 ppb	Min. arrival time entrained oil ≥10 ppb (day:hours)	Probability (%) dissolved oil at ≥10 ppb	Min. arrival time dissolved oil ≥10 ppb (days:hours)	Total contact probability (%) floating oil ≥1 g/m²	Min. arrival time floating oil ≥1 g/m² (days:hours)	Total contact probability (%) shoreline accumulation ≥10 g/m²	Min. arrival time shoreline accumulation ≥10 g/m² (days:hours)
Vessel collision at KP23 (300 m³ MDO)								
Afghan Shoal*	16.33	1 day: 21 hours	NC	NC	0.33	2 days: 18 hours	NA	NA
Beagle Gulf-Darwin Coast	10.33	2 days: 23 hours	NC	NC	NC	NC	NC	NC
Flat Top Bank*	8.33	5 days: 23 hours	NC	NC	NC	NC	NA	NA
Lowry Shoal*	5.67	6 days:11 hours	NC	NC	NC	NC	NA	NA
Moresby Shoals*	10	6 days:13 hours	NC	NC	NC	NC	NA	NA
Shepparton Shoal*	29	8 hours	NC	NC	2	7 hours	NA	NA
Skottowe Shoal*	7.67	6 days	NC	NC	NC	NC	NA	NA
Tiwi Islands	8.67	2 days: 9 hours	NC	NC	NC	NC	0.33	9 days: 14 hours
Vernon Islands CR	12.33	7 days: 12 hours	NC	NC	NC	NC	1.67	10 days: 21 hours
Vessel collision at KP91.5 (300 m³ MDO)								
Outer Harbour West (Darwin Harbour)	NC	NC	NC	NC	NC	NC	10.67	18 hours
Restricted Area 5*	21	11 hours	NC	NC	1	1 day: 5 hours	NA	NA
Booya#	12.67	1 day: 6 hours	NC	NC	NC	NC	NA	NA
Vessel collision at KP114 (300 m³ MDO)								
Restricted Area 1* (Darwin Harbour)	34.67	1 day: 4 hours	-	-	0.67	1 day: 21 hours	NA	NA
Restricted Area 4* (Darwin Harbour)	96.67	5 hours	1.67	1 day: 17 hours	17	6 hours	NA	NA
Restricted Area 5* (Darwin Harbour)	47.33	1 day: 5 hours	-	-	-	-	NA	NA
Restricted Area 6* (Darwin Harbour)	98	4 hours	7.33	1 day: 11 hours	26	4 hours	NA	NA

Scientific monitoring priority area	Probability (%) entrained oil at ≥10 ppb	Min. arrival time entrained oil ≥10 ppb (day:hours)	Probability (%) dissolved oil at ≥10 ppb	Min. arrival time dissolved oil ≥10 ppb (days:hours)	Total contact probability (%) floating oil ≥1 g/m²	Min. arrival time floating oil ≥1 g/m² (days:hours)	Total contact probability (%) shoreline accumulation ≥10 g/m²	Min. arrival time shoreline accumulation ≥10 g/m² (days:hours)
Booya[#]	66	15 hours	-	-	-	-	NA	NA
L. Ann[#]	90	10 hours	0.33	7 days: 5 hours	-	-	NA	NA
Bell Bird[#]	99	4 hours	12.33	22 hours	-	-	NA	NA
British Motorist[#]	99	3 hours	16.67	23 hours	-	-	NA	NA
Darwin Harbour Unidentified wreck 2[#]	99	2 hours	25	9 hours	-	-	NA	NA
Diemen[#]	87.67	9 hours	-	-	-	-	NA	NA
East Arm Barge 1[#]	26	2 days	-	-	-	-	NA	NA
East Arm Vietnamese Refugee Boat 1[#]	11.33	1 day: 23 hours	-	-	-	-	NA	NA
East Arm Vietnamese Refugee Boat 2[#]	26	2 days	-	-	-	-	NA	NA
Ellengowan[#]	52.67	1 day: 6 hours	-	-	-	-	NA	NA
Landing Barge[#]	98	4 hours	7.33	1 day: 13 hours	-	-	NA	NA
Mandorah Unidentified wreck 1[#]	90	10 hours	0.33	7 days: 5 hours	-	-	NA	NA
Mauna Loa USAT[#]	99	2 hours	33.67	2 hours	-	-	NA	NA
Middle Arm Unidentified wreck[#]	52.67	1 day: 6 hours	-	-	-	-	NA	NA
Peary USS[#]	99	2 hours	26	12 hours	-	-	NA	NA
Vietnamese Refugee Boat Pk76[#]	98.67	6 hours	8	1 day: 20 hours	-	-	NA	NA
Yu Han 22[#]	97.67	4 hours	12	7 hours	-	-	NA	NA
WQ Zone 1 Elizabeth River Estuary* (Darwin Harbour)	11.33	1 day: 23 hours	-	-	0.67	2 days: 2 hours	NA	NA
WQ Zone 2 East Arm* (Darwin Harbour)	98	5 hours	3	1 day: 23 hours	25	5 hours	NA	NA

Scientific monitoring priority area	Probability (%) entrained oil at ≥10 ppb	Min. arrival time entrained oil ≥10 ppb (day:hours)	Probability (%) dissolved oil at ≥10 ppb	Min. arrival time dissolved oil ≥10 ppb (days:hours)	Total contact probability (%) floating oil ≥1 g/m²	Min. arrival time floating oil ≥1 g/m² (days:hours)	Total contact probability (%) shoreline accumulation ≥10 g/m²	Min. arrival time shoreline accumulation ≥10 g/m² (days:hours)
WQ Zone 3 Middle Arm* (Darwin Harbour)	7.67	1 day: 21 hours	-	-	0.33	2 days:11 hours	NA	NA
WQ Zone 4 West Arm* (Darwin Harbour)	95.33	5 hours	1	1 day:14 hours	15.67	7 hours	NA	NA
WQ Zone 6 Outer Harbour* (Darwin Harbour)	91	9 hours	2.67	13 hours	4	12 hours	NA	NA
East Arm (Darwin Harbour)	-	-	-	-	34.33	3 hours	60.33	4 hours
West Arm (Darwin Harbour)	-	-	-	-	21.33	5 hours	45	7 hours
Wickham Point (Darwin Harbour)	-	-	-	-	16.67	6 hours	41.33	8 hours

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

 # Submerged shipwreck

NC: No contact to receptor predicted for specified threshold

NA = Not applicable

Note: All receptors within Darwin Harbour are accounted for within the 'Darwin Harbour' receptor in Table 2-2 of the Northern Australia OSM-BIP (7715-650-ERP-0003)

Source: RPS, 2024

Appendix O Resourcing requirements for OMP: Shoreline clean-up assessment

Each shoreline clean-up assessment team will comprise 2–3 members and each team is assumed to be able to cover 10 km per team per day. Teams may be able to exceed this distance, especially if remote sensing techniques (e.g. UAVs) are used to cover shorelines that have access limitations, which includes many receptor locations in the EMBA.

Santos used both stochastic and deterministic modelling data for shoreline contact to plan personnel requirements for the worst-case shoreline and habitat assessment. Table O-1 presents all receptors contacted at ≥100 g/m² using the stochastic modelling results for the MDO spill at KP114 —the scenario with the greatest overall contact and length of oiled shoreline—along with the SCAT planning considerations and estimated number of SCAT teams required.

Note: Not all the receptors listed in Table O-1 will be contacted by one single spill. These results present the range of possible worst-case timeframes to contact and length contacted based on all runs that make up the stochastic model. Santos will use initial monitor and evaluate data (e.g. trajectory modelling and aerial surveillance) to determine where resources should be allocated. This may include directing resources to conduct SCAT at locations not identified as Protection Priority Areas, to determine if protection and clean-up activities may be required at these receptors.

Initially, shoreline clean-up assessment may be conducted via reconnaissance surveys and later confirmed via ground and/or vessel surveys.

Deterministic run #96 (MDO spill at KP114) (Table O-2) was selected to guide resourcing estimates for SCAT because it had the maximum volume of oil ashore ≥100 g/m^2, and a short time (8 hours) for oil accumulation ≥100 g/m^2. Based on run #96 (MDO spill at KP114) (Table O-2), the worst-case personnel requirements are 2–6 personnel—1 to 2 teams with 2–3 personnel each (1 Team Leader and 1–2 Team Members).

Table O-3 lists the resource capability available to Santos that may be used to implement SCAT.

Table O-1: Resource requirements for shoreline clean-up assessment for all locations contacted ≥100 g/m² based on stochastic results for the MDO spill at KP114

Location	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline oiled (km) ≥100 g/m²	Planning considerations	Estimated No. of teams required
East Arm (Darwin Harbour)	5 hours	11	Accessible mainland location with industrial infrastructure and East Arm Wharf. Presence of mangroves and small inlets on the northern side. Presence of saltwater crocodiles, making ground surveys unsuitable. Using UAVs and/or suitable vessels may be more suited to the northern side of this sector.	1-2
West Arm (Darwin Harbour)	8 hours	9	Inaccessible mainland location with presence of mangroves and small inlets. Presence of saltwater crocodiles, making ground surveys unsuitable. Using UAVs and/or suitable vessels may be more suited to this sector.	1-2

Location	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline oiled (km) ≥100 g/m²	Planning considerations	Estimated No. of teams required
Middle Arm (Darwin Harbour)	2 days: 10 hours	1	Inaccessible mainland location with presence of mangroves, small inlets and connection to creek systems, including Berry Springs and Blackmore River Conservation Reserve. Presence of saltwater crocodiles, making ground surveys unsuitable. Using UAVs and/or suitable vessels may be more suited to this sector.	1
Wickham Point (Darwin Harbour)	8 hours	10	Accessible mainland location with industrial infrastructure. Presence of mangroves and small inlets. Presence of saltwater crocodiles, making ground surveys unsuitable. Using UAVs and/or suitable vessels may be more suited to this sector.	1-2

Note: SCAT numbers not to be added up from this table as spill will not contact all receptors modelled (as these are stochastic results). Number of personnel required will be based on direction of spill and timeframes to contact.

Source: RPS, 2024

Table O-2: Resource requirements for shoreline clean-up assessment for protection priority areas based on the MDO spill at KP114

Location	Minimum arrival time shoreline oil accumulation ≥100 g/m² (days:hours)	Maximum length of shoreline oiled (km) ≥100 g/m²	Estimated No. of teams required
East Arm (Darwin Harbour)	8 hours	8	1-2
Total estimated SCAT teams required			**1-2**

Source: RPS, 2024

Table O-3: Shoreline clean-up assessment – resource capability

Equipment type / personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Shoreline assessment team leaders	Santos	12	Perth, Varanus Island	<24–48 hours from time of shoreline contact prediction (WA-based, Santos personnel, AMOSC staff and Core Group personnel)
	AMOSC Core Group	60+ (industry Core Group)	Perth, Dampier and other Australian locations	
	AMOSC staff	12 trained in SCAT	Perth and Geelong	
	OSRL	18	Perth and international	5 personnel available from 2–3 days, remaining personnel available from 4–5 days (subject to approvals/ clearances)
Shoreline assessment team members	Santos-contracted workforce hire company (e.g. Dare)	As per availability (up to 2,000)	Australia-wide	Subject to availability (indicatively 72+ hours)
Drones and pilots ** To assist shoreline and vessel-based surveillance	AMOSC	Drones available 24/7 through AMOSC sub-contract 1 pilot	Fremantle	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 (refer to Table 10-12)

Equipment type / personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
	OSRL – Third-Party UAV provider	2 qualified remote pilots, however response is on best endeavour	Perth	Depending on the port of departure, 1–2 days if within Australia
	Local WA hire companies	10+	Perth and regional WA	<48 hours

Appendix P Forward operations guidance

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 Management Plan – WANATL (7700-650-PLA-0016).

To facilitate a streamlined response, forward operational bases are required close to the response operational areas equipped with near duplicated IMT equipment and personnel. Further information on FOBs is provided in the Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017).

Forward operating base (FOB)

For a significant Level 2/3 response requiring coordination of resources to be deployed to the field, Santos will establish a FOB. For a Level 2/3 spill crossing from Commonwealth to Territory waters (cross-jurisdictional spills) NT Control Agency will establish a FOB.

For a Barossa development activity spill response, Santos will establish a FOB in Darwin – details of the Darwin FOB are provided in the Santos Oil Spill Response – Forward Operating Base Guideline (SO-91-IF-20017).