WHP and Subsea Fields AC_L7 & AC_L8 Drilling Program 2020 OPEP
TM-50-PLN-I-00002
Rev 0

FACILITY	TM - Montara Field
REVIEW INTERVAL	30 Months

Rev No	Date	Approval		
		Owner	**Reviewer**	**Approver**
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REVISION HISTORY

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[This document] **WHP & SUBSEA FIELDS AC/L7 & AC/L8 DRILLING PROGRAM 2020 OIL POLLUTION EMERGENCY PLAN (OPEP)** TM-50-PLN-I-00002	• Drilling 2020 Activities and oil spill risks • Resource Requirements • Response Strategies: • Source Control • Operational Monitoring • Chemical Dispersant • Containment and Recovery • Protection and Deflection • Shoreline Clean-up • Oiled Wildlife Response • Controls • Response • Appendices: • - A1. Observer logs • - A2. Bonn Agreement Oil Appearance Code • - A3. Shoreline Assessment Form • - A4. Evidence in support of dispersant use at Montara • - A5. Montara Crude Assay • - A6. Skua Crude Assay

QUICK REFERENCE INFORMATION

Parameter	Information		Further Information
Facility Name	WHP & SUBSEA FIELDS AC/L7 & AC/L8 DRILLING PROGRAM 2020		Section 3 of EP
Location (Lat/Long and Easting Northing)	Refer to Table 3-1		
Title/s (Block/s)	Production Licence AC/L7 and AC/L8		Section 3
Water Depth	78-80m		Section 3
Hydrocarbon Type/s	Marine Diesel Oil (MDO) Montara Crude Oil Skua Crude Oil		Section 4.1 - Hydrocarbon Characteristics and Behaviour
International Tanker Owners Pollution Federation (ITOPF) Classification	Marine Diesel Oil (MDO): Group 2 Montara Crude Oil: Group 3 (AMSA) Skua Crude Oil: Group 2		Section 4.1 - Hydrocarbon Characteristics and Behaviour, Appendices A5 and A6
Worst Case Spill Scenarios	**Scenario**	**Worst case spill volume**	Section 7.5.2 of the EP
	Loss of well control – surface (H6)	234 682 m^3	
	Loss of well control – subsea (H6)	234 498 m^3	
	Vessel collision	906 m^3 released over 5 hours	
Weathering Potential	**Montara Crude Oil** is a moderately persistent hydrocarbon with approximately 27% of residual components. Evaporation rates are moderate with ~16% of the oil mass evaporating within the first 12 hours; a further ~18% evaporating within the first 24 hours; and a further ~39% evaporating over several days. **Skua Crude Oil** is a moderately persistent hydrocarbon with approximately 24% of residual components. Evaporation rates will increase with temperature, but in general about 26.1% of the oil mass should evaporate within the first 12 hours; ~ 20.8% should evaporate within the first 24 hours; and ~29.4% should evaporate over several days. **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 rate of evaporation. Up to 60% will generally evaporate over the first two days. Approximately 5% is considered “persistent hydrocarbons”, which are unlikely to evaporate and will decay over time. MDO has a strong tendency to entrain into the upper water column (0–10 m) (and consequently reduce evaporative loss) in the presence of moderate winds		Section 4.1 - Hydrocarbon Characteristics and Behaviour and Appendices A5 and A6

Parameter	Information	Further Information
	(> 10 knots) and breaking waves. MDO re-surfaces when the conditions calm. It does not form mousse.	
Priority Receptors	• Ashmore / Cartier • Tiwi Islands (Melville and Bathurst) • Darwin Coast • Western NT (Kakadu, Coburgh, East Arnhem Land, West Arnhem Land) • Joseph Bonaparte Gulf (NT) • Indonesia • Timor-Leste • Kimberley Coast (including North Kimberley Marine Park) • Browse Island	Section 12.4 and 13.4 of OPEP and 7.6.8 of EP

In the event of an emergency where human safety is at significant risk, tasks included in this OPEP may not be implemented, and the International Convention for the Safety of Life at Sea (SOLAS) 1974 may take precedence.

PART A – REGULATORY

1. PURPOSE

The purpose of this Oil Pollution Emergency Plan (OPEP) is to detail Jadestone Energy's oil pollution preparedness and response arrangements for the *WHP and subsea fields AC/L7 and AC/L8 2020 Drilling Program 2020* Environment Plan TM-50-PLN-I-00001 (the EP hereafter).

2. OBJECTIVES

The objectives of this OPEP in relation to the unplanned release of hydrocarbons arising from drilling activities are:

- to safely limit the adverse environmental effects to the marine environment;
- to define the capability requirements for response activities;
- to demonstrate arrangements for sufficient capability to respond in a timely manner and for the duration of the oil pollution incident; and
- to provide guidance to the IMT in relation to spill response implementation.

3. SCOPE

This OPEP applies to oil spill risks associated with drilling campaign in the Montara and Skua fields described in Section 2 of the EP. The Montara and Skua fields are located in Production Licence AC/L7 and AC/L8 respectively in the East Timor Sea, Australia, approximately 690 km west of Darwin (Figure 3-1).

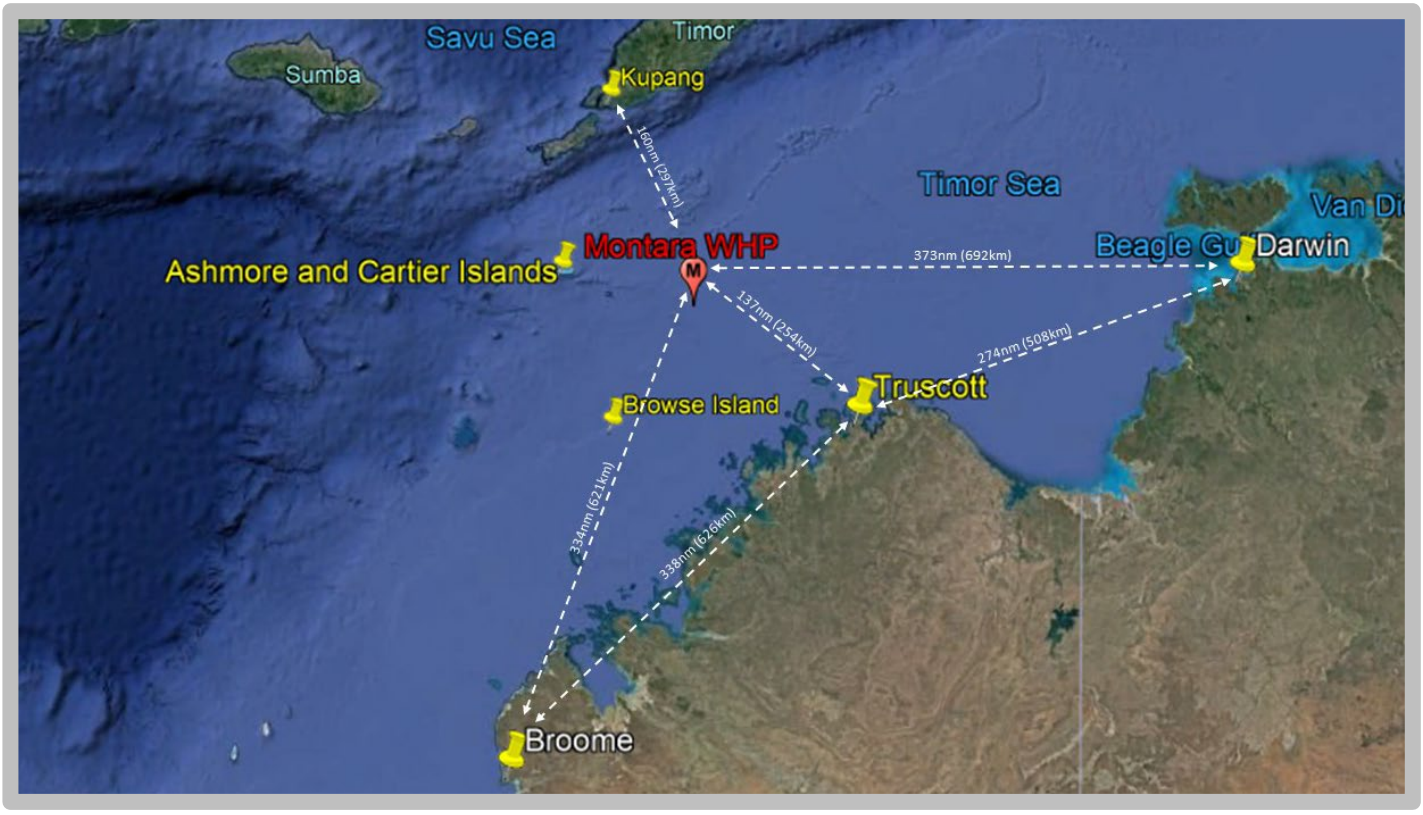


Figure 3-1: Montara Location

Location details of the activities in this drilling campaign are as follows:

Table 3-1: Location of Activities

Site	Skua-12 (subsea well)	H-6 (surface well)	Skua-10 workover	H-3 (surface well) workover
Field	Skua	Montara	Skua	Montara
Licence/Permit	AC/L8	AC/L7	AC/L8	AC/L7
Water depth m	80	78	80	78
Location	12° 29’ 43.452” S 124° 25’ 16.855” E	12° 40' 20.472'' S 124° 32' 22.297'' E	12° 30' 4.6” (S) 124° 25' 5.4” (E)	12° 40' 20.548'' S 124° 32' 22.162'' E

Section 3 of the EP includes a comprehensive description of the existing environment in the Operational Area and Appendix C describes the existing environment and locations of key environmental sensitive receptors within the potential spill trajectory area (as predicted by spill fate modelling).

4. SPILL SCENARIOS AND CONTEXT

An environment risk assessment (ERA) was undertaken as part of developing the EP. Workshops were conducted that identified possible hazards with the potential for routine or non-routine (unplanned) loss of hydrocarbons to the marine environment. Each of these hazards has been assessed with selected control measures to reduce the likelihood and consequence of hydrocarbon losses to the marine environment to ALARP.

Refer to Section 7.5 of the EP which contains a summary of all the spill scenarios identified and assessed.

This OPEP has been prepared for the spill scenarios as summarised in the EP with a focus on the Level 3 LOWC scenario. The scenarios modelled represent the worst case scenarios as defined by the AMSA (2015) Guideline*: Technical guideline for preparing contingency plans for marine and coastal facilities*, however Jadestone understands that other scenarios are possible, such as a Level 2 Diesel spill, and as such Jadestone has made provisions in spill response to guide decision makers for all types of hydrocarbon spillages at any Level.

4.1 Hydrocarbon Characteristics and Behaviour

During the Drilling Activities, the following hydrocarbons may be unintentionally released to the marine environment: oily water, marine diesel, hydraulic oils and lubricating fluids, or oil. The following three hydrocarbons are the primary types spilled and therefore associated with this OPEP

- Marine diesel;
- Montara oil; and
- SKUA oil.

For details relating to the specific properties of the hydrocarbons refer to Appendices A5 and A6.

4.1.1 Marine Diesel

In the marine environment, marine diesel will behave as follows:

- Spread rapidly to low thickness levels in the direction of the prevailing wind and waves;
- Evaporation is the dominant process contributing to the fate of spilled marine diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance within 48 to 72 hours;
- The evaporation rate of marine diesel will increase in warmer air and sea temperatures such as those present in the region; and

- Due to the low specific gravity of marine diesel, it does not sink and accumulate on the seafloor as pooled or free oil unless adsorption occurs with sediment. However, it is possible for the diesel oil that is dispersed by wave action to form droplets that are small enough to be kept in suspension and moved by the currents.

ITOPF (2015) categorises diesel as a light Group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of marine diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering.

4.1.2 Montara Oil

Montara crude is classified as a Group III persistent oil (AMSA 2012) with an API of 34.5°(density of 845 kg/m^3) at 15ºC, dynamic viscosity of 3.9 cP at 40ºC and a pour point of 27^{o}C (when fresh). The Montara oil has residual components of approx. 27%, which means under certain conditions (i.e. exposure to weathering) it can solidify into small waxy flakes. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 16% of the oil mass should evaporate within the first 12 hours (Boiling Point (BP) < 180 °C); a further 18% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 39% should evaporate over several days (265 °C < BP < 380 °C).

4.1.3 SKUA Oil

SKUA oil is a medium crude with an API of 41.9°(815 kg/m^3 at 15^{o}C), which is categorised as a Group II oil (ITOPF). The SKUA oil has residual components of approx. 24%, which means under certain conditions (i.e. exposure to weathering) it can solidify into small waxy flakes. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 26.1% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 20.8% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 29.4% should evaporate over several days (265 °C < BP < 380 °C).

5. PREDICTED SPILL TRAJECTORY AREA, SENSITIVITIES AND RESPONSE PRIORITIES

Potential shoreline contact and protection priorities were identified using spill modelling results. This information has been used to inform the spill assessment process and will support the response process and development of an Incident Action Plan (IAP) in the unlikely event of a spill.
Shoreline locations that were identified as priority protection areas based on modelling thresholds described in the EP are shown in Figure 5-.1.

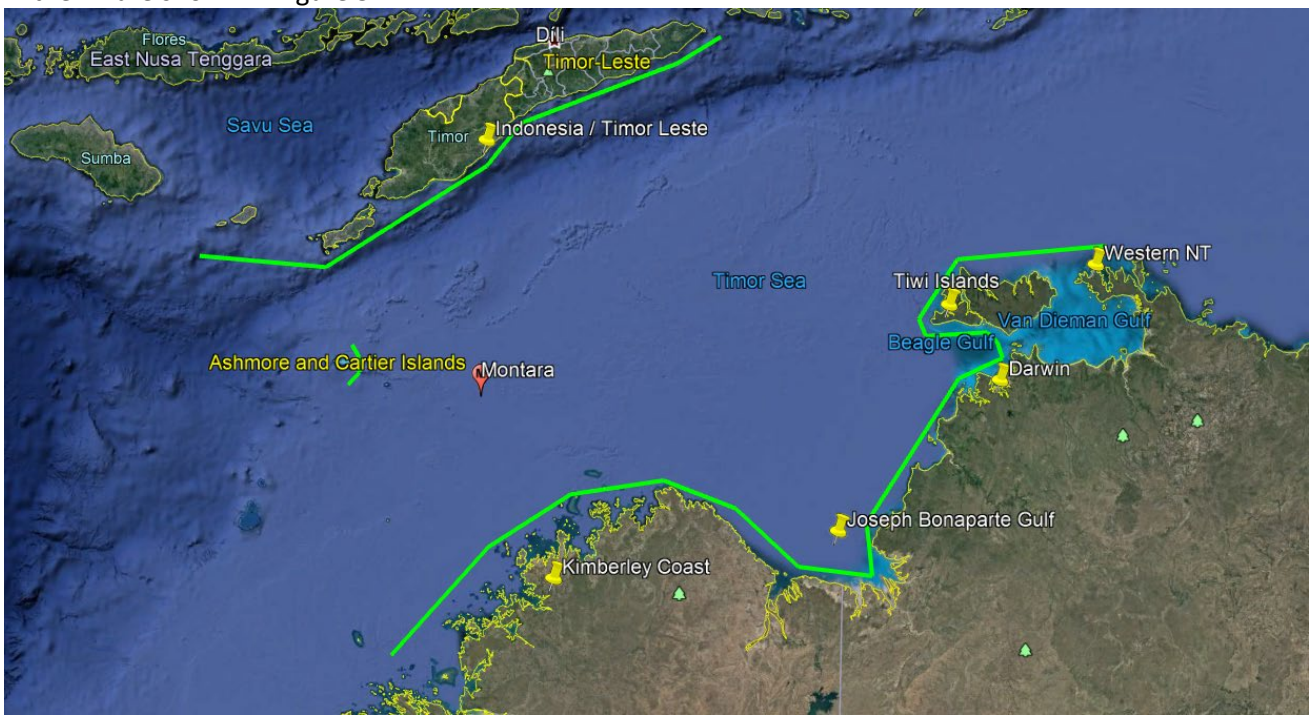


Figure 5-.1: General Location of Protection Priorities Used in Spill Modelling

The response strategies identified in this OPEP will be adopted in the IAP process as required to protect the environmental values of these areas. Refer Section 7.6.8. of the EP for priority receptors and spill modelling summary including impact descriptions of sensitive locations from surface oil, entrained and dissolved aromatic threshold concentrations. Section 3 of the EP describes the existing environment at the Operational Area and Appendix B describes the environment within the potential spill trajectory area, and, identifies the protected areas and fauna that may be impacted by a spill. Appendix H provides an overview of the Protected Priority areas.

6. APPLICABILITY OF RESPONSE STRATEGIES

The response strategies outlined in this OPEP have been developed by Jadestone utilising risk assessments to identify credible worst-case 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 spread that is used to identify potential sensitive receptors and response strategies required to reduce the consequences of a spill to ALARP. The response strategies are assessed using a NEBA process so the most effective response strategies with the lowest environmental consequences can be identified, documented and prepared for.

Table 6.1 below describe the decision to adopt or omit spill response strategies, and the potential environmental benefit of each strategy. An ALARP discussion regarding each oil spill response strategy is provided in the EP (Sections 6.8.4 and 7.6.12).

Table 6-1 shows the operational considerations for response strategies, applicability to the three potential oil types that could be spilled and operational considerations for response operations.

The response strategies described in Sections 8 to 14 contain both a description of the response strategy and decision-making criteria and guidance for implementation of the response strategy. Action Plans and mobilisation of resources to respond to the spill is presented in Part B of this OPEP.

Table 6-1: Oil Spill Response Strategy Operational Considerations

Strategy	Tactic	Acceptability/Applicability			Operational Considerations
		SKUA oil	Montara oil	Diesel	
Source Control	Refuelling: watch alert	✗	✗	✓	Suitable for spillage during refuelling activities
	Bunded areas around machinery and engines	✓	✓	✓	Suitable for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment onboard the vessels or platform. Bunded areas will minimise the volume of hydrocarbons escaping to marine waters.
	Relief Well	✓	✓	✗	Suitable for a LOWC scenario
	Capping Stack	✗	✗	✗	Not suitable due to the connection of the top of the Christmas Tree not being compatible with a capping stack or jack-up rigs.
Subsea Dispersant Application	Subsea First Response Toolkit (SFRT)	✓	✓	✗	Suitable for a LOWC scenario to clear debris and apply subsea dispersant. Subsea dispersant injection typically uses smaller volumes of dispersant to treat the oil than surface dispersants and is not constrained to daylight hours. Application is also less affected by adverse metocean conditions. Application must be accompanied with subsea dispersant effectiveness monitoring to determine efficacy and any modifications that may be required to application methods or Dispersant to Oil application rates.
Operational Monitoring	Aerial, Vessel, Tracking Buoys, Trajectory Modelling, Satellite surveillance, Fluorometry; SCAT	✓	✓	✓	Surveillance actions are used to monitor and evaluate the movement and volume of the released hydrocarbon, and to identify and report on any actual or potential impacts to flora and fauna that occur while the spill disperses. Surveillance results will be used to assist in escalating or de-escalating response strategies as required. Fluorometry is used for entrained oil monitoring. Shoreline and coastal habitat assessment provide intelligence to the IMT regarding oil contact to shorelines, validation of known sensitivities and potential shoreline clean-up activities.

Strategy	Tactic	Acceptability/Applicability			Operational Considerations
		SKUA oil	Montara oil	Diesel	
Surface Chemical Dispersion	Aerial and vessel application and subsea	✓	✓	✘	The previous Titleholder, PTTEP AA, commissioned dispersant testing on Montara oil to assess the efficacy of Dasic Slickgone NS (and Nalco Corexit 9500A) dispersant in conditions representative of winter and summer seasons. The results indicated that dispersant efficacy is a minimum of 73% at 12 hours and remains a minimum of 68% for summer and winter within 24 hours. After 24 hours the efficacy decreases due to the weathering (increased pour point and viscosity) of the oil (Leeder, 2013). The summer and winter seasons were tested for efficacy as they were representative of the minimum and maximum conditions (water, air temperature and wind speed) in the Timor Sea. Dispersants can be effective to reduce floating slick, and therefore the potential for shoreline contact and oiled wildlife. Not suitable for marine diesel as marine diesel is not a persistent hydrocarbon and has high natural dispersion rates in the marine environment. Chemical dispersant application has a low probability of increasing the dispersal rate of the spill while introducing more chemicals to the marine environment.
Containment and Recovery	Booms and skimming	✓	✓	✘	Suitable for SKUA and Montara oil if the sea state is acceptable and the oil can be corralled into sufficient volumes for collection. Not suitable for marine diesel given its rapid spreading and weathering nature. Marine diesel spreads quickly to a thin film, making recovery via skimmers difficult and ineffective.
Nearshore and Shoreline Protection and Deflection	Deflection and protection booms	✓	✓	✘	Will be considered if a spill is predicted to contact sensitive shorelines and resources can be deployed effectively and safely. However, given high tidal influences, lack of access, lack of anchoring points and subsequent distance for effective placement, this strategy would be unsuitable in many locations. This is not considered to be a primary response strategy.

Strategy	Tactic	Acceptability/Applicability			Operational Considerations
		SKUA oil	Montara oil	Diesel	
Shoreline Clean-up	Physical removal, surf washing, rock flushing, low pressure flushing, bioremediation, natural dispersion and remediation	✓	✓	✘	Intrusive response that requires careful site-specific planning to reduce secondary impacts of beach erosion, habitat damage and secondary contamination beyond shorelines. The majority of the affected coastline is tidal wetlands and flats, offshore islands and without access by land. Flushing may be considered if the oil enters high priority/slow recovery habitats such as mangroves and access is feasible without inflicting more damage onto the environment. Natural dispersion will occur as the hydrocarbon is remobilized and residual will biodegrade. This response has potential to cause more harm due to disturbance than light oiling, so must be carefully considered under a shoreline assessment analysis, and likely only for accessible sandy shorelines.
Oiled Wildlife Response	Reconnaissance, IAP OWR subplan development, hazing, rescue, rehabilitation, release, monitoring.	✓	✓	✘	Suitable for marine animals that come close to the spill when on the water and shorelines. Care to be taken not to drive marine animals into spill or split up the pods, schools, and flocks. Suitable for oiled marine animals. Difficult to do for large marine animals or poisonous animals such as sea snakes, however this response must always be assessed.
Scientific Monitoring (See OSR Arrangements JS-70-PLN-I-00037)	Activation of SMP	✓	✓	✘	Suitable for marine environment contacted by hydrocarbons either floating, dissolved or entrained.

6.1 Response Resource Planning

Spill response planning to identify a suitable combination of response strategies involves estimating required resources and an assessment of the capability required to support the response. Capability to support the minimum resources required has been planned for and is presented in **Table 7-1**.

The spill is predicted to contact international shorelines. In addition, the remoteness and nature of the shorelines contacted in Australia places a priority on offshore response strategies that reduce the volume of oil to shore. The primary response strategies will be:

- Source Control (relief well) will reduce the length of time the oil is released into the marine environment. Subsea dispersant application will reduce the amount of hydrocarbons reaching the surface and reaching priority receptors;
- Operational monitoring is the first response strategy implemented to enable Jadestone to gain and maintain situational awareness;
- Surface chemical dispersant application implemented because of the predicted benefit demonstrated through spill fate modelling; and
- Containment and recovery operations complement the dispersant strategy by being able to target areas of floating oil that have not dispersed.

The mix of resources presented provides a basis from which complementary response strategies can be undertaken for priority receptors with a reasonable prospect for positive outcomes.

- Spill response planning assumptions take into consideration:
- The weathering properties of Montara and SKUA oil are well understood, however this does not negate the influence of real time variables on the rate of evaporation and dispersion;
- Review of the response operations for the Montara Operations OPEP MV-70-PLN-G-00001; and
- Oil properties as described in Section 4.1 and Appendix C of the IMT Response Plan.

An overview of the equipment and dispersant available to Jadestone from national and international stocks and approximate mobilisation times is provided in Table 6-2.

Table 6-2: Oil Spill Response Equipment

Agency	Stockpile Locations	Equipment
Jadestone	• Darwin Supply Base • Supply vessel	Computerised Management Maintenance System (CMMS) provides up-to-date equipment lists for the various stockpile locations
AMOSC	• Broome • Exmouth • Fremantle • Geelong • Industry Mutual Aid register	AMOSC equipment and dispersant lists are available via the Member Login webpage: • AMOSC website: https://amosc.com.au/member-login/ AMOSC can arrange for transport of their equipment and dispersant to Darwin FOB.
AMSA	• ACT • Adelaide • Brisbane • Dampier • Darwin • Devonport • Fremantle • Gladstone • Horn Island • Karratha • Melbourne • Sydney • Townsville	AMSA equipment and dispersant lists are available on the AMSA website via the following links: • Equipment: https://amsa-forms.nogginoca.com/public/equipment.html?loc=%2Fapi%2Fv1%2Fasset%2F2616201 • Dispersant: https://amsa-forms.nogginoca.com/public/dispersant.html?loc=%2Fapi%2Fv1%2Fasset%2F2544502 • Fixed Wing Aircraft: https://amsa-forms.nogginoca.com/public/aircraft-avilability.html
OSRL	• Global	OSRL equipment and dispersant lists are available on the OSRL website via the following link: • OSRL website: https://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report/
ToxFree	• Darwin • Broome • Port Hedland • Karratha	Toxfree's waste management equipment are summarised in Toxfree document - Spill Response Waste Management Plan.

7. RESOURCES REQUIRED FOR A WCS SPILL EVENT AT MONTARA

Table 7-1: Resources Required for a WCS Spill Event at the Montara and Skua fields

Response Strategy	Capability Details	Week 1(total)	Week 2 (total)	Week 3 (total) onwards	Providers and quantities	Arrangement
Source Control						
Subsea dispersant application	Subsea First Response Toolkit and dispersant	None	One toolkit – up to 1240m^3 available	One toolkit – up to 5,000m^3 dispersant available	AMSA 355 m^3 AMOSC 247 m^3 AMOSC SFRT stockpile 500 m^3 OSRL 5347 m^3	AMSA MOU AMOSC SFRT membership OTA with Oceaneering OSRL
	Construction class vessel	None	One	One	Clarksons Platou (Vessel Broker)[1]	Contract / Subscription
	ROV	None	Two	Two	Vertech	Contract
Operational Monitoring						
Satellite tracking buoy	Satellite tracking buoy	Two	Four	Four	Satellite buoy provider AMOSC	Metocean Services International AMOSC
Satellite imagery	Synthetic Aperture Radar	7 images/week	7 images/week	7 images/week	KSAT	AMOSC MSC OSRL
Modelling	OSTM	7 trajectory and weathering models	7 trajectory and weather models	7 trajectory and weather models per week	RPS APASA	RPS APASA AMOSC MSC
Aerial surveillance	Aircraft	1 aircraft	2 aircraft	2 aircraft	Jadestone aviation contract	Babcock / Air North / Hardy Aviation
	Aerial observers	1 observer	2 observers	2 observers	AMOSPlan – Core Group	AMOSC
Vessel surveillance	Vessel of opportunity	1 vessel	1 vessel	1 vessel	Jadestone marine contracts	MSAs with vessel providers subject to availability
Fluorometers	Towable fluorometers	5 fluorometers	5 fluorometers	5 fluorometers	Jacobs Environmental or CSIRO	Scientific Monitoring Plan PO and CSIRO via AMSA MOU
Shoreline and coastal habitat assessment	Trained team leaders and team members trained on site.	7 team leaders, 14 team members (total 21 people).	12 team leaders, 24 team members (total 36 people).	25 team leaders and 50 team members (total 75 people)	DoT, OSRL, AMOSC and AMSA trained shoreline assessment team leaders. Labour hire contract	AMOSplan, DoT State Response Team, AMSA MOU, and OSRL Access Human Talent

[1] Jadestone subscription to Clarksons Seanet (AIS) system which provides access to vessels meeting required technical specifications to support offshore C&R operations.

Response Strategy	Capability Details	Week 1(total)	Week 2 (total)	Week 3 (total) onwards	Providers and quantities	Arrangement
Chemical Dispersant						
Dispersant volumes required based on daily calculations of oil able to be treated on the surface Average daily rate = 174m3 (Day 1 – 7) Minimum daily rate = 58 m3 (Day 77)		1225m^3	804m^3	4378m^3 Plus manufacture production capacity (if required) between 54m^3/day to 100m^3/day within 1-2 weeks of notification	Jadestone 15 m^3 AMSA 355m^3 AMOSC 747m^3 OSRL 5347m^3	BASSNet CMMS AMSA MOU AMOSC membership SFRT membership OSRL
	FWADC	6 spray aircraft	6 spray aircraft	6 spray aircraft	FWADC contractor	AMSA, AMOSC, Aerotech 1st Response JSOP
	OSRL	1 x Hercules 1 x Boeing 727	1 x Hercules 1 x Boeing 727	1 x Hercules 1 x Boeing 727	OSRL	OSRL Agreement
	Air attack supervisor (AAS)	1 aircraft 1 AAS	1 aircraft 1 AAS	2 AAS	Jadestone aircraft contracts	Babcock
	Spray vessels	5 spray vessels	5 spray vessels	5 spray vessels	Jadestone marine contracts	MSAs with vessel providers subject to availability
	Spray systems afedo spray system per vessel	10 (2 systems per vessel)	10 (2 systems per vessel)	10 (2 systems per vessel)	AMOSC	AMOSC membership
	Search and Rescue	1 aircraft	1 aircraft	1 aircraft	Jadestone aircraft contracts	Babcock
Containment and Recovery						
Containment and Recovery[2][3]	Offshore system (as per Section 11.3.2)	24 (1 x Jadestone) (12 x AMOSC) (11 x AMSA)	31 (24 from Week One) (7 x AMSA/OSRL)	45 ongoing	AMOSC AMSA OSRL Clarksons Platou (Vessel Broker)[4]	AMSA MOU AMOSC membership OSRL membership Contracts MSA Call off contracts Jadestone marine broker Clarksons
Personnel	2 x Trained oil spill responders per system	48 (AMOSC/CG/AMSA)	62 (AMOSC/CG/AMSA/OSRL)	90 ongoing	AMOSC core group AMSA NRT OSRL	AMSA MOU AMOSC membership OSRL membership

[2] Equipment no.s based on availability from AMOSC (Nov 2019), AMSA (Nov 2019) and OSRL (50% - Jan 2019) availability reports

[3] Waste capacity will be dependent on vessels being used, waste management (ashore) will be managed and coordinated through contracted waste service provider. Offshore waste to be managed using Montara FPSO and/or Stag facility.

[4] Jadestone subscription to Clarksons Seanet (AIS) system which provides access to vessels meeting required technical specifications to support offshore C&R operations.

Response Strategy	Capability Details	Week 1(total)	Week 2 (total)	Week 3 (total) onwards	Providers and quantities	Arrangement
Protection and Deflection						
	Protection and Deflection systems	1,200m Shoreline protection boom 1,200m Intertidal protection booms 600m solid flotation boom Shoreline and intertidal boom ancillaries	5,250m Shoreline protection boom 2,900m Intertidal protection booms 1,800m solid flotation boom Shoreline and intertidal boom ancillaries	9,950m booms	AMOSC AMSA OSRL	AMSA MOU AMOSC membership OSRL membership Labour Hire
Vessels	Small support craft	One vessel	10 vessels	10 vessels	Jadestone marine contracts	MSAs with vessel providers subject to availability
Personnel	Trained oil spill responders	4 trained responders 10 labour hire	12 trained responders 30 labour hire	20 trained responders 50 labour hire	AMOSC core group AMSA NRT OSRL	AMSA MOU AMOSC membership OSRL membership Labour hire contract
Shoreline Clean-up						
Personnel	1 x Trained oil spill responder (team leader) + 10 labourers per team	None	10 Teams (10 trained shoreline team leaders and 100 labourers) on site	42 Teams (42 trained shoreline team leaders and 420 labourers) on site	Labour hire contract Global Spill Control AMOSC core group DoT AMSA	Access Human Talent Global Spill Control AMSA MOU AMOSC membership OSRL membership
Waste	Bins, containers, bags	Bins, containers, bags	Bins, containers, bags	44 x 3 kL Waste skips 44 x IBCs and as determined by OSTM	Waste contractor	Toxfree NWA
Shoreline clean up equipment	Kits	Kits	Kits	Shoreline Clean-up Kits (Decontamination, Beach Wash Down, Initial IAP Support and Beach Clean-up Kits)	AMOSC AMSA	AMSA MOU AMOSC membership OSRL membership
Oiled Wildlife Response						
Oiled wildlife response	Refer to section 14				AMSA AMOSC DBCA Perth Zoo OSRL	AMSA MOU AMOSC membership OSRL membership DBCA and DBCA network

Personnel required to support the IMT functions and response strategies are grouped according to source and skill base.

- Jadestone group are sourced directly from within Jadestone.
- AMOSC and AMOSC Core Group members are specifically trained in oil spill response and are identified as those who fulfil team leader roles and who can train team members if required.
- National Response team (NRT) include trained personnel from AMSA and State/Territory response teams.
- OSRL trained oil spill responders.
- Mutual Aid / contractors / service providers group is made up of industry members, i.e. staff of other Titleholders; contract personnel; or service providers who can fulfil team member roles and don't necessarily have oil spill response training, for example labour hire.

Table 7-2 provides a summary of the cumulative personnel resource requirement across the sources.

Table 7-2: Indicative Cumulative Personnel Requirement Across Response Activities and Source

Function	TOTAL Personnel required – team & labour hire	Jadestone	AMOSC & AMOSC Core Group	OSRL	Mutual Aid / Contractors / Service providers
IMT functions	**38**	21 (3 x 7)	8 (2 x 4)	8 (2 x 4) + 1	-
WA DoT IMT (IGN)	**10**	3	7	-	-
Source control	**40**	2			38 WWC / Oceaneering / Provider
Monitor and evaluate	**79**	-	13 SCAT Team Leaders	12 SCAT Team Leaders	4 (2 x 2) Air Obs 50 Labour Hire for SCAT surveys
Chemical dispersant operations	**18**	-	10 (5 x 2) Vessel Ops	-	2 AAS 3 AFR 3 AMSA
Containment and recovery	**90**	-	20 (10 x 2)	22 (11 x 2)	48 NRT
Protection and deflection	**70**	-	12 (6 x 2)	-	8 (4 x 2) NRT 50 Labour Hire
Shoreline clean-up	**466**	-	16	10	20 (10 x 2) NRT 420 Labour Hire
Oiled wildlife	**122**	Sourced as per the WA/NTWORP arrangements (Level 6)			
TOTAL personnel required and source	**933**	**26**	**86**	**53**	**646**
Total Personnel for Response	**1522**				

8. SOURCE CONTROL STRATEGY

The initial and highest priority response to an oil spill incident is to prevent or limit further oil loss into the marine environment, if safe to do so. In most circumstances, the net benefit of source control outweighs impacts of further oil being released into the marine environment. However, further risks may arise due to increased vessels and rigs and the associated increased health and safety risks for the teams involved in the response.

The below tactics relate to minor releases, subsea flowline release and a vessel spill scenario. The Loss of Well Control scenario (surface and subsea) is covered under Section 16.5.

8.1 Initiation and Termination Criteria

Source	Initiation criteria	Termination criteria
Vessel or MODU release	Spill observed.	Release of oil ceased, spilled oil that has been contained is cleaned up and disposed of.
Subsea or Surface well		

8.2 Tactics

Source Control response plans, to cover the spill scenarios identified, are provided for:

- Vessel, MODU and topside releases - minor spills with small volumes of hydrocarbons such as bilge/oily wastewater, hydraulic fluids, or Diesel;
- Vessel release - Fuel tank release from vessel collision (Diesel);
- FPSO release -oil release from storage tank resulting from vessel collision with FPSO or fuel tank release (Diesel); and
- Subsea or surface well release – release of oil.

The IMT Team will gather surveillance information from those involved in preventing further release of hydrocarbons to the marine environment and ensure that the appropriate source control actions are being undertaken.

8.3 Tasks for Vessel, FPSO and Topside Minor Releases

In the event of a refuelling incident such as pipe rupture, coupling failure or tank overfilling, the pump will be stopped upon detection of the leak. The hydrocarbon remaining in the transfer line may escape to the environment as well as any hydrocarbon released prior to the transfer operation being stopped. For Diesel refuelling this has been estimated at a maximum volume of 5 m^3 (representing a 60m^3/hr pump rate and a release duration of up to 5 mins) as bunkers are taken with a watchman on deck of the supply vessel and a pump stop at the bunker station.

Shut off valves are regularly serviced and tested to ensure they will work properly if required. Released oil will be captured in the FPSO's bunds, which have closed drainage systems that deliver drainage water (which may contain hydrocarbon contamination) to a designated storage tank. The support vessels also have closed drainage systems for capture of on- board leaks.

The spilt hydrocarbons contained on-board the MODU or support vessels will be controlled and cleaned up in accordance with each vessels Shipboard Oil Pollution Emergency Plan (SOPEP), which is compliant with MARPOL 73/78 Annex 1- Prevention of Pollution by Oil under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. The mitigation measures within each SOPEP include:

- Pumping operations ceased immediately following the spill;
- Valve/s closed;
- System receiving product is immediately shut down following a spill;
- Drainage network is closed as soon as practicable following the spill to prevent discharge/spillage to the ocean;

- Make necessary repairs to pipe to prevent further leakage;
- Use spill kit to clean-up spills on platform and/or vessel; and
- Store any clean up waste in bunded area for onshore disposal.

Areas used for the permanent or temporary storage of bulk fuels and/or chemicals are either fully bunded by sealing deck drains or secondary containment is provided to prevent accidental discharges to the ocean. Bunding is also located beneath the refuelling hose connections, operational equipment, and fuel tanks on the supply vessel.

In the event hydrocarbon is spilt onto the decks of the vessel or MODU, the relevant SOPEP will be implemented. Sorbent materials are used from spill kits on-board the vessel/platform to mop up hydrocarbon on deck. Soiled sorbent materials are bagged and disposed to shore. Before washing down the deck after excess oil has been cleaned up, the OIM or Vessel Master will confirm that the drainage network is closed and will not discharge to the ocean.

Section 7 of the EP describes the environmental risks and management for unplanned events associated with the operational activities.

8.4 Tasks for Hydrocarbon Storage or Fuel Tank Rupture

This source control plan covers vessel collision scenarios that may result in the release of all or part of a storage tank or fuel tank contents, releasing hydrocarbons to the marine environment. The hydrocarbon type could be:

- Diesel from a support vessel or FPSO (906m^3); and

In the event hydrocarbon is released from the FPSO or support vessel due to vessel collision, the following activities are to be immediately implemented (subject to safety considerations of all on-board at the time of incident response):

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

Unplanned release of hydrocarbons from the FPSO or support vessels to the marine environment is managed by the Vessel Master in accordance with MARPOL 73/78 Annex 1- Prevention of Pollution by Oil under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983.

8.5 Subsea Dispersant Application Strategy

Subsea dispersant application aims to disperse hydrocarbons close to the release point and minimise hydrocarbons reaching the sea surface. It is primarily applicable to wells where the loss of contentment is subsea. Unlike wells drilled with subsea BOPs, the “Macondo” like scenario of a subsea blowout is much less likely on wells with surface BOPs. However, a subsea loss of containment could occur on Skua-12 or Skua-10, when a subsea tree is involved, and hydrocarbon leaks could feasibly occur at the seabed. This subsea dispersant technique helps to break up the oil droplets so that they are dispersed, diluted and biodegraded more rapidly in the water column, reducing the amount of surface hydrocarbons drifting towards sensitive receptors. An additional benefit of this technique is that it can successfully reduce volatile organic compounds from reaching the surface close to the release site, which is beneficial to the health and safety of personnel involved in any source control operations.

Chemical dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA) are to be prioritised for use. Chemical dispersants not listed as

approved on the OSCA register are to be assessed for acceptability using Jadestone's Chemical Selection Evaluation and Approval Procedure (JS-70-PR-I-00033) prior to application, and only used if evaluated to be an acceptable level of risk.

The previous Titleholder, PTTEP AA, commissioned dispersant testing on Montara oil to assess the efficacy of Dasic Slickgone NS (and Nalco Corexit 9500A) dispersant in conditions representative of winter and summer seasons, the results indicated that dispersant efficacy is a minimum of 73% at 12 hours and remains a minimum of 68% for summer and winter within 24 hours. After 24 hours the efficacy decreases due to the weathering (increased pour point and viscosity) of the oil (Leeder, 2013). The summer and winter seasons were tested for efficacy as they were representative of the minimum and maximum conditions (water, air temperature and wind speed) in the Timor Sea.

Through its membership with AMOSC, and also by joining the SFRT committee, Jadestone has access to the Subsea First Response Toolkit (SFRT) which includes manifolds, jumpers, wands and a dedicated dispersant stockpile, including Dasic Slickgone NS and Nalco Corexit 9500A. Jadestone can access a suitable vessel for transportation of the subsea dispersant injection system and ancillary equipment including ROVs through the contracted vessel broker. The location of suitable vessels is checked every 2 weeks during "at risk" drilling operations.

Coiled tubing is not required for subsea dispersant injection at depths <150m.

It is assumed the dispersant to oil ratio (DOR) would commence at 1:100 and would be modified based on the results of the effectiveness monitoring. Research conducted by Brandvik et al., 2014 indicated that DORs of 1:50, 1:100 may be sufficient to cause substantial additional dispersion, particularly if the dispersant is injected close to the nozzle. To achieve a DOR of 1:100, IPIECA & IOGP 2015 recommend for a flow rate of 20,000 bbl./day, a dispersant pump rate of 22L/min is required.

Subsea dispersant application will not commence until Day 10, due to transportation of the equipment to site (Refer to Section 8.5.2). The flow rate by Day 10 has been calculated to be ~ 4,223m^3/day or 26,561 bbl/day. Using the recommended IPIECA/IOPG flow rates for a DOR of 1:100, a given the mature state of the field, a conservative flow rate of 30,000 bbl/day has been used to calculate dispersant volumes required for week 1. This equates to **~47.52m^3/day** of dispersant required to treat a release of 30,000 bbl/day, however, this volume will reduce over time as the reservoir depletes. For example, by Day 30, the flow rate is estimated to be reduced to 2,896m^3/day (18,215 bbl/day), requiring a dispersant rate of 28.8 m^3/day.

8.5.1 Initiation and Termination Criteria

Tactic	Initiation Criteria	Termination Criteria
Mobilise Subsea First Response Toolkit	Immediately when a subsea Level 3 spill incident is confirmed	When there is no net environmental benefit of continuing dispersant application
Mobilise vessel and ancillary equipment	Immediately when a subsea Level 3 spill incident is confirmed	When there is no net environmental benefit of continuing dispersant application

8.5.2 Tactics

The following tactics are included for subsea dispersant operations:

- Subsea First Response Toolkit; and
- Vessel and ancillary equipment

The Source Control Action Plan (**Section 16.5**) is activated at the initial stage of the incident so that resources can be mobilised and ready for use. As the incident progresses, chemical dispersant use is continually reassessed through the NEBA and IAP processes.

Subsea First Response Toolkit

The subsea first response toolkit (SFRT) was built by Oceaneering and resides in Jandakot, Western Australia. The SFRT comprises:

- Debris clearance equipment;
- BOP intervention equipment;
- Dispersant equipment (pumps, flying leads, coiled tubing head, dispersant wands); and
- Ancillary tools.

Supporting this there is 500m^3 of Dasic Slickgone NS dispersant which is dedicated to SFRT and resides in Fremantle. This stockpile is managed by AMOSC.

If the SFRT is required, notification and activation is made through AMOSC. The SFRT and dispersant would be transported via road from Jandakot and Fremantle to Darwin (24 hours to arrange and 72 hours to transport). Once the SFRT is loaded onto the vessel in Darwin and the vessel transits out to the well location, the vessel and equipment would be infield within 9 days of the spill and commencing subsea dispersant application by day 10 (Refer to **Section 16.5**).

Vessels and Ancillaries

The SFRT does not include vessels or ROV equipment. The SFRT requires a suitable construction class vessel for deployment. It is expected that this class of vessel would be available from the Singapore region and could transit and be available for onloading of the SFRT in Darwin by day 7. Vessel availability shall be monitored monthly via Jadestone's contracted vessel broker Clarksons.

ROVs would be supplied from Vertech under existing contractual arrangements.

Subsea Dispersant Effectiveness Monitoring

Subsea dispersant effectiveness monitoring is required as part of this response strategy. Prior to any application of subsea dispersants, initial monitoring should be conducted at the release point to determine the nature of the release, characterise the properties and behaviour of the oil and estimate the oil and gas flow rates. This information will inform the initial choice of dispersant injection methods (e.g. number of nozzles, nozzle sizes) and application rates.

Subsea dispersant monitoring will include monitoring 'phases', as per the Industry Recommended Subsea Dispersant Monitoring Plan (API 2013). Results from the monitoring will feed into the operational NEBA assessment used for decision-making regarding the continuation or termination of subsea dispersant use.

8.5.3 Chemical dispersant stocks

Refer to Section 10.4 for information relating to dispersant stockpiles.

8.5.4 Resource Rationale for Chemical Dispersant Application

Calculations - Volume of oil to be treated

- Assume 100% available to be dispersed due to location of wands next to well head.

Calculations - Volume of dispersant required

- For planning purposes, a DOR of 1:100 is used because it is a broadly accepted ratio and can be adjusted depending on effectiveness

Assumptions – SFRT operations

Once operational, subsea dispersant operations can continue 24 hours per day / 7 days per week as it is not constrained by daylight hours, as with most other response operations. However, extreme weather events such as a cyclone would require the subsea dispersant vessel and supply shuttle vessels to cease operations and transit to a safe location.

8.5.5 Dispersant budget

The total amount of dispersant required for subsea application is 1,832m^3 which can be achieved using the dispersant stock available in Australia and the OSRL GDS (Table 10-2). The assumptions above have been factored into these calculations. It is also assumed that once subsea dispersant application commences, surface dispersant application would be scaled down, or ceased, depending upon the results of subsea dispersant effectiveness monitoring.

A dispersant budget has been prepared taking into account the daily / weekly application requirements, daily volume of dispersant arriving in Darwin and balance on hand after each day. It also accounts for the depletion of the reservoir over the duration of the release. See Table 8-1 for these details.

Jadestone will review the dispersant application plan daily and modify according to the NEBA and operational feedback.

Dispersants listed on the OSCA Register have undergone both efficacy and toxicity tests. Toxicity testing must be undertaken in a NATA (or equivalent) accredited laboratory and be ANZECC compliant or consistent. They are tested for both at sea and shoreline applications. Once OSCA Register listed, the use of these products to assist in oil spill clean-up in Australian Waters during a National Plan response is protected under an exemption under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

National logistics arrangements for mobilisation of dispersants to deployment locations within the required timeframes have been confirmed.

Table 8-1: Subsea dispersant delivery budget

Day	Maximum volume of dispersant applied for subsea application (m^3)	Dispersant arrived in Darwin m^3	Balance on hand m^3
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	500	500
6	0	90	590
7	0	90	680
8	0	80	760
9	0	80	840
10*	48	80	872
11	48	80	904
12	48	80	936
13	48	80	968
14	48	80	1000
Week			
3	241.5	Access to 5,000m^3 of Global Dispersant stockpile to meet remaining need of 1,592m^3 Dispersant delivery and supply will be continually assessed and administered as required.	
4	202		
5	182		
6	171.5		
7	171.5		
8	161		
9	161		
10	151		
11	151		

* subsea dispersant injection commences

8.6 Relief well

Relief wells are a proven strategy to successfully intercept and kill a well blow out, so that plug and abandonment activities can be safely performed. This technique requires personnel with demonstrated experience in relief well planning and drilling.

8.6.1 Initiation and Termination Criteria

Tactic	Initiation Criteria	Termination Criteria
Mobilise relief well	Immediately when a subsea Level 3 spill incident is confirmed	When relief well drilling is complete and well is successfully killed

8.6.2 Tactics

The following tactics are included for relief well operations:

- Mobilise for relief well

The Source Control Plan (Section 16.5) is activated at the initial stage of the incident so that resources can be mobilised and ready for use.

8.6.3 Relief well

To kill a well where control has been lost, and make it safe, a suitable Mobile Offshore Drilling Unit (MODU) is required to transit to the well location and drill an intercept (relief) well. It is estimated that a relief well could drill down to the required intercept point within 21 days. To mobilise a rig and complete the relief well installation and well kill operations is estimated to be done within 77 days.

Appendix H of the Blowout Contingency Plan (JS-70-PLN-D-00001), provides details of reservoir and wellbore data, reservoir and wellbore geometry, kills weights and pumping rates and equipment requirements. This information will be used to finalise a detailed relief well plan should an incident occur.

To help facilitate securing a suitable rig in the shortest timeframe possible, Jadestone is a signatory to the APPEA MOU for mutual assistance to facilitate and expedite the mobilisation of a MODU for a relief well. The MoU commits the signatories to share rigs, equipment, personnel and services to assist another operator in need. Jadestone will also monitor external drilling programs to gauge MODU availability throughout the life of the EP. When selecting a suitable rig, the MODU's Safety Case should be considered, therefore Jadestone will continue to monitor the status of Registered Operators with approved Safety Case rigs.

To ensure personnel with specialist technical knowledge and experience are engaged throughout the relief well operations, Jadestone will maintain a Contract and Equipment Access Agreement with Wild Well Control (WCC) throughout the life of the EP. This is embedded in the Blowout Contingency Plan.

9. OPERATIONAL MONITORING STRATEGY

A combination of methods has been identified as appropriate to characterise the released hydrocarbon, estimate the extent of the spill, measure oil volume and concentration on or in the water and locate oil along shorelines.

Understanding the behaviour and likely trajectory of an oil spill is critical to evaluate the appropriate response strategy. In some situations, after operational monitoring activities have been employed, leaving the oil to naturally dissipate and degrade may be considered the most appropriate option if any further response is a risk to increasing the environmental impact, or presents a significant safety risk.

9.1 Common Operating Picture (COP)

The ability of the IMT to manage and coordinate response operations will be heavily reliant on being able to compile and effectively manage all the information and data provided as part of the operational monitoring strategy. To achieve this a Common Operating Picture (COP) will be utilised, consisting primarily of geographical and geospatial information.

9.2 Operational Monitoring Plan

To coordinate the operational monitoring requirements, an overarching operational monitoring plan (OMP) will be developed and implemented by the IMT. The OMP will include ALL operational monitoring activities and will be designed to provide clarity around each activity, the interaction with other monitoring operations and to ensure that all monitoring activities are conducted safely and effectively.

9.3 Initiation and Termination Criteria

Tactic	Initiation Criteria	Termination Criteria
Tracking buoys	Immediately once an oil spill is confirmed	Tracking buoy no longer required to inform response planning.
Vessel surveillance	Immediately once Level 2/3 oil spill is confirmed	Vessel surveillance reports no longer required to inform common operating picture
Aerial surveillance	Immediately once Level 2/3 oil spill is confirmed	IAP no longer requires aerial surveillance to inform common operating picture; and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Satellite imagery	Immediately once Level 2/3 oil spill is confirmed	Satellite imagery no longer required to inform common operating picture
Oil Spill Trajectory Modelling (OSTM)	Immediately once Level 2/3 oil spill is confirmed	Modelling no longer required to inform common operating picture; and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Fluorometry	Dispersant application has occurred	Dispersant application no longer being undertaken; and

Tactic	Initiation Criteria	Termination Criteria
		Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Shoreline and coastal habitat assessment	Immediately once Level 2/3 oil spill is confirmed	When all shoreline segments have reached status of no further action be taken (NFA); and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response

9.4 Tactics

The following tactics are considered to be the most effective for supplying the required information to achieve situational awareness and inform response decisions to reduce impacts resulting from the worst-case potential spill, from the Drilling Activities to ALARP:

- Tracking buoys;
- Vessel surveillance;
- Aerial surveillance;
- Satellite imagery;
- OSTM;
- Fluorometry; and
- Shoreline and coastal habitat assessment using Shoreline Clean-up Assessment Technique (SCAT) surveys.

9.4.1 Tracking Buoy Deployment

Satellite tracking buoy deployment is to be initiated within three hours of spill notification and placed within or as close as is safely allowable to the plume to follow the movement of a surface spill in the marine environment.

Note: Buoys are not to be dropped from a height of greater than 10m to water surface.

Satellite tracking buoys can be deployed directly from the facility (below 10m) or mobilised via available support vessels as directed by the OIM.

The time taken to deploy the tracking buoys will depend on the location they are sourced from and transit time for the vessels to deploy or retrieve. After initial deployment additional buoys will be deployed on a regular basis as determined by the IMT to best support the building and maintenance of situational awareness.

Tracker buoys are deployed under the direction from the IMT Leader, by following the appropriate standard operating procedure (SOP). Once deployed it is essential that confirmation of a successful deployment is provided back to the OIM or IMT.

Deployed buoys will be tracked online by the IMT and spill fate modelling service provider. The Linc Metocean login details are available on OneNote Jadestone IMT resource. On completion of spill monitoring using tracking buoys, the buoys are to be retrieved by vessel.

Normal procedure will be for the deployment of a single tracking buoy on Day 1 and the second approximately 24 hours later. On being deployed all buoys will be checked to be operational through the online website. All buoy data will be used to assist with understanding the local metocean conditions.

Additional buoys will be sourced as part of the response, however if required buoys can be collected and redeployed.

9.4.2 Vessel Surveillance

Direct observations from the field support vessels or other incidental vessels can be used to assess the location and visible extent of the spill from hydrocarbon incidents, to verify modelling predictions and trajectories, and to support other response strategies.

Note: Vessel-based surveillance is only effective if sea state conditions are calm and the spill is observable.

A decision on the suitability of the metocean conditions will be made (OIM / Vessel Master / IMT) and direction provided to available vessels. Vessel surveillance is to be instructed by the OIM (Level 1) or IMT (Level 2 or 3). Vessel surveillance observations will be used by the IMT in conjunction with all other operational monitoring information (Level 2 or 3) to confirm location and extent of the spill, which will in turn assist with the development of appropriate response strategies.

The nearest support vessel to the release location will be mobilised upon notification of incident. Vessels currently on hire to Jadestone will be initially selected for vessel surveillance duties with other vessels provided from Jadestone's contracted vessel providers.
Reporting requirements will be as follows:

- Information to be provided to the OIM (Level 1) or IMT (Level 2 or 3);
- Essential information to be reported will include:
  - Spill location (latitude & longitude);
  - Length and width of slick;
  - Visual appearance of the slick (colours, emulsification etc) using the Bonn Oil Appearance Code (refer to Appendix A2);
  - Associated weather conditions in vicinity of the spill (wind speed/direction, sea state, swell);
  - Any marine fauna or other activities observed; and
  - Photographic images.
- All information is to be compiled into a Vessel Surveillance Log (refer Appendix A1.) which will be sent to the OIM/IMT within an hour of the observations being taken.

9.4.3 Aerial Surveillance

Direct observations from aircraft can be used to assess the location, estimated volume and visible extent of the spill from hydrocarbon incidents, in order to verify modelling predictions and trajectories, and to support other response strategies.
Trained Aerial Observers will be sourced through the AMOSplan arrangements and deployed to the response location, however, should a delay in their arrival be anticipated, a surveillance flight will be conducted utilising available aircraft crew.
A decision on the suitability of the meteorological conditions will be made by the aircraft captain, who will relay this decision to either the OIM (Level 1) or IMT (Level 2 or 3) to receive appropriate tasking. Aerial surveillance observations will be used by the IMT in conjunction with all other operational monitoring information (Level 2 or 3) to confirm location and extent of the spill, which will assist with the development of appropriate response strategies or modification to existing strategies.

Note: Specific meteorological limits will vary depending on the type of aircraft being flown.

Reporting requirements will be as follows:

- Information to be provided to the OIM (Level 1) or IMT (Level 2 or 3);

- Essential information to be reported will include:
  - Spill location (latitude & longitude);
  - Length and width of slick;
  - Visual appearance of the slick (colours, emulsification etc) using the Bonn Oil Appearance Code (refer to Appendix A2);
  - Associated weather conditions in vicinity of the spill (wind speed/direction, sea state, swell);
  - Any marine fauna or other activities observed; and
  - Photographic images.
- All information is to be compiled into an Aerial Surveillance Log (refer Appendix A1) which will be sent to the OIM/IMT within an hour of the aircraft returning to its operating base. Where possible, a verbal report via radio/telephone en route providing relevant information should be considered if the aircraft has long transits from the spill location to base.

Flight Schedules are to be developed in support of response operations. The frequency of flights will be sufficient to ensure the information collected during each flight (i.e. observer log and spill mapping) meets the information needs of the IMT to validate spill location, dispersion and the information needs of fate modelling.

Note: Flights will only take place during daylight under visual flight rules (VFR).

A recording of the spill extent is made by outlining the approximate two-dimensional extent of the slick(s) on a map template, including GPS coordinates of extent, the time observations were made and date noted on the map template. Photographic images are to be taken of the slick and sent to the IMT.

The trained Aerial Observer or the IMT will make estimations of thickness based on visual sighting or the photographic images respectively. Thickness estimates are to be based on the Bonn Agreement Oil Appearance Code.

Photographic or video records taken by the Aerial Observers for each fauna sighting and the location and details of each sighting are recorded with a cross-reference to photographic imagery captured. The Aerial Surveillance Marine Fauna Sighting Record Sheet is provided in Appendix A1.

9.4.4 Satellite imagery

Satellite imagery uses Synthetic Aperture Radar (SAR) to detect oil spills by emitting a radar pulse and measuring the 'backscatter' from the earth. It is a cost effective and proficient surveillance technique, as it is not reliant on daylight, cloud cover and can survey large areas of ocean in a single satellite pass. It is a useful surveillance tactic to help quantify data received from other optical-based surveillance tactics (e.g. aerial and vessel surveillance).

Satellite imagery can be obtained through AMOSC via AMOSPlan arrangements. OSRL also provides access to this service. Satellite data is available within 24 hours, then every 6 to 24 hours thereafter depending on satellite positions.

9.4.5 Oil Spill Trajectory Modelling

OSTM provides a simulated trajectory of the spill based on historic and actual metocean data. This modelling will be provided in the form of a geospatial information system (GIS) format so that it can be easily integrated into the COP.

OSTM will be provided by RPS in Perth, WA. The fate modelling service is to be initiated by submission of the RPS trajectory modelling request. OSTM will start within two hours of submission of the request.

Contact details for RPS are as follows:

Email: Response@apasa.com.au
Mobile: 0407 477 196

Three day forecast outputs are provided daily to Jadestone. More frequent updates can be provided if weather conditions are highly variable or change suddenly. Data from aerial surveillance is to be provided to RPS who are contracted to undertake modelling 24/7 to verify and adjust fate predictions of the spill and improve predictive accuracy.

9.4.6 Fluorometry

Fluorometry surveys are used to inform the ongoing dispersant decision-making process. Surveys will be run across the expected plume extent, as well as vertically through the water column. This allows a far greater area of coverage than discrete sampling, aiding in the detection and delineation of entrained oil. This is particularly relevant for subsea releases which may not be detectable using visual means above the sea surface.

This will allow continuous monitoring of entrained oil covering a large area and will provide near real-time three-dimensional data on the distribution of entrained oil to enable decision making within the IMT. Similarly, other sources of monitoring data (e.g. spill fate modelling) can be used in near real-time to inform the path of the sub surface glider.

In the event that sub surface fluorometers are unavailable or cannot cover the required scale of operation, towed fluorometers towed behind vessels will be used as an alternative or complementary approach. Jadestone has engaged Jacobs Environmental as a supplier of sub surface gliders with fluorometer sensors for the monitoring of entrained oil following an oil spill. Multiple towed fluorometers are also available from CSIRO. If required, within 24 hours 5 fluorometers could be mobilised to support monitoring of chemical dispersant program.

9.5 Shoreline and Coastal Habitat Assessment

Shorelines are highly variable and some (i.e. non-rocky shores and medium- to high-energy shorelines) can be quite dynamic. To assist in determining which clean-up methods are most appropriate for those areas exposed to hydrocarbons, it is necessary to obtain information about shoreline character (topography, complexity, exposure etc.), source oil characteristics and distribution, and shoreline processes and redistribution of any oil.

Shoreline clean-up assessment technique (SCAT) surveys provide a mechanism by which to record shoreline exposure to stranded oil (see Appendix A3 for shoreline assessment forms). The outcome of SCAT surveys is to provide a rapid assessment of:

- Shoreline character;
- Distribution of coastal habitat/fauna;
- Level of oil contamination and oil characteristics (if oil present); and
- Any constraints to responding to shoreline (e.g. access and safety constraints).

The information collected through SCAT surveys is used to inform appropriate shoreline response strategies, in particular termination criteria for response actions.

A shoreline assessment comprises the following tasks:

- Assessment of shoreline character, habitats and fauna including:
  - shoreline structured biotic habitats;
  - distribution of fauna;
  - shoreline energy and processes;

- shoreline substrate;
- shoreline form; and
- access/ safety constraints.

- Assessment of shoreline oiling (if present):
  - surface distribution and cover;
  - subsurface distribution;
  - oil type, thickness, concentration and physical character; and
  - sampling of oil for laboratory analysis.

9.6 Resource Rationale for Operational Monitoring

SCAT is made up of 3 members per team and are assumed to be able to cover at least 10km per day. This distance may be more, especially if UAVs are employed to cover shorelines that have access limitations. Jadestone has used the OSTM data for shoreline contact to plan worst case shoreline and habitat assessment personnel requirements. In this case, the Western Northern Territory region presents the greatest resource requirement of 18 personnel (6 teams of 3 members each) and Ashmore/ Cartier presents the minimum contact time, presented in Table 9-1. Team leaders will be sourced from AMOSC and OSRL and will be trained in shoreline assessment techniques. Team members can include personnel who have completed basic training prior to mobilisation.

It should be noted that a single spill will not contact all shorelines listed in Table 9-1. In preparing for this capability, Jadestone will be able to meet lesser shoreline assessment requirements for other locations.

Table 9-1: Resource Rationale for Shoreline Assessment Personnel

Receptor	Minimum time to shoreline oil at >100g/m^2 (days)	Oiled shoreline at concentrations >100 g/m^2 in worst replicate simulation (km)	Number of SCAT teams required
Ashmore / Cartier	3	80	1[5]
Tiwi Islands (Melville & Bathurst)	19	352	5
Darwin Coast	17	137	3
Western NT (Kakadu, Coburgh, East Arnhem Land, West Arnhem Land)	21	716	6
Joseph Bonaparte Gulf (NT)	17	346	4
Kimberley Coast (North Kimberley Marine Park)	7	339	5
Browse Island	14	4	1
Indonesia	26	337	TBA

[5] SCAT at Ashmore/Cartier will need to be performed by Unmanned Aerial Vehicles (UAV) as it is prohibited to anchor anywhere in Cartier Island Commonwealth Marine Reserve due to the risk of Unexploded Ordnances (UXO) – Refer to Section 13.4.1

Receptor	Minimum time to shoreline oil at >100g/m^2 (days)	Oiled shoreline at concentrations >100 g/m^2 in worst replicate simulation (km)	Number of SCAT teams required
Timor-Leste	36	42	TBA

Note: SCAT numbers not to be added up as spill will not contact all receptors modelled. Number required based on direction of spill and timeframes to contact.

10. SURFACE CHEMICAL DISPERSION STRATEGY

Evidence from the Montara oil spill in 2009 from AMSA reported that 'based on experienced personnel during the response the use of dispersant was highly effective in assisting the natural process of biodegradation and minimising the risk of oil impacts on reefs and shorelines' (Refer Appendix A4 of the OPEP). If there is a weather condition that prevents the application of dispersant (which is unusual for the environment around the Montara facility), this in itself aids natural dispersion.

Dispersants are chemicals sprayed onto oil spills from aircraft or vessels to accelerate the process of natural dispersion. They are designed to separate the oil particles on surface waters and help dispersion in the water column (as small droplets) to speed up the process of natural biodegradation. Chemical dispersants can also be used to:

- Decrease volume of floating oil;
- Reduce the impact to shorelines; and
- Reduce the quantity of waste created.

Chemical dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA) are to be prioritised for use. Chemical dispersants not listed as approved on the OSCA register are to be assessed for acceptability using Jadestone's Chemical Selection Evaluation and Approval Procedure (JS-70-PR-I-00033) prior to application, and only used if evaluated to be an acceptable level of risk.

The previous Titleholder, PTTEP AA, commissioned dispersant testing on Montara oil to assess the efficacy of Dasic Slickgone NS (and Nalco Corexit 9500A) dispersant in conditions representative of winter and summer seasons, the results indicated that dispersant efficacy is a minimum of 73% at 12 hours and remains a minimum of 68% for summer and winter within 24 hours. After 24 hours the efficacy decreases due to the weathering (increased pour point and viscosity) of the oil (Leeder, 2013). The summer and winter seasons were tested for efficacy as they were representative of the minimum and maximum conditions (water, air temperature and wind speed) in the Timor Sea.

For the WCS surface release, Jadestone will apply surface chemical dispersants as soon as practically possible to maximise the application of dispersant to the freshest oil (<24 hours old). Dispersant is most effective on oil that is of a thickness between 50g/m^2 and 100g/m^2.

However, for dispersant planning purposes, Jadestone has the ability to deliver chemical dispersants to any threshold and has targeted visible oil closest to the source. The dispersant budget has accounted for this option which shows that Jadestone are able to exceed and deliver the maximum volume of dispersant required from Day 8 onwards.

Jadestone will monitor the effectiveness of dispersant application to assess whether to continue planned volumes through the NEBA process. For a subsea release, Jadestone will initially mobilise the surface dispersant capability as required until the AMOSC SFRT is operational.

Chemical dispersants can decrease the risk of oil impact to shorelines but can increase the risk to pelagic wildlife through entrained oil. NEBA will be used to assist in assessing the exchange of one risk to another. The Planning Team will be required to complete the Risk Assessment step in the IAP process before proceeding.

10.1 Initiation and Termination Criteria

Table 10-1: Initiation and Termination Criteria Surface Chemical Dispersant Tactics

Tactic	Initiation criteria	Termination criteria
Mobilising dispersant	Immediately when Level 2 or 3 spill incident is confirmed; and Net Environmental Benefit Assessment (NEBA) demonstrate beneficial use of dispersant prior to application that is likely to result in a net environmental benefit	When there is no net environmental benefit of continuing dispersant application; and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Aerial application of dispersant via FWADC aircraft and Hercules	Immediately when a Level 2 or 3 spill incident is confirmed	When there is no net environmental benefit of continuing dispersant application; and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Vessel based application of dispersant	Immediately when Level 2 or 3 spill incident is confirmed	When there is no net environmental benefit of continuing dispersant application; and Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response

10.2 Tactics

The following tactics are considered for surface chemical dispersant operations are:

- Aerial application of dispersant; and
- Vessel based application of dispersant.

The Surface Chemical Dispersion Action Plan (Section 16.7) is activated at the initial stage of the incident so that resources can be mobilised and ready for use. As the incident progresses, chemical dispersant use is continually reassessed through the NEBA and IAP processes.

10.2.1 Aerial Application of Chemical Dispersants

Fixed Wing Aerial Dispersant Capability (FWADC) – notification and activation is made through AMOSC (on behalf of industry) who will liaise directly with AMSA with respect to the activation of the contract and associated aircraft. In addition, where necessary, Jadestone will utilise deployment of aircraft from designated airfields (e.g. Darwin/Truscott) and arrange for pilots (Jadestone-AMSA MOU 2016). Arrival time of the aircraft will depend on flight time and will include a four-hour lead time for 'wheels up' from initial request. Two aircraft are stationed in the Northern Territory with one based in Darwin.

OSRL shall be activated and have the capability to send a Hercules C-130 and Boeing 727 aircraft to apply chemical dispersants. The Hercules C-130 is made ready in 6 hours which includes fuelling and if required, dispersant loading. The flight time from Senai, Malaysia to Darwin is 8 hours, with 1 technical stop at Bali/Makassar. This includes dispersant fully loaded on the plane. The flight time could be reduced to 7 hours with dispersant at half capacity.

The Boeing 727 has a 4-hour mobilisation time. The flight time from the United Kingdom to Darwin is 19 hours, with one overnight stop in Dubai (12 hours).

Jadestone plan to mobilse both aircraft to Darwin without dispersant and use stock in Darwin to supply the aircraft until the OSRL stockpile is approved to arrive.

For OSRL, Jadestone will:

- Apply for permit to spray and low-level flying;
- Provide aircrew with accommodation and transport to/from airport; and
- Ensure immigration clearance for the aircrew is completed after initial 72 hours in country.

Aerial chemical dispersant application will commence within 3 days (using worst case response time) of initial AMSA and OSRL notification (daylight and weather condition dependent).

The IMT is to develop an "Air Operations Plan" in accordance with the Joint Standard Operating Procedure which is to be submitted to AMSA prior to commencement of any National Plan Fixed Wing Aerial Dispersant Contract (FWADC) aircraft operations.

10.2.2 Vessel-Based Application of Chemical Dispersant

Vessel based chemical dispersant application is activated within 6 hours of spill notification, due to the time it takes for the vessel to arrive at the spill location within 36 hours (using worst case response time). Jadestone uses a contracted infield support vessel (ISV) as the Montara operations supply vessel, to assist with vessel dispersant application. The trained crew aboard can mobilise to Darwin (depending on location, the vessel may be in field or in transit to/from Darwin) for pick-up of dispersant and equipment. This is likely to be the first vessel on-site applying dispersants.

In addition to this resource, the following activations may apply:

- Jadestone mobilises an additional 4 x suitable vessels through existing contracts to carry vessel-based dispersant equipment;
- Mobilise supply vessels to Darwin Port to receive dispersant, load and ship to the dispersant spray vessels at the spill location; and
- Maintain chemical dispersant supplies to dispersant application vessels at spill location until dispersant application terminated.

Spraying systems deliver chemical dispersant uniformly to the floating oil to maximise dispersant/oil mixing and minimise wind drift. As such, if mixing is evident in sea surface waters, this will improve the effectiveness of chemical dispersant applied to floating oil. Where sea surface conditions are calm, agitation of the sea surface will be undertaken by vessels to create mixing. Where this is not successful, a reduction in oil/water mixing will result and containment and recovery operations are to be implemented instead.

Vessel based dispersant operations require two afedo spray systems per vessel. Spray arms need to be secured to vessel by welding or chains as determined by the vessel master. One spray system consumes approximately 500L/hr of dispersant meaning that for 5 vessels spraying for 8 hours per day (daylight 10 hours operation to include travel to site), with two spray systems per vessel, and dilution of dispersant as applied means 40m^3 of dispersant per day will be required for all vessels.

Two AMOSC Core Group Responders are to be dispatched to each vessel to oversee operations. These personnel have been trained in the operation of vessel-based dispersant systems and are competent in the setup of dispersant spraying systems.

The effectiveness of the vessel based chemical dispersion strategy is communicated to the IMT via Core Group Responders on-board the vessels. The Operations Lead is responsible for terminating application when chemical dispersants are no longer effective.

Chemical dispersants will be applied in conjunction with other response strategies. After the decision is made by the IMT to apply chemical dispersant, ongoing monitoring will be necessary to ensure that dispersant has been and will continue to be effective. This will be achieved by using visual observations during the Operational Monitoring activities.

During ongoing operations, if the currents are directed toward the shallow parts of the coast, the application area must be far enough away to allow for sufficient chemical dispersal before contact with the 20m contour. This is to be evaluated through RPS modelling requests for chemical dispersion characteristics throughout the application operation. The HMA will be notified of dispersant operations and predicted application area by the IMT so that an assessment of movement of dispersed oil into State Waters can be made.

Small breakaway patches of oil identified by surveillance operations are ideally treated by vessel-based chemical dispersant systems, whereas the larger slicks of oil are more suitably targeted by the aerial application systems.

Note: All surface chemical dispersant operations will occur during daylight hours only.

At no time, can chemical dispersant be applied:

- Within 10 km of water shallower than 20 m;
- Within exclusion zones for offshore facilities;
- Within an Australian Marine Park boundary or its buffer; or
- Within State Waters unless approved by the HMA.

10.3 Dispersant Effectiveness Monitoring

It is known that chemical dispersants are effective at dispersing Montara crude. In addition to dispersant effectiveness testing carried out by the previous Titleholder, PTTEP AA, conducted by Leeder (2013), the response to the Montara wellhead platform incident in 2009 showed that dispersants were 'highly effective in assisting the natural process of biodegradation and minimising the risk of oil impacts to reefs or shorelines' (AMSA, 2010) (Refer to Appendix A4 for additional information). Consequently, in-field efficacy testing to ensure the product is amenable to dispersants is not anticipated to be required.

However, ongoing chemical dispersant effectiveness will be tested through visual observation (aerial and vessel) of small direct applications on the hydrocarbon slick, adjusting the dispersant dilution ratio and loading through direct observations. This process will be continued throughout the response.

Chemical dispersant effectiveness is shown in Figure 10-1. The effectiveness of the aerial based chemical dispersion strategy is communicated to the IMT via the Air-Attack Supervisors, who are supplied by AMSA through the FWADC. Air-Attack Supervisors will advise the IMT if chemical dispersant application operations are to be terminated.

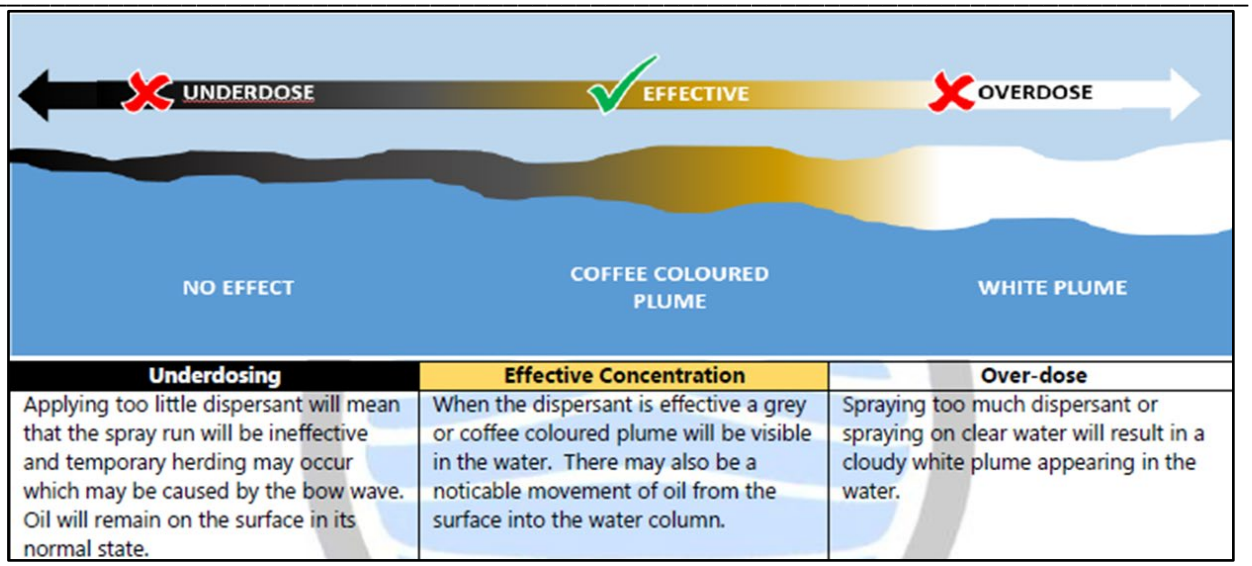


Figure 10-1: Effective and Ineffective Dispersant Application

Ongoing chemical dispersant application is to be determined using a the IAP process which involves a NEBA assessment, through the visual monitoring of the effectiveness of chemical dispersant applied, oil characteristics, predicted fate of the plume (updated daily), environmental conditions (sea state and weather) and surrounding environmental/ social/ cultural sensitivities. The NEBA will be re-evaluated daily during an incident to assess varying net benefits and impacts. Chemical dispersants are only to be applied if there is net benefit to the highest-ranking priority resource.

10.4 Stocks of Chemical Dispersants

Access to the National Plan stockpiles is via AMOSC and AMSA. Jadestone will additionally access the Global Dispersant Stockpile via the OSRL membership. The IMT will request the delivery of chemical dispersant stocks to Darwin Port (vessel-based application) and Darwin airport (Aerial Dispersant application) from AMOSC, OSRL and AMSA stockpiles.

There are sufficient dispersant stocks in Australia and globally to sustain the response at the required application rates for the majority of the response as per the dispersant plan (refer Table 16-1: Chemical Dispersant Application Plan (Surface)). The OSRL SLA stock will be delivered to Darwin from Day 4 and the GDS will begin arriving from Day 5.

Under the MOU between AMSA and Jadestone, AMSA will provide all resources available through the National Plan in support of a Jadestone spill response, which includes all logistical services to transport chemical dispersants from National Plan stockpiles to Darwin. All stockpiles are deliverable to any other stockpile location in Australia within 48 hours.

Table 10-2: Chemical Dispersant Inventory as at November 2019

Owner	Stockpile Locations	Dispersant Volume (m^3)	Dispersant Type	Total Volume (m^3)
Jadestone	Darwin Supply Base and Truscott	13	Slick Gone NS	15
	Montara FPSO	2	Slick Gone NS	
AMSA	Adelaide	10	Slick Gone EW	355
		10	Slick Gone NS	
	Brisbane	10	Slick Gone NS	
		10	Slick Gone EW	
	Townsville	10	Slick Gone EW	
		15	Slick Gone NS	

Owner	Stockpile Locations	Dispersant Volume (m^3)	Dispersant Type	Total Volume (m^3)
	Karratha	10	Slick Gone EW	
		10	Slick Gone NS	
	Darwin	10	Slick Gone EW	
		10	Slick Gone NS	
	Devonport	10	Slick Gone NS	
		10	Slick Gone EW	
	Fremantle	48	Slick Gone NS	
		52	Slick Gone EW	
	Horn Island	10	Slick Gone NS	
	Melbourne	10	Slick Gone EW	
		10	Slick Gone NS	
	Sydney	45	Slick Gone NS	
		55	Slick Gone EW	
AMOSC	Exmouth	75	Slick Gone NS	747
	Fremantle	8	Slick Gone NS	
		27	Corexit 9500	
		500 (SFRT stockpile)	Slick Gone NS	
	Geelong	75	Slick Gone NS	
		62	Corexit 9500	
OSRL (Jadestone has access up to 50% of SLA stocks)	Various: • Singapore • Southampton (UK) • Bahrain • Fort Lauderdale (USA)	694 (50% = 347)	Slick Gone NS Slick Gone EW Slickgone LTSW Finasol OSR 52 Corexit 9500 Corexit 9527	347
TOTAL (access agreements in place)				**1,464**
OSRL Global Dispersant Stockpile (GDS) (Jadestone to request access to GDS at the time of an event)	Various: • Singapore • Southampton (UK) • Vatry (France) • Cape Town (South Africa) • Fort Lauderdale (USA) • Rio de Janeiro (Brazil)	5,000	Slick Gone NS Finasol OSR 52 Corexit 9500	5,000
TOTAL (including additional ORSL 50% SLA and GDS stocks)				**6,464**

Note: All dispersants listed above are on the AMSA Oil Spill Control Agents (OSCA) list. Corexit is in Transitional Acceptance meaning that it is deemed to be OSCA registered on the basis that it has met previous acceptance requirements and is available for use for National Plan responses until used or disposed of.

10.5 Resource Rationale for Chemical Dispersant Application

An estimation of the resources required for the chemical dispersant strategy was undertaken and the analysis provided below.

10.5.1 **Calculations** - Volume of oil to be treated

Based on the weathering properties of the oil[6] being in the range of 16% to 26% in the first 12 hours and 34% to 47% in the first 24 hours, the amount of oil available to be dispersed is conservatively considered to be **70%** of the total daily available volume.

10.5.2 **Calculations** - Volume of dispersant required

- The Dispersant to Oil Ratio (DOR) can range from 1:10 through to 1:50 or even less depending on the oil and dispersant types; and
- For planning purposes, a DOR of 1:25 is used because it is an accepted ratio to start with and can be adjusted depending on effectiveness.

10.5.3 **Assumptions** - Fixed wing aerial dispersant (Air Tractor) operations

- Operations will be conducted out of Darwin, via Truscott (refuelling) to the Montara facility. Based on standard aircraft endurance of 4 hours;
- All dispersant required will be mobilised to Darwin in support of ALL aerial dispersant operations;
- Two hours (approx.) required to complete each flight operation (dispersant loading/aircraft refuelling/transit to-from spill location);
- Operations to be conducted during daylight hours only – therefore based on an estimated 10 hours daylight each aircraft will conduct approximately two sorties each day; and
- Various aircraft types are included under the provision of the FWADC. For planning purposes, a minimum payload of 3,000 litres (3m3) will be used with respect to aircraft to be mobilised in support of the response.

10.5.4 **Assumptions** - Hercules aerial dispersant operations

- Hercules C-130 aircraft will be mobilised to Darwin on activation (first sortie conducted on Day 3);
- All dispersant required will be mobilised to Darwin in support of ALL aerial dispersant operations;
- Operations will be conducted out of Darwin, directly to the Montara facility;
- Hercules dispersant operations to be conducted during daylight hours only – based on an estimated 10 hours daylight each aircraft will conduct approximately two sorties each day; and
- Hercules C-130 aircraft has a payload capacity of 13m3, although 12m3 is typically loaded (and is used for these planning purposes) due to safety considerations.

10.5.5 **Assumptions** – Boeing 727 aerial dispersant operations

- Boeing 727 aircraft will be mobilised to Darwin on activation (first sortie conducted on Day 4);
- All dispersant required will be mobilised to Darwin in support of ALL aerial dispersant operations;
- Operations will be conducted out of Darwin, directly to the Montara facility;
- 727 dispersant operations to be conducted during daylight hours only – based on an estimated 10 hours daylight each aircraft will conduct approximately two sorties each day; and
- 727 has a payload capacity of $15m^3$.

10.5.6 **Assumptions** - Vessel based dispersant operations

- Vessels fitted with two spray systems = 1,000l/hr spray rate (dispersant diluted with sea water);
- Dispersant operations to be conducted during daylight hours only – based on an estimated 8hrs spraying = 8,000l/vessel (sea water and dispersant); and
- Vessels will require 8m3 dispersant, therefore = 40m3/day of dispersant required for five vessels.

10.5.7 Dispersant budget

The total amount of dispersant required over 77 days is $6,407m^3$. This volume can be met using the dispersant stock available in Australia and the OSRL GDS (**Table 10-2**). However, these volume

[6] Refer sections 4.1.2 & 4.1.3 – Hydrocarbon Characteristics and Behaviour

requirements are close to the available Australian and global dispersant stockpile volumes. If additional dispersant is predicted to be required, OSRL dispersant providers are able to manufacture dispersant requirements within 1-2 weeks of notification. Manufacturing capacity ranges from 54m^3/day to 100m^3/day. Jadestone would be aware of any potential shortfall in dispersant availability well in advance (e.g. Week 2-3), so would have ample time to request the manufacture of dispersants. Expected dispersant volumes required towards the end of the expected WCS scenario (11 weeks; ~58m^3/day) are predicted to be met by the volumes that can be manufactured.

A combination of delivery systems was assessed and the optimum to meet the need most efficiently was by utilising:

- Six FWADC air tractors;
- One OSRL Hercules aircraft
- One OSRL Boeing 727 aircraft; and
- Five vessels.

Jadestone can meet daily dispersant requirements from Day 8. Daily dispersant volumes required range from 174m^3 (average) for the first week to 75m^3 midway to 58m^3 by Day 77. Daily volumes required drop significantly after week 2, as the reservoir flow rate drops. Jadestone will review the dispersant application plan daily and modify according to the NEBA and operational feedback.
The FWADC aircraft and vessels are considered the primary platform for dispersant application operations because of the ability to treat specific areas of oil with dispersant at the required dosage and droplet size. The Hercules and 727 are also to be utilised to meet the required delivery amount, as they can take a larger payload than the FWADC aircraft.

Dispersants listed on the OSCA Register have undergone both efficacy and toxicity tests. Toxicity testing must be undertaken in a NATA (or equivalent) accredited laboratory and be ANZECC compliant or consistent. They are tested for both at sea and shoreline applications. Once OSCA Register listed, the use of these products to assist in oil spill clean-up in Australian Waters during a National Plan response is protected under an exemption under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

National logistics arrangements for mobilisation of dispersants to deployment locations within the required timeframes have been confirmed.

A dispersant budget has been prepared taking into account the daily application requirements, daily volume of dispersant arriving in Darwin, cumulative totals and balance on hand after each day. See Table 10-3 for these details. It is clear that dispersant stockpiles are sufficient and are not the limiting factor for dispersant operations. The limiting factor during the first week of operation is the capacity of available platforms to apply enough dispersant. All available platforms (vessel and aerial) are incorporated into the dispersant delivery budget, however it is not until Day 8 when flow rates drop that supply can meet demand.

Table 10-3: Dispersant delivery budget

Day	Maximum volume of dispersant required m^3 based on volume of oil released	Arrival of dispersant in Darwin m^3	Aerial application m^3	Vessel application m^3	Balance on hand m^3
1	251.5	42	0	0	42
2	211	105	0	8	139
3	178	351	42	16	432
4	161	91	78	24	421
5	150	91	90	32	390
6	140	90	90	40	350
7	133	90	90	40	310
8	127	80	90	40	260

9	122	80	90	32	218
10	118	80	90	32	176
11	115	80	90	32	134
12	111	80	90	24	100
13	107	80	90	24	66
14	104	80	90	24	32
Week					
3	591	Access to 5,000m^3 of GDS stockpile to meet remaining need of 4,378m^3 Dispersant delivery and supply will be continually assessed and administered as required			
4	575				
5	529				
6	499				
7	472				
8	452				
9	434				
10	419				
11	407				

11. CONTAINMENT AND RECOVERY STRATEGY

Booms and skimming equipment can be used to create physical barriers on the water surface to contain and recover the oil spill where information and predictive spill fate modelling indicate a likely threat to environmental, social and cultural sensitivities. Effective Containment and Recovery provides significant environmental benefit by removing floating oil and thereby decreasing the likelihood of oiling wildlife and reducing the amount of oil reaching shorelines.

Jadestone containment and recovery planning is to be a primary response around the source (with dispersant application) and a secondary response targeting priority receptors.

Containment is the name for using booms (inflatable or solid) to corral oil usually in the offshore environment near the hydrocarbon source. Once contained, an attempt to recover the hydrocarbons from the surface waters can be undertaken. The response is only feasible in certain conditions that include:

- Weather and sea state: containment and recovery equipment is only effective in calm conditions. Effectiveness is variable depending on equipment type, but is generally only considered effective below 20 knots of wind, wave heights less than 1.5 m and currents less than 2 knots (Stevens & Aurand, 2008);
- Based on discussions with RPS APASA, the normal weather/sea conditions in the vicinity of Montara (100nm) outside of cyclones will not normally exceed conditions that will directly impact vessel operations based on safety concerns;
- The concentration threshold of surface hydrocarbons for successful containment and recovery operations to be a minimum of 50g/m2; and
- Oil type and characteristics: containment of fresh, volatile oil should not be attempted due to its low flash point. No attempt should be made until the safety of the area has been established. Containment of lighter oils such as diesel is often not viable because they evaporate and dissipate quickly.

If this option is deemed suitable through assessments and situational awareness (NEBA, trajectory to sensitivities, weather, seas state, oil type), significant logistical support will be required that will include suitable vessels, experienced crew, booms and skimmers, pumps, on-board storage for recovered oil and aircraft to direct the vessel to the areas with the thickest floating oil. In addition to logistical support requirements, containment activities are inherently inefficient due to the spreading characteristics of oil on water.

11.1 Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
Offshore containment and recovery	Immediately when Level 2 or 3 spill incident is confirmed	When boom encounter rate (BER) is less than 10m^3 per hour
Offshore waste storage and collection	When offshore containment and recovery is initiated.	When all oily waste water temporarily stored offshore has been transferred to intermediate waste storage on land.

11.2 Tactics

- Offshore containment and recovery; and
- Offshore waste storage and collection.

11.2.1 Containment and Recovery

In the initial response, Jadestone will mobilise offshore booms and hydraulic power pack equipment from AMSA Darwin/Dampier, then from AMOSC in Fremantle/Exmouth. This provides the shortest timeframe for implementation. Requirements for additional resources will be assessed during the spill. If conditions and equipment are proving successful, then further activity will be implemented with vessels on contract to Jadestone using booms and pumping equipment from AMOSC, (AMSA) National Plan equipment, OSRL equipment, and personnel from the AMOSC core group, OSRL and National and State Response team personnel through AMSA.

Each vessel conducting containment and recovery is to have a team of trained (minimum two) Oil Spill Responders who will be tasked with controlling the operations and implementing in a safe and responsible method. The Team Leader has the responsibility of evaluating the effectiveness of the containment and recovery operations and communicating the information to the IMT. The IMT has the authority to demobilise or stand vessels off in the event of ineffective operations.

11.2.2 Offshore Waste Storage and Collection

Activation of the Jadestone waste management contract will enable waste to be collected, stored disposed of. Waste management is discussed in the IMTRP.

Oily waste water recovered through skimming is estimated to be 40m^3 per team per day. Decanting into boomed areas has the potential to reduce the volume of waste water collected. Depending on storage configuration, waste collected may be collected by vessels transiting the operational area or may return to Darwin for offloading.

1,800m^3 of oily water is estimated to be the worst-case average to be recovered per day using 45 containment and recovery systems.

11.2.3 WA DoT Requirements for Offshore Decanting of Waste Water

During offshore containment and recovery operations there is generally a large amount of water that is collected with the oil. This water can be decanted back into a boomed area to reduce waste and create more valuable storage area. The reduction of overall waste in some circumstances can create an environmental benefit which outweighs the minimal impact caused by the release of water with very low concentrations of oil. Under the POWBONS Act; s. 8 allows for decanting for combating specific pollution incidents. Additionally, Annex 1 of MARPOL (Regulation 9) allows for decanting for combating specific pollution events to minimize the damage from pollution. Under both MARPOL and POWBONS decanting must be approved by the government in whose jurisdiction the discharge will occur. In WA State waters this is DoT (as the Hazard Management Agency under the Emergency Management Act 2005) and in Commonwealth waters this is the Australian Maritime Safety Authority (AMSA).

The scale of the oil present at sufficient concentrations and the proximity to Montara, coupled with the volatile nature of the fresh oil and the chemical dispersant operations, are likely to prevent effective containment and recovery close to the release location. This will be validated through operational monitoring in a response.

11.3 Resource Rationale for Containment and Recovery

This strategy will mobilise containment and recovery teams available to Jadestone by arrangements with AMOSC and AMSA. Worst case spill modelling indicates that these teams would initially be deployed from Darwin, Dampier or Broome for rapid response close to the spill site.
Boom encounter rate (BER) is a concept used in response planning to estimate the amount of oil that may be encountered by booming arrays and contained ready for recovery by skimmers. The formula for estimating BER is described in the AMSA Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities (2015). The BER has been used to inform containment and recovery planning for the OPEP.

11.3.1 Amount of oil available to recover

Table 11-1 is used for planning purposes to identify the number of containment and recovery systems likely to be required to utilise this as a primary response strategy. This information should be used as a guide only, as the amount of oil available to recover may vary from the volumes provided below. The weekly volumes provided in Table 11-1 are based on weekly oil flow rates (with 30% evaporation applied). These volumes do not account for volumes of oil still recoverable on the sea surface, although fragmentation and dispersion may result in thicknesses less than the minimum 50g/m^2 for existing oil. Neither do the volumes below account for the low recovery rates commonly associated with containment and recovery (the Montara well blow out of 2009 had one of the highest recovery rates - only 10% of the total oil spilled was contained and recovered). The resource requirements below are based on a much higher recovery rate. From Week 4, the amount of oil released in a LOWC decreases by half and continues to decrease steadily after that. Jadestone will meet the number of vessels required from Week 6 onwards.

Table 11-1: Containment and Recovery Plan Calculation

Week	Oil available to recover (m^3) after 30% evaporation	C&R Systems needed (assume 1 system = 40m^3 per day recovered)	C&R systems Jadestone can access
1	30,657	109	24
2	20,172	72	31
3	16,591	59	45
4	14,906	53	45
5	13,630	48	45
6	12,743	45	45
7	12,061	43	45
8	11,525	41	45
9	11,060	39	45
10	10,625	37	45
11	10,303	36	45

Note: weekly C&R calculations done by weekly flow rate volume (-30%)/7 days/40m3 per day recovered = number of systems required

11.3.2 Containment of oil

Containment calculations have been made using the AMSA Boom Encounter Rate formula:

$$\mathbf{BER} = (\mathbf{400} \times \mathbf{0.3}) \times \mathbf{V} \times \mathbf{T}$$

Where:

- BER is the boom encounter rate (BER);
- LB is the length of boom deployed;
- 0.3 represents the opening of boom array (also called the swathe) and is considered to be 30% of the total boom length;
- V is the velocity of the vessel and is assumed for planning purposes to be 0.7knot (1852m/hr); and
- T is the average thickness of oil (mm) from indicative planning targets table. Assuming 50g/m^2 (0.047).

Therefore:

- BER = (400 x 0.3) x 0.7 x 0.047 = 4m^3;
- 4m^3 is the amount of oil 1 system can encounter in 1 hour @ 50g/m^2; and
- For planning purposes one "Containment & Recovery" system equates to over a 10 hour day:
    - Two x vessels with 400m offshore boom, 1 x offshore skimmer @ min. 4m^3/hour.

11.3.3 Resources

Jadestone has the ability to mobilise up to 24 containment and recovery systems within Week 1, 31 from Week 2 and 45 systems from Week 3 onwards. Jadestone will meet then exceed the required number of vessels from Week 6 which allows for extra recovery to account for any excess from Weeks 1 to 5. After Week 6, Jadestone will reassess as there is a decreasing need from Week 6 onwards. However, if the trajectory modelling indicates that shoreline contact will occur, a proportion of containment and recovery vessels can be directed towards protecting those shorelines and priority receptors. (refer Table 11-2).
The vessels and crew are accessed from a combination of companies that Jadestone currently holds MSA's with, call-off contracts and in consultation with Jadestone's approved marine broker – Clarksons.

Jadestone is a small company and it is considered disproportional to purchase and maintain equipment to be on standby when there is access to sufficient vessels and equipment through contracts and AMOSC. Vessels and people are more effective undertaking targeted C&R as determined through the IAP and NEBA.

Analysis also found that the potential for recovery always outstrips potential for containment. Excess capacity exists in recovery operations using the current planning assumptions which means actual operations may work less than the assumed 8 hours currently used in planning.

Jadestone has access to 48 personnel in Week 1, increasing to 62 personnel available by Week 2 of the incident and 90 in week 3 onwards. These personnel will be sourced from:

- AMOSC core group 115+;
- 18 (SLA) + 70 (Contracted) OSRL personnel; and
- 63 National Response Team personnel to be accessed through AMSA.

Active booming systems are deployed to allow containment and recovery operations without the need for an additional skimming system (where deployed). This allows for greater effectiveness and continued skimming operations. Active booming systems are available through AMOSC and OSRL and would be prioritised for mobilisation. Rapid sweep systems are also deployed, which allow containment and recovery operations to be undertaken at speeds of up to 3knots. This allows for greater encounter rates and surface coverage.

For planning purposes, the vessel speed of 0.7knots was chosen as this allows for more manoeuvrability and targeting of oil windrows.

In support of containment and recovery operations it is intended to establish a Logistics Base in Darwin utilising support provided by the current contracted Jadestone logistics support service provider.

12. PROTECTION AND DEFLECTION STRATEGY

This strategy involves a combination of nearshore booming using vessel-based operations ('nearshore operations') while the spill remains on a predicted shoreline impact trajectory, and the placement of shoreline boom to:

- Protect sensitive shorelines;
- Deflect the oil back to ocean or to easier locations for shoreline clean-up;
- Reduce the volume of oil impacting sensitive shoreline habitats to ALARP; and
- Align the response strategy with NEBA.

In all areas, the primary shoreline priority receptors are mangrove environments and identified turtle nesting beaches during nesting and hatching seasons. The effectiveness of a protection and deflection response will be dependent on sea, current and wind conditions. Much of the potential deployment locations are characterised with large tidal movements (>10m), which would result in tidal currents exceeding boom capabilities. Protection booms will only be installed in areas where the tidal currents are below 0.75 knots.

Protection and deflection activities are advised for slicks greater than 100g/m^2. Modelling shows that the oil decreases below the 100g/m^2 threshold rapidly when the oil is at the surface, thereby constraining minimum arrival times to relatively low values or no contact for this threshold (i.e. low oil persistence at concentrations >100g/m^2 due to evaporative losses and spreading).

It should be noted that operationally the effectiveness of this strategy will vary depending on the level of contact at different locations. MES and SCAT operations will likely be a more reliable planning tool for response actions. However, if a tangible, positive outcome is demonstrated, and if health and safety risks are not disproportionate to the environmental benefit achieved in mobilising the response, a protect and deflect operation may be possible. Jadestone have provided guidance within this OPEP in the event the IMT is required to mobilise equipment and personnel to potentially contacted shorelines, prior to that identified in the oil spill modelling.

12.1 Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
Nearshore booming	When NEBA of shoreline strategies recommends protection and deflection activities.	When shoreline receptors no longer able to be protected by nearshore booming.

12.2 Tactics

Given the remoteness and nature of the shorelines potentially contacted, Jadestone has prepared a protection and deflection response that caters for the priority receptors and can move to other locations as required. Deployment is subject to safety concerns of operations in high tidal influence and shallow waters; and possible grounding issues of small vessels, so must therefore be assessed under a NEBA (see IMTRP Appendix A Section 5.4).

The locations for initial nearshore protection and deflection operations will be evaluated by the IMT through observations and modelling during the incident response. Locations identified for potential shoreline impact are to be cross-referenced with the shoreline sensitivity and feature mapping data available through the DoT Oil Spill Response Atlas (OSRA).

As deflection and protection operations will occur in State/Territory Waters, the Hazard Management Agency (HMA) will direct the response operations to locations identified in the Jadestone OPEP or as determined by real time data and State/Territory priorities receptors.

If deployment of protection and deflection booms is considered feasible and effective, inspections and maintenance of the booms are to be timed based on tidal cycles and are to be undertaken by response personnel to ensure locations and formations are maintained so that they remain effective in achieving objectives.

The range of protection and deflection methods include nearshore booms (beach guardian, zoom boom, short curtain boom and sorbent boom) anchored close to the identified priority receptor areas, or open water booms (deep curtain ocean boom) placed at significant distances from shorelines to deflect the open water pathway of the oil to force the oil to miss the predicted shoreline requiring protection.

Operational monitoring and Incident Action Planning will guide the response to prioritise protection of sensitive key features. The protection and deflection response is to be scaled to be commensurate to the risk posed by an actual incident. The results of spill fate modelling will provide the accumulated oil and shoreline contact information which will enable calculation of the required amount of protection and deflection equipment.

Initial deployment of equipment and personnel is to be from the AMSA, State/Territory and AMOSC stockpiles and Core Group. Depending on actual conditions and possible responses to the reduce impacts to ALARP, further deployments of resources can be implemented through OSRL and the AMSA National Plan shoreline response equipment stockpiles and NRT personnel, as agreed with by AMSA and Jadestone and implemented by the relevant Incident Management Team.

While equipment and personnel mobilisation is occurring, operational monitoring is continuing and the results sent to the IMT within two hours of teams returning to their operating base. The most up-to-date information will then be communicated to the protection and deflection teams to guide the selection of the operational locations.

The HMA will advise on priority receptors aided by the oil spill trajectory modelling to locations with the most likely impact. Deployment locations will be selected from the closest facilities to where priority receptors are identified.

The effectiveness of the protection and deflection strategy to achieve performance objectives against the IAP objectives is to be communicated to the IMT by a nominated Shoreline Response Team Leader. The IMT has the responsibility to extend or terminate the response in consultation with the HMA.

A Browse Island Oil Spill Incident Management Guide (INPEX, 2018) and a Kimberley Shoreline Response (PTTEP, 2019) have been prepared to assist in the planning and safe execution of an oil spill response at Browse Island and the Kimberley coast (or other remote shorelines). Jadestone will review these plans at the time of a spill, to assist in the preparation of an appropriate shoreline response plan and capability to match the need for other remote shorelines. This will be undertaken in consultation with OSRL and State/Territory, considering the practicalities, likely success and risks associated with a shoreline operation in remote locations.

12.3 Resource Rationale for Protection and Deflection

OSTM outputs assisted in identifying priority receptors. Pre-deployment of resources at locations in which priority receptors are identified in modelling would not be practical as:

- OSTM outputs show shoreline contact for 100 spill simulations, meaning that not all shorelines contacted in modelling will be contacted in an actual spill event dependent upon the direction of the spill movement;
- There are no facilities for storage and maintenance of booms and ancillaries, vessels, waste storage and PPE at the priority receptors;
- The time for oil to contact priority receptors provides sufficient time to access regional and local resources based on real time modelling; and
- The effectiveness of the dispersant strategy and containment and recovery strategy will inform the nature and scale of protection and deflection activities through the IAP process.

For planning purposes, **one protection and deflection operation** consists of:

- Boom (shore sealing, self-inflating and solid flotation);
- Ancillary equipment and vessels (if required);
- 2 trained oil spill responders; and
- 5 personnel / labour hire to deploy the booms.

Jadestone has access to the required resources via AMOSC, AMSA and OSRL (refer Table 6-2: Oil Spill Response Equipment).

12.4 Priority Receptors

In locations along the Kimberley coast, access to shorelines is typically restricted to boat and long distance steam times from launching, so it will be very difficult to get to suitable locations to install protection booms. For these areas the removal of oil using offshore Containment and Recovery, together with the application of dispersants, is the key strategy for preventing shoreline impacts.

In some offshore locations the water may be sufficiently calm to install fixed booms in deep water to assist in the protection of highly sensitive areas where shoreline clean-up may be very difficult to effectively achieve. This will be considered to protect large mangrove stands that are difficult to access, however, the large tidal range will result in high velocity water and may exceed the operating parameters of booms.
The minimum time for oil contact at a priority receptors area at 100g/m^2 is 3 days with most areas on a scale of more than 2 weeks. This provides time for pre-assessment of shoreline areas for which oil may contact, noting sensitive receptor locations, fauna presence (e.g. nesting turtles and birds) and morphology of shorelines/creek systems. These aspects change seasonally, and a pre-assessment window provides the ability for up to date information to be considered when formulating a specific plan for shoreline protection.

Priority receptor	Minimum time to shoreline oil at >100g/m^2 (days)	Oiled shoreline at concentrations >100 g/m^2 in worst replicate simulation (km)
Ashmore / Cartier	3	80
Tiwi Islands (Melville and Bathurst)	19	352
Darwin Coast	17	137
Western NT (Kakadu, Coburgh, East Arnhem Land, West Arnhem Land)	21	716
Joseph Bonaparte Gulf (NT)	17	346
Kimberley Coast (North Kimberley Marine Park)	7	339
Browse Island	14	4
Indonesia	26	337
Timor-Leste	36	42

13. SHORELINE CLEAN-UP STRATEGY

In the event of hydrocarbon spills with potential shoreline contact, operational monitoring will identify possible impact areas. The IMT will assess if shoreline clean-up activities will be beneficial in accelerating the return of the shorelines to baseline conditions. As shoreline clean-up operations occur in State/Territory Waters, and the arrangements under respective State/Territory plans, the HMA will implement Jadestone's planned shoreline operations and response techniques to reduce impacts to ALARP. Jadestone, in combination with the mutual aid arrangements of the AMOS Plan are to provide all necessary equipment and resources to enable State/Territory to undertake shoreline activities.

Around 5102 km of shoreline was surveyed, analysed and mapped to provide spatial and quantitative characterisation of vulnerable coastal ecological features between Darwin (NT) and Broome (WA) (UniQuest, 2010). ***Table 13-1*** summarises the shoreline between Broome and Darwin, which is the area the worst-case spill scenario for Montara may contact on mainland Australia.

Mangroves grow along 63% of the surveyed shoreline, covering over 3200 km. Saltmarsh occurs on more than 1200 km of coastline or 23.8% survey region and the coastline is rocky for 2763 km of shoreline. For the total shoreline surveyed, 9441 km^2 of tidal wetland were observed. This is calculated as 1.85 km^2 of tidal wetland for every kilometre of shoreline within the Montara loss of well control region (Darwin to Broome).

Table 13-1: Summary of coastal characteristics from Darwin (NT) to Broome (WA).

		km	% of shoreline
Physical characteristics	Rocky	2762.8	54.2
	Beach	1663.7	32.6
	Flat	2185.5	42.8
	Dune	1536.9	30.1
	Other wetland	15.9	0.3
Vegetated habitat type	Mangrove	3214.1	63.0
	Saltmarsh	1215.4	23.8
	Fringing coral	350.9	6.9
	Seagrass verge	11.5	0.2
	Coastal Woodland	3886.6	76.2
State of erosion and deposition	Deposition	548.8	10.8
	Erosion	544.7	10.7
	Stable	3576.7	70.1
Tidal wetlands	Mangrove	3214.1	63.0
	Saltmarsh	1215.4	23.8
	Sand and mud flats	1379.2	27.0
	Salt flat	1396.8	27.4

Source: Shoreline Ecological Assessment Aerial and Ground Surveys, 9-19 November 2009. UniQuest Pty Ltd 2010.
Note: percentages do not add to 100 as categories overlap in some locations.

13.1 Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
NEBA of shoreline response strategies	When SCAT surveys recommend shoreline clean-up activities.	When SCAT surveys recommend no further action be taken (NFA).
Shoreline clean-up and waste management	When NEBA of shoreline strategies recommends shoreline clean-up activities.	When SCAT surveys recommend no further action be taken (NFA); and Agreement has been reached with the Jurisdictional Authority relevant

		to the spill to terminate the response

13.2 Tactics

Jadestone will:

- Undertake a NEBA of shoreline response strategies utilising findings from SCAT surveys; and
- Implement shoreline clean-up and waste management.

For planning purposes, Jadestone uses a minimum threshold of 100g/m^2 (concentration of accumulated hydrocarbons on shorelines) to determine the lower limit for effective clean-up operations.

Once SCAT surveys of key shorelines have been completed, the results would help inform an operational NEBA and suitable response tactics for that location. Response tactics may include manual bagging of stranded oil where access can be gained, surf washing where wave action and sandy beaches are accessible by machinery, tilling and turning the sand to aid bioremediation where wave action is not strong enough to drive surf washing, rock flushing with high volume low pressure sea water, or leaving the weathered oil in-situ to breakdown where access for man or machinery is not possible.

Shoreline habitats in the region predominantly comprise of high relief rocky shoreline, sandy beaches, inter-tidal reefs, and mudflats/mangrove habitats. Macroalgal and seagrass beds will be avoided when assessing shoreline clean-up response tactics and the less intrusive options of natural attenuation and bioremediation will be preferred.

Information on shoreline type obtained from SCAT surveys will contribute toward the NEBA process. Each likely shoreline impact will be evaluated through observations and modelling, and shoreline response teams will be deployed and positioned as per those observations. Through information gathered and assessed by the IMT and HMA, the movement of floating oil towards shorelines is to be identified and clean-up tactics implemented to reduce the consequences to shoreline habitats to ALARP. A summary of shoreline clean-up techniques is provided at Table 13-2.

Intrusive shoreline clean-up techniques have the potential to damage sensitive shorelines. Given that the majority of the mainland shoreline contacted consists of tidal mangroves and saltmarshes, the appropriateness of clean-up will be determined as opposed to natural attenuation. Selection of the shoreline clean-up methods and controls to prevent further damage from the clean-up activities are to be undertaken in consultation with the HMA and selected based on NEBA.

Jadestone will have an agreed process which allows for stakeholder input into the termination criteria as per AMSA Guidance NP-GUI-025 2015. The degree of damage from shoreline clean-up activities is to be managed to ALARP, considering net environmental benefit of the clean-up activity.

AMOSC Core Group Responders may be substituted with NRT personnel as agreed by AMSA with Jadestone. AMSA will be a member of the IMT and will confirm and approve NRT personnel deployment as they deem necessary to reduce impacts to ALARP.

Table 13-2: Shoreline clean-up techniques

Method	Description
Mechanical clean-up	Mechanical clean-up techniques may utilise several equipment types. It is best to use equipment in the way for which it was designed. Front end loaders, bulldozers and elevating scrapers can all be used to rework beach sediment (e.g. cobble, pebble, and boulder) or to push such sediments into the shoreline for cleaning by waves. Note: Vehicles should not be allowed to pass over oiled sediment since this tends to result in the burial of oil into sediment.
Manual clean-up	Manual clean-up is the preferred option for cleaning inaccessible shorelines or those where mechanical clean- up is undesirable. Manual clean-up is slower than mechanical clean-up but generally results in the removal of much less sediment. Hence disposal requirements are reduced. Equipment is usually basic and consists of wheelbarrows, rakes, buckets, shovels, plastic bags (industrial strength) or other temporary storage. The requirements for manual beach clean-up are highly variable but generally a 10-person team, plus 1 supervisor is required to recover $10m^3$ of oil in one day.
Low pressure flushing	Low pressure flushing can be used, with care, to remove surface oils from most beach type surfaces. It is important that refloated oil is collected in booms or other containment devices and recovered using skimmers or sorbents. Generally low pressure flushing does not result in the emulsification of oils and so sorbents may be used. It is preferable to check the condition of refloated oil and choose a suitable skimming device and pump. It is important also that refloated oil does not pass over clean sediment.
High pressure flushing	High-pressure washing is to be used only on artificial surfaces such as wharves, jetties etc. This method tends to emulsify oil and consequently the use of sorbents to collect refloated oil is not recommended. Oil, which is removed from surfaces, can be collected within light inshore booms or onshore using Shore Guardian or a similar boom. Oil can be recovered using vacuum systems or skimmers. Material and labour requirements are highly variable and will depend on the extent of oiling, the speed with which cleaning is expected to proceed, the type of substrate and the ease with which containment can be achieved.
Use of sorbents	Two types of sorbent materials can be used; (1) loose, powdered or granular sorbents, or (2) solid, pads, rolls or sheets. Each of these may be either of synthetic or natural fibre. As a general rule, loose sorbent materials are not used because they are difficult to recover. However, there are occasions when this is not considered to be a problem, such as in high-energy areas where oily sorbent materials can be expected to be washed from surfaces and dissipated to sea. Of course, oil too is likely to be washed off such shorelines, to dissipate. Solid sorbents may be used in the form of sorbent booms to recover light oil films or as pads or rolls to absorb free oil from the surface of sediments in cases where vacuum systems cannot gain access or where oil is too fluid for manual recovery.
Vacuum systems	Vacuum systems may be portable hand operated systems or vacuum trucks. Vacuum systems tend to pick up large volumes of water with the oil and so it is preferable to use them on oil pooled on the sediment surface or to remove oil from containers or dams in which the water has been decanted. One method to minimise the amount of water removed from the beach is to use light, portable vacuum systems to deposit oil-water into temporary storage containers on the beach, allow settling time and to decant the water. Large units can then be used to collect the oil from these containers and transport oil to storage sites. Vacuum systems can also be used in association with deflection booms to recover oil from the sea surface. It is advisable in this case to fit the hose with a broad Manta Ray head.

Method	Description
Enhanced bioremediation	Machinery is used to breakup large paddies of stranded oil on beaches and to till and turn the oiled sands to aerate the sandy sediment and enhance the biological breakdown of the oil. This can be applied to oil that has deposited on sands above the normal high-tide area, typically during large storms, and there is little likelihood of the water reaching the stranded deposits.
Monitoring of natural attenuation and bioremediation	By implementing shoreline clean-up methods described above, the amount of oil remaining stranded on shorelines will be reduced to ALARP; the remaining oil will be very difficult to access or remove and the activity is no longer preferred under NEBA when compared to the impacts of the intrusive clean-up methods. In addition, and assessed under NEBA, some areas of coastline will not be subjected to any clean-up methods due to access issues or possible impacts from the clean-up activities. It's at this point that monitoring of natural attenuation and bioremediation become the selected clean-up methods under a NEBA assessment. These areas will be monitored until no visible oil is remaining in the impacted area.

13.3 Resource Rationale for Shoreline Clean-Up

The combination of machinery for mechanical removal of oil (bulldozers/ scrapers/ front end loaders) and personnel requirements have been considered for each priority receptors area based on opportunities for use and sensitivity of shoreline (i.e. may not be used for small offshore islands or for remote rocky or mangrove lined shorelines). Therefore, it is the opportunity for use rather than the availability of machinery and personnel which is considered the limiting factor.

Operational Constraints

- Access to remote islands;
- Biosecurity issues associated with moving people and equipment between remote islands and the mainland;
- Access to sites (habitat, terrain, distance from the mainland, landing/mooring sites for shallow draft vessels);
- Transport of equipment to remote sites from vessels;
- Crew rotation requirement;
- Duration of response;
- Weather and sea-state; and
- Hazardous wildlife.

Analysis of the worst replicate simulation for the greatest number of shoreline clean-up responders required, and highest probability for shoreline contact has been used to inform the personnel and waste requirements for shoreline clean-up. It is assumed that planning for the greatest number of teams will meet the requirements of all shoreline contact. Jadestone has planned for a trained oil spill responder and 10 personnel in each shoreline clean-up team and assume that each team can recover 10m^3 per day. This will vary with specific real-time shoreline contact volume and extent. Western NT (Kakadu, Coburgh, East Arnhem Land, West Arnhem Land) presents the greatest resource requirement for shoreline clean-up teams (10 teams) as presented in Table 13-3.

A Browse Island Oil Spill Incident Management Guide (INPEX, 2018) and Kimberley Shoreline Response Plan (2019) have been prepared to assist in the planning and safe execution of an oil spill response at Browse Island (or other remote shorelines). Jadestone would review the INPEX guide and Kimberley Shoreline Response Plan at the time of a spill, to assist in the preparation of an appropriate shoreline response plan and capability to match the need for remote shorelines. This will be undertaken in consultation with OSRL and WA DoT, considering the practicalities, likely success and risks associated with a shoreline operation in remote locations.

13.4 Priority receptor

Table 13-3: Resource Rationale for Shoreline Clean-up Personnel

Priority receptor	Minimum time to shoreline oil at >100g/m^2 (days)	Maximum accumulated oil on shoreline in worst replicate simulation (m^3)	Maximum daily average oil ashore (m^3)[7]	Number of shoreline clean-up teams required (1 team per 10m^3/day)	Potential waste generated per day (worst replicate simulation bulking factor of 10) (m^3)
Ashmore / Cartier	3	5 284	39	n/a	n/a
Tiwi Islands (Melville and Bathurst)	19	8 375	71	7	710
Darwin Coast	17	4 255	36	4	360
Western NT (Kakadu, Coburgh, East Arnhem Land, West Arnhem Land)	21	11 496	99	10	990
Joseph Bonaparte Gulf (NT)	17	8 694	73	7	730
Kimberley Coast (North Kimberley Marine Park)	7	11 220	86	9	860
Browse Island	14	511	4	1	40
Indonesia	26	2 789	25	3	250
Timor-Leste	36	619	6	1	60

13.4.1 Ashmore Reef and Cartier Island

Shoreline clean-up is not an option for Ashmore Reef or Cartier Island. Cartier Island and the surrounding marine area within a 10km radius was a gazetted Defence Practice Area up to 20 July 2011. Although no longer used, there is a substantial risk that Unexploded Ordnances (UXO) remain in the area. Landing or anchoring anywhere within the Cartier Island Commonwealth Marine Reserve is strictly prohibited.

Ashmore Reef comprises of a shelf-edge reef system with small islands and associated sandbars within the reef rim. Ashmore Reef Ramsar site is located within the boundary of the Marine Park. Shoreline clean-up activities would result in more damage to the environmental values than the oil. Focus for protection is offshore strategies and scientific monitoring.

Ashmore and Cartier Island also present environmental and safety constraints for shoreline clean-up activities including:

[7] Model duration = 137 days. Max daily average oil ashore = maximum accumulated oil on shoreline / (137 days – min time to oil on shoreline).

- Remote location presenting logistics challenges and safety concerns for landing vessels, people and equipment;
- Small sand islands within a submerged and emergent reef system presenting challenges for personnel to work with suitable facilities and waste storage;
- Landing and undertaking shoreline clean-up activities is likely to result in damage of any turtle and bird nesting sites that may be present; and
- The sands of Cartier Island were found to be highly mobile during campaigns in 1986 to clear the site of UXO.

13.4.2 Tiwi Islands (Melville and Bathurst)

Contact times (19 days) allow for comprehensive planning to be undertaken and the required capability to be sourced. Modelling indicates that approx. 352 kms across Bathurst and Melville Islands will have shoreline loading of 100g/m^3 or above. Contacted shorelines include beaches where shoreline clean-up is viable, with consideration to turtle nesting. Considerations for planning for shoreline clean-up are:

- Maximum daily oil ashore is calculated at approx. 71m^3 per day from Day 19;
- 71m^3 would require 7 clean-up teams to meet maximum daily oil volumes.

13.4.3 Darwin Coast

This area has large areas of tidal wetlands and very high tidal ranges. Modelling indicates that approx. 137 kms will have shoreline loading. This includes beaches, but mainly consists of mangroves and tidal flats. Considerations for planning for shoreline clean-up are:

- Maximum average daily oil ashore is calculated at approx. 36m^3 per day from Day 17;
- A total of four teams will be required (one team per site and an additional team available to support - depending on level of contact).

13.4.4 Western NT

This area has large areas of tidal wetlands and very high tidal ranges. Modelling indicates that approx. 716 kms will have shoreline loading, concentrated on the Coburg Peninsula, East Arnhem Land and Kakadu Coast. This includes beaches, but mainly consists of mangroves and tidal flats. Considerations for planning for shoreline clean-up are:

- Maximum average daily oil ashore is calculated at approx. 99m^3 per day from Day 21;
- A total of 10 teams will be required to meet maximum daily oil volumes.

13.4.5 Joseph Bonaparte Gulf (NT)

This area has large areas of tidal wetlands and very high tidal ranges. Modelling indicates that approx. 346 kms will have shoreline loading of 100g/m^2 or above, concentrated on the north-eastern side. Considerations for planning for shoreline clean-up are:

- Maximum average daily oil ashore is calculated at approx. 73m^3 per day from Day 17;
- A total of 7 teams will be required to meet maximum daily oil volumes.

13.4.6 Indonesia and Timor Leste

Although not within the bounds for acceptance of activities in Commonwealth Waters, a response to International shorelines has been considered to ensure that sufficient capability is available for a LOWC. Jadestone will be responsible for activating and overseeing capability engaged to manage shoreline response activities on international shorelines through the arrangements detailed in the OSR Arrangements. OSRL has been engaged as a response agency and will be mobilised to provide SCAT surveys and shoreline response activities within this timeframe in consultation with the appropriate authorities. Oil spill modelling predicts shortest shoreline contact on Indonesian Islands and West Timor within 26 days.

Assuming a worst-case shoreline contact of approximately 3,408m^3, the capability required to respond to an event of this nature and scale will depend on the shoreline clean-up tactics recommended by the SCAT teams guiding shoreline response activities.

OSRL has the capability required to respond to a spill event of this nature and scale as demonstrated through their online equipment resource lists. Jadestone has signed an APAC Associate Agreement with OSRL to hire oil spill response equipment, vessels and vehicles, as well as to engage dedicated response personnel. Personnel are on standby and available 24/7 with equipment and logistics support to initiate, mobilise and sustain a response comprising of up to 18 fully trained and competent response personnel.

Typical initial roles of the team may include, but are not limited to the following tasks:

- Technical advice and incident management coaching within the command centre;
- Development of an Incident Management Plan;
- In country logistics planning and support for inbound equipment;
- Impact assessment and advice on response strategy selection;
- SCAT and aerial surveillance; and
- Tactical response planning.

OSRL maintains a minimum pool of 80 dedicated response staff which Jadestone can access for an international response.

13.4.7 Kimberley Coast

This area has large areas of tidal wetlands, coastal coves, offshore islands and very high tidal ranges. Modelling indicates that approx. 339 kms will have shoreline loading. The offshore islands create a natural barrier and prevent intrusion into the coastal rivers and estuaries. This coastline has a small percentage of accessible beaches suitable for shoreline clean-up. Considerations for planning for shoreline clean-up are:

- There are no clear defined locations across the receptor for clean-up operations to be conducted;
- Maximum average daily oil ashore is calculated at approx. 86m^3 per day from Day 7;
- Clean-up operations will be sea based and therefore mobile;
- A total of 9 teams will be required to meet maximum daily oil volumes.

13.4.8 Browse Island

Shoreline clean-up activities at Browse Island would be conducted in accordance with the Browse Island Oil Spill Incident Management Guide (INPEX, 2018). This plan contains details of pre-planned shoreline response activities at Browse Island (or similar offshore islands) which has been already reviewed by WA DoT. Due to the sensitivities of this location, clean-up would be conducted by manual removal via limited personnel. It has been assessed that a maximum of 30 responders would be situated on the island at any time, however modelling indicates approximately 4m^3/day (from Day 14), is likely to arrive at Browse Island, requiring one team (10 personnel) to complete clean-up activities.

14. OILED WILDLIFE RESPONSE

This Oiled Wildlife Response Plan describes how, in the event of a spill that will or could potentially oil wildlife, the Planning Team Lead will activate Government and Industry (AMOSC) Oiled Wildlife Advisors (OWAs) as stipulated in Jadestone's IMT Response Plan. These roles ensure minimum standards for Oiled Wildlife Response (OWR), as outlined within the WA/NT OWRP, are met and ensure timely mobilisation of appropriate resources (equipment and personnel) through communication with the wildlife logistics team. Timely provision of equipment and personnel will be provided by AMOSC through a combination of owned and operated equipment, call-off contracts with suppliers, and the management of industry OWR response personnel (refer IMTRP). Under the WA/NT OWRP arrangement, the AMOSC OWA may request further assistance from State/Territory in the form of trained personnel, and vice versa, if their own expertise has been exhausted.

14.1 Initiation and Termination Criteria

Table 14-1: Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
Wildlife first response Mobilisation of resources Wildlife reconnaissance	Immediately when Level 2 or 3 spill incident is confirmed.	When transition into oiled wildlife IAP subplan is complete.
IAP wildlife subplan Wildlife rescue and staging Oiled wildlife response facility Oiled wildlife rehabilitation Oiled wildlife response termination	When oiled wildlife first response has transitioned to IAP subplan development.	When the NEBA for oiled wildlife response activities indicates no further action required (NFA).

14.2 Oiled Wildlife Response Levels and Personnel Requirements

The WA/NT OWRP nominates oiled wildlife response incident Levels based on the scale and severity of oiled wildlife impacts.

Table 14-2 provides the indicative level descriptions for Level 1 to Level 6 incidents in WA. The WAOWRP also nominates indicative personnel numbers and role requirements for each OWR Level as shown in Table 14-3**.**

Table 14-4 provides the indicative level descriptions for Level 1 to Level 6 incidents in the NT. The NTOWRP also nominates indicative personnel numbers and role requirements for each OWR Level as shown in Table 14-5.

Jadestone Energy is approaching oiled wildlife preparedness in a conservative manner by preparing for a OWR Level 6. The number of personnel may change depending on the complexity response (spatial scale and variety of wildlife impacted). Additional personnel will be required as scribes/PAs for key functional positions. The skill level required is indicated as OWR 1-4, these correspond to competency-based levels that ensure personnel have adequate knowledge to effectively perform the indicated roles/functions. These tables are used to guide the planning process; actual resourcing requirements will be guided by situational awareness on the complexity, scale and fauna types involved.

Table 14-2: WA Oiled Wildlife Response Levels

OWR level	Duration of OWR	Birds general	Birds OWR complex #	Turtles - hatchlings / juveniles / adults	Dolphins / Whales	Pinnipeds	Mammals terrristrial	Reptiles	Dugongs
Level 1	<3 days	1-2 birds per day or < 5 total	No complex birds	None	None	None	None	None	None
Level 2	4-14 days	1-5 birds per day or <20 total	No complex birds	< 20 hatchlings no Juveniles or adults	None	None	None	None	None
Level 3	4-14 days	5-10 birds per day or < 50 total	1-5 birds per day or <10 total	< 5 juv/adults, < 50 hatchlings	None	< 5 seals	< 5	< 5 - no crocodiles	None
Level 4	>14 days	5-10 birds per day or < 200 total	5-10 birds p/day	< 20 juv/adults < 500 hatchlings	< 5 or known habitats affected	5-50 seals	5-50 mammals	5-50 reptiles	Dugong habitat affected only
Level 5	>14 days	10-100 birds per day or > 200 total	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
Level 6	>14 days	>100 birds for day	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
# Threatened species, protected by treaty, or specialist feeders									

Table 14-3: WA OWR Response Level and Personnel Numbers

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

Table 14-4: NT Oiled Wildlife Response Levels

OWR level	Duration of OWR	Birds general	Birds complex #	Dolphins / Whales	Pinnipeds / Dugongs	Mammals terrestrial
Level 1	<3 days	1-2 birds per day or < 5 total	No complex birds	None	None	None
Level 2	4-14 days	1-5 birds per day or <20 total	No complex birds	None	None	None
Level 3	4-14 days	5-10 birds per day or < 50 total	1-5 birds per day or <10 total	None	< 5 seals	<5
Level 4	>14 days	5-10 birds per day or < 200 total	5-10 birds per day	< 5 or known habitats affected	5-50 seals	5-50 mammals
Level 5	>14 days	10-100 birds per day or > 200 total	10-50 birds per day	>5 dolphins	> 50 seals	> 50 mammals
Level 6	>14 days	>100 birds per day	10-50 birds per day	>5 dolphins	> 50 seals	> 50 mammals
# Threatened species, protected by treaty, or specialist feeders						

Table 14-5: NT OWR Response Level and Personnel Numbers

Category	Role	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Strategic	Oiled Wildlife Advisor	1^{+1}	1^{+1}	1^{+1}	1^{+1}	1^{+1}	1^{+1}
	WD Coordinator**			1	1	1	1
	Wildlife Operations Officer**			1	1	1	1
	Wildlife logistics Officer		1	1	1	1	1
	Wildlife Planning Officer			1	1	1	1
	Wildlife Finance/Admin Officer			1	1	1	1
	Wildlife Communications Officer			1	1	1	1
	Wildlife Situation Officer			1	1	1	1
	Wildlife Supply/Resource Officer		1	1	1	1	1
	Wildlife Safety Officer			1	1	1	1
	Wildlife Volunteer Coordinator			1	1	1	1
Staging Area / Facilities	Wildlife Staging Area Manager*	1	1	1	1	2	2
	Wildlife Staging Area / intake Team			3	3	6	8
	Wildlife Facilities Manager *			1	1	1	1
	Wildlife Trades assistants			1	2	3	3
	Wildlife housekeeper			1	1	2	3
	Wildlife Security			1	1	1	1
Reconnaissance	Wildlife Reconnaissance Officer	1	1	1	1	1	1
	Wildlife Aviation Supervisor			1	1	1	1
	Wildlife Vessel Supervisor				1	1	1
	Wildlife Shoreline Supervisor				1	1	1
	Wildlife Reconnaissance Team			2	4	6	8
Rescue	Wildlife Rescue Officer	2	1	1	1	1	1
	Wildlife Exposure Modification Officer		1	1	1	1	1
	Wildlife Field Collection Team		3	6	9	22	22
	Wildlife Transport Officer		1	1	1	1	1
Rehabilitation	Triage officer	2	1	1	1	1	1
	Triage team		1	4	5	5	6
	Wildlife Veterinarian *		1	1	3	3	3
	Wildlife Veterinarian technician *			1	1	1	1
	Wildlife Stabilisation Officer		1	1	1	1	1
	Wildlife Rehabilitation Officer		1	1	1	1	1
	Facilities Team		3	4	6	8	8
	washing/drying personnel ***		4	6	10	15	15
	Recovery/release personnel ***		3	8	10	20	20
Total number of personnel		6	26	59	77	116	122
NOTES		* 1 person per facility / ** May have deputy 1^{+1} = In an industry spill there may be two oiled wildlife advisors (1 state agency, 1 industry)					

It is expected that Jadestone may require 122 level 5 personnel. Personnel at skill levels 2 - 4 and those with specialised skills are expected to be sourced through AMOSC, OSRL, DBCA, Universities and contractors.

At OWR level 6, Jadestone expects to initially establish two staging areas and oiled wildlife facility and scale up staging areas as required in response to the location, number of wildlife and different species encountered.

Roles could be filled by wildlife carers known to State/Territory government and through labour hire agencies that can provide field workers that undergo an induction and basic training. Basic training (over 1 day) for OWR personnel can be delivered as just-in-time training through an arrangement with the relevant State/Territory agency.

In the event of a spill impacting wildlife, Jadestone will commence arrangements to mobilise personnel and equipment to fill positions and implement strategies within the WAOWRP and NTOWRP. Further information describing oiled wildlife response arrangements is provided at Appendix A of the IMTRP.

15. CONTROLS

Environmental performance outcomes (EPOs) of the response strategies, control measures, performance standards presented in Table 15-1 are:

- Reduce oil volumes from reaching the shoreline to as low as reasonably practicable; and
- Reduce impacts to marine and coastal fauna through the implementation of the WA/NT Oiled Wildlife Response Plan.

Table 15-1: Operational Performance Standards and Measurement Criteria

Response Elements	Control Measures	Performance Standards	Measurement Criteria
Notifications and Activations	AMOSC activation	Verbal notification/activation of AMOSC within 60 mins of IMT activation	Incident Log
	OSRL activation	Verbal notification/activation of OSRL within 60 mins of IMT activation	Incident log
	AMSA activation	Verbal notification/activation of AMSA within 60 mins of IMT activation	Incident log
	WWC activation	Verbal notification/activation of WWC within 60 mins of IMT activation	Incident log
	IMTRP	Complete regulatory notification within designated timeframes	Incident log
	Jacobs activation	Verbal notification/activation of Jacobs within 24 hours of IMT activation	Incident log
Source Control Action Plan	Shipboard Oil Pollution Emergency Plan (SOPEP)	SOPEP activated within 60 minutes of spill incident	Incident log
	Montara Emergency Response Plan	Montara Emergency Response Plan activated within 60 minutes of spill incident	Incident log
	Blowout Contingency Plan	Blowout Contingency Plan activated within 60 minutes of LOWC incident	Incident Log
	LOWC notification	Complete notification and activation of AMOSC, Oceaneering, WWC and relevant others within two hours of IMT activation	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
	SFRT activation	SFRT equipment and vessel in Darwin within seven days SFRT Vessel loaded and commence transit within 7.5 days SFRT equipment infield within nine days of activation	Incident Log
	Relief Well	Commence drill rig contracting within 24 hours of activation	Incident Log
		Rig infield within 21 days of activation	Incident Log
		Finalise relief well plan within 21 days of spill	Incident Log
		Commence drilling relief well within 22 days of spill	Incident Log
		Finalise relief well kill plan within 50 days of spill	Incident Log
		Commence kill operations within 51 days of spill	Incident Log
	Survey and Planning	Commence site survey to inform source control options within 11 days of activation	Incident Log
	Well Debris Removal (if applicable)	Develop debris removal plan within 12 days of activation	Incident Log
		Commence debris removal within 13 days of activation (using SFRT) and 21 days for heavy debris removal (WWC)	Incident Log
	SSDI	Commence subsea dispersant injection within ten days of spill using SFRT	Incident log
Operational monitoring	Operational Monitoring Plan	Activate Operational Monitoring Action Plan within 60 minutes of IMT activation	Incident Log
	Vessel Surveillance	Vessel Surveillance initiated within 24 hours following request from IMT.	Incident log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		Daily observation reports submitted to IMT until termination criteria is met.	Incident log
	Aerial Surveillance	Aerial Surveillance mobilised within 6 hours following request from IMT.	Incident log
		Trained Aerial Observers supplied from Day 2 of response.	Incident log
		Flight schedules are maintained throughout response.	Incident Action Plan
		Observers completed aerial surveillance observer log following completion of flight.	Aerial Observer Logs
		Aerial surveillance continues until termination criteria are met.	Incident log
	Tracking Buoys	Tracking buoys deployed within 3 hours of request from IMT or OIM, subject to vessel availability and weather conditions.	Incident log
		Tracking buoys utilised until termination criteria met.	Incident log
	Satellite imagery	Satellite imagery commissioned within 6 hours of a Level 2 or 3 spill notification	Incident Log
		Satellite imagery delivered to IMT within 24 hours of request to service provider	Incident Log
		Satellite imagery continues until termination criteria are met.	Incident Log
	Oil Spill Modelling	Oil Spill modelling commissioned within 24 hours for a Level 2 or 3 spill notification.	Incident Log
		Modelling delivered to IMT within 2 hours of request to service provider.	Incident Log
		Modelling continues until termination criteria are met.	Incident Log
	Fluorometry	Fluorometry surveys mobilised within 7 days of initiation.	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		Daily report including fluorometry results provided to IMT within 24 hours of completing daily survey.	Incident Log
	SCAT	Commence deployment of SCAT Teams within 48 hours of becoming aware of impacts to state / territory waters	Incident Log
		Completed SCAT surveys are delivered to IMT within two hours of the Survey Team returning to its operating base	Incident Log
		SCAT surveys undertaken daily at priority locations	Incident Log
Surface Chemical Dispersion	Chemical Dispersion Action Plan (Surface)	Activate Chemical Dispersant Action Plan within two hours of IMT activation	Incident Log
		Commence mobilisation of resources (equipment, stock, platforms) to support dispersant operations within four hours of IMT activation	Incident Log
		Activate Darwin logistics support arrangements within six hours of IMT activation	Incident Log
		Chemical dispersants listed as approved in the National Plan (OSCA) are to be prioritised for use. Additional chemical dispersants not on the OSCA list will be used only if evaluated to be an acceptable level of risk as determined by the Chemical Selection Evaluation and Approval Procedure (JS-70-PR-I-00033)	Chemical Selection Evaluation and Approval Procedure (JS-70-PR-I-00033) Applied to non-OSCA dispersants and recorded in Incident Log
		NEBA undertaken within two hours of spill and daily thereafter to determine if chemical dispersion will have a net environmental benefit. NEBA is to be included in development of following period Incident Action Plan.	Incident Log/ IAP
		The NEBA for dispersant application will consider the following inputs: • Trajectory of spill and sensitive receptors within EMBA	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		• Forecast spill modelling of naturally and chemically dispersed oil • Ecotoxicity data (species protection trigger levels) for dispersed oil (including chemically dispersed oil) (once available) • Consultation with the HMA	
		Commence aerial chemical dispersant application within 3 days of initial AMSA notification (daylight and weather condition dependent).	Incident Log
		Commence vessel chemical dispersant application within 36 hours of initial IMT activation (daylight and weather condition dependent).	Incident Log
		Chemical dispersant applied in consultation with relevant statutory agencies & HMA.	Incident Log
		IMT to complete an Air Operations Plan and submit to AMSA within 6 hours of initial activation to enable activation of the FWADC.	Incident Log Air Operations Plan
		All surface chemical dispersant operations will occur during daylight hours only. At no time can chemical dispersant be applied: • In waters shallower than 20 m; • Within exclusion zones for offshore facilities; • Within an Australian Marine Park boundary or its buffer; • Over responders; and • Within State Waters.	Incident Log
		Application rates and dilution ratio monitored and adjusted daily based upon operational monitoring reports.	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		The effectiveness of the aerial based chemical dispersion strategy is communicated to the Operations Lead via the Air-Attack Supervisors	Incident Log
		Response to continue until NEBA demonstrates no environmental benefit to use chemical dispersants.	Incident Log
Shoreline Protection and Deflection	Shoreline Protection and Deflection Action Plan	Activate Protection and Deflection Action Plan within 24 hours of IMT activation	Incident Log
		Develop a P&D Plan (if required) within 12 hours of NEBA confirming an overall environmental benefit	Incident Log
		Obtain regulatory approvals to access locations for P&D operations within 3 days of spill or 48 hours prior to estimated shoreline contact	Incident Log
		Commence mobilisation of equipment within 48 hours of IMT activation	Incident Log
		Commence receiving equipment within 96 hours of IMT activation	Incident Log
		Mobilise support vessels with capability to deploy P&D teams and equipment to remote locations – onsite within six days or 24 hours prior to estimated shoreline contact	Incident Log
		Commence P&D operations onsite 24 hours prior to estimated shoreline contact	Incident Log
		IMT to confirm Priority receptors in consultation with the HMA	Incident Log/ IAP
		NEBA undertaken within two hours of spill and daily thereafter to determine if protection and deflection will have a net environmental benefit. NEBA is to be included in development of following period Incident Action Plan.	Incident Log/ IAP
		Activate Containment and recovery Action Plan within three hours of IMT activation	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
Offshore Containment and Recovery (C&R)	Containment and Recovery Action Plan	Commence mobilisation of C&R resources into Darwin within 12 hours of IMT activation	Incident Log
		Commence Containment and Recovery operations ongoing from Day 2 operational period	Incident Log
		NEBA undertaken within two hours of spill and daily thereafter to determine if containment and recovery will have a net environmental benefit. NEBA is to be included in development of following period Incident Action Plan.	Incident Log/ IAP
		Containment and recovery operations to be managed by a minimum of two trained Oil Spill Responders (per system)	Incident Log/ IAP
		Obtain approvals from relevant Jurisdictional Authority prior to commencing decanting operations	Incident Log
Shoreline Clean-up	Shoreline Clean-up Action Plan	Activate Shoreline Clean-up Action Plan within 2 hours of potential shoreline contact within State/Territory	Incident Log
		Develop a Shoreline Clean-up Plan within 12 hours of NEBA confirming an overall environmental benefit	Incident Log
		Obtain approvals to access land within three days of spill or 48 hours prior to estimated contact with shoreline	Incident Log
		Commence mobilisation of shoreline clean-up equipment/personnel in readiness for use within 48 hours of spill notification, onsite within 7 days of spill notification or 24 hours prior to shoreline contact	Incident Log
		Set up shoreline clean-up operations onsite within six days of spill notification or 24 hours prior to shoreline contact	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		Commence shoreline clean-up operations as per the IAP within seven days of spill or 24 hours after shoreline contact	Incident Log
		Shoreline Team Lead to consult with SCAT Team and confirm shorelines for appropriate clean-up techniques prior to undertaking clean-up.	Incident Log
		Selection of the shoreline clean-up method appropriate to shoreline type is to be undertaken in consultation with the HMA and selected based on NEBA.	Incident Log
		Shoreline clean-up team members are briefed by shoreline team leads on how to implement the shoreline clean-up techniques described in Table 13-2 including how to prevent damage to shoreline habitat and surrounding laydown/staging areas.	Operational Orders
		Clean-up strategies will be implemented under the direction of the HMA.	Incident Log
		Shoreline team leads shall verify clean-up effectiveness and conduct final evaluations.	Incident Log
		NEBA undertaken within two hours of spill and daily thereafter to determine if shoreline clean-up will have a net environmental benefit. NEBA is to be included in development of following period Incident Action Plan.	Incident Log/ IAP
Oiled Wildlife Response (OWR)	Oiled Wildlife Response Action Plan	Activate OWR Action Plan within 24 hours of IMT activation	Incident Log
		NEBA undertaken within 24 hours of spill and daily thereafter to determine if OWR will have a net environmental benefit. NEBA is to be included in development of following period Incident Action Plan.	Incident Log
		Establish OWR structure within IMT within 24 hours of OWR risk being identified	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		Stand-up OWR capability within 48 hours of OWR risk being identified, and onsite within seven days	Incident Log
		Commence mobilisation of OWR resources within 48 hours of OWR risk being identified	IAP/Incident Log
		Prepare IAP oiled wildlife response sub-plan within 24 hours of wildlife reconnaissance confirming potential or realised impacts to wildlife	IAP/Incident Log
		Conduct preparations in support of OWR operations within seven days of OWR risk being identified	Incident Log
		Establish OWR facility (staging, rehab) to be onsite within seven days of OWR risk being identified	Incident Log
Waste Management	Waste Management Plan	Activate Waste Management Plan within 24 hours of IMT activation	Incident Log
		Request to stand up Waste Contractor to arrange waste pickup and transport undertaken immediately following assessment of need for waste management in the response.	Incident Log
		All decisions to escalate and de-escalate waste management equipment and personnel shall be approved by the IMT Leader	Incident Log
		The IAP process is to be used to determine the required level of response and the quantities and types of waste management equipment required.	Incident Log
		The Waste Management Operations Team Leader shall communicate daily reports to the Logistics Team Leader to inform of required resources and response effectiveness.	Incident Log

Response Elements	Control Measures	Performance Standards	Measurement Criteria
		The Logistics Lead shall monitor and record the response to demonstrate all waste management legislative requirements are met.	Incident Log
		The State/Territory Waste Management Plan must be considered in development of the waste management plan by the Waste Contractor	Incident Log
		Demobilisation of the Waste Management Plan will be guided by IAP.	Incident Log
		Waste contractor shall track all wastes from point of generation (Warm-zones and Marinas) to final destination.	Waste contractor records
Scientific Monitoring	Scientific Monitoring Plan (GF-70-PR-I-00035)	Activate Scientific Monitoring Action Plan within 24hours of IMT activation	Incident Log
		An Environmental service provider is in place	Contract with Environmental service provider
		A Scientific Monitoring Implementation Plan is in place	
		2 yearly audit of capability and readiness as described in the Implementation Plan and SMP Framework is conducted by Jadestone	Audit Manual (JS-90-PR-G-00003)
		Participation in a Jadestone annual exercise for a spill response scenario by the Environmental service provider is undertaken	Emergency exercise evaluation report
		12 monthly review of SMPs post OPEP exercise. Six monthly external legislative review of environmental matters to ensure currency of information	Audit Manual (JS-90-PR-G-00003) Notification of membership Contract with external environmental consultancy

Response Elements	Control Measures	Performance Standards	Measurement Criteria
Activation of IMT	Competency and Training Management System [JS-60-PR-Q-00014]	IMT members are competent to undertake IMT role as defined by the Competency and Training Management System	Skills matrix and annual audit of Competency and Training Management system.
	Incident Management Team Response Plan [JS-70-PLN-F-0008]	IMT members available for an initial IMT briefing within 30 minutes of receiving the activation notification	Incident Log
		IMT members located in Perth will meet physically at the office within 3 hours of receiving the activation notification	Incident Log
		IMT Core Members will be maintained at numbers capable of responding defined in Table 7-2.	Skills matrix and annual audit of Competency and Training Management system.

PART B – RESPONSE

16. RESPONSE ACTIONS

16.1 Initial Actions

The following sections within this OPEP are provided in order to assist and aid the Jadestone Incident Management Team (IMT) and wider organisation in reacting to and coordinating the ongoing requirements of an oil spill incident from the Montara facility as outlined in Part A.
The following initial actions tables provide broad guidance which is to be followed on activation of the IMT and need to stand up the organisations oil spill response arrangements.

Spill Level Assessment
***OIM** to determine if the spill can be managed using available resources infield*

*If **YES** – Montara to respond to spill. Continue with response actions as per Montara ERP*

Perth IMT can be activated to support Montara as needed

Go to Level 1 Spill – Initial Action

Spill Escalation
*If **NO** – Perth IMT is to be activated and the spill level escalated*

Spill Response Operations
***OIM** to coordinate response actions as per* Montara ERP *and OPEP*

***Incident Controller (IMT Leader)** to initiate spill response operations*

Go to Level 2 / 3 Spill – Initial Action

16.2 Level One Spill – Initial Actions

LEVEL ONE SPILL - INITIAL ACTIONS	
Primary Objectives:	1. Gain control of the spill source (stop or minimise further loss) 2. Build and maintain situational awareness
Priority receptors:	**Spill Response Strategies:**
• N/A	1. Source Control 2. Operational monitoring

INITIAL ACTIONS			
Timeframe	**Strategies**	**Tactics (what is to be done)**	**Reference (how to do it)**
60 mins	Activate **Source Control** – fuel tank rupture from vessel collision	Isolate hydrocarbon leak source and control source of the spill	Shipboard Oil Pollution Emergency Plan (SOPEP)
			Montara Emergency Response Plan
60 mins	Activate **Operational Monitoring**	Deploy tracking buoys Conduct visual surveillance Report weather information to IMT Determine extent of spill (volume, size, movement)	Table 16.4
2 Hours	Commence **Notifications**	Complete verbal and written notifications IMT to assist if required	Table 16.3

16.3 Level Two / Three – Initial Actions

LEVEL 2 / 3 SPILL - INITIAL ACTIONS	
Primary Objectives	1. Gain control of spill source (stop or minimise further loss) 2. Build and maintain situational awareness 3. Minimise oiling of priority receptors
Priority Receptors:	**Spill Response Strategies:**
• Ashmore & Cartier Islands • Tiwi Islands • Joseph Bonaparte Gulf (NT) • Darwin Coast • Kimberley Coast • Western NT • Indonesia • Timor Leste • Browse Island	1. Source control 2. Operational Monitoring 3. Chemical Dispersion 4. Containment and Recovery 5. Protection and Deflection 6. Shoreline Clean-up 7. Oiled Wildlife Response 8. Scientific Monitoring

LEVEL 2/3 SPILL: INITIAL ACTIONS			
Timeframe	**Strategies**	**Tactics (what is to be done)**	**Reference (how to do it)**
60 mins	Activate Source Control – fuel tank rupture from vessel collision	Isolate hydrocarbon leak source/shut down equipment as per normal operating practice.	Shipboard Oil Pollution Emergency Plan (SOPEP) Montara Incident Response Plan
60 mins	Activate Source Control – Loss of well control	Isolate hydrocarbon leak source/shut down equipment as per normal operating practice.	Table 16.4 / LOWC Source Control Plan
60 mins	Activate Operational Monitoring Action Plan	Deployment of resources to build and maintain situational awareness	Table 16.5
2 hours	Commence Notifications Plan	Complete verbal and written notifications	Table 16.3 / IMTRP
2 hours	Activate Surface Chemical Dispersion Action Plan	Mobilisation and deployment of vessel/aerial dispersant equipment, dispersant stockpiles and resources to reduce the impact of the oil on the priority receptors	Table 16.6
3 hours	Activate Containment and Recovery Action Plan	Mobilisation and deployment of vessels, personnel and equipment to reduce volume of oil impacting priority receptors	Table 16.7
24 hours	Activate the nearshore Protection and Deflection Strategy Action Plan	Booming configurations to protect sensitivities or deflect oil away from sensitivities	Table 16.8

LEVEL 2/3 SPILL: INITIAL ACTIONS			
Timeframe	**Strategies**	**Tactics (what is to be done)**	**Reference (how to do it)**
24 hours	Activate Scientific Monitoring Plan	Scientific monitoring plans to be conducted throughout spill response activities as directed by ongoing IAPs.	Operational and Scientific Monitoring Program
24 hours	Activate the Shoreline Clean-Up Strategy Action Plan	Shoreline assessment and selection of suitable clean-up techniques. Deployment of personnel and resources to clean-up impact locations	Table 16.8
24 hours	Activate the Oiled Wildlife Response Action Plan	Mobilisation of support and resources to manage and coordinate oiled wildlife response operations	WA/NT OWRP / IMTRP
24 hours	Activate the Waste Management Plan to prepare for managing waste, and safe treatment and disposal of oily contaminated materials	Activation of initial waste collection, storage, and transport options.	IMTRP Toxfree Oil Spill Waste Management Plan
As the situation dictates	Commence transition to pro-active incident management by completing the IAP process.	Develop IAPs for subsequent operational periods. Document 'Performance Objectives' and 'Measurement Criteria' against actions in IAPs, and feed performance data into the development of subsequent IAPs. Manage the response documentation and records to ensure sufficient information is available to post-incident cost recovery and litigation processes.	Incident Management Team Response Plan (IMTRP)

16.4 Notification and Activation

ACTION PLAN: INITIAL NOTIFICATIONS & ACTIVATIONS				
Aim: To provide early notification (and activation if required) to essential support organisations				
Task		**Actions**	**Resources**	**Timeframe**
1. Contact and provide incident information to support and regulatory organisations Responsible Person: IMT Leader to delegate task				
Note: - Notification and/or activation of these support organisations is to be clearly annotated in the IMT Incident Log, additionally, all associated contracts/forms are to be filed. - To reduce confusion, IMT (Log or Ops) is to assume **PRIMARY** point of contact with AMOSC and OSRL (+ AMSA if resources are required)				
INITIAL RESPONSE ACTIONS	**Initial Response (Support Organisations)** IMT Leader to direct designated IMT staff to conduct "initial" notifications to relevant support organisations.	**Australian Marine Oil Spill Centre (AMOSC)** Verbal Call AMOSC Duty Officer and provide initial incident notification. An initial call should be completed as soon as possible so that AMOSC can start their own internal preparations for activation. This initial call can be followed up once more information is known and a decision has been made as to what spill response equipment / personnel are going to be required. Signed Contract Note After verbal notification AMOSC will email a copy of Contract Note which will formalise activation. The CN must be signed by an authorised member of staff and returned to AMOSC. **Note:** may also include requirement to access SFRT (see Source Control)	For all - Contact details as per Jadestone Phone Book 24hr Phone: 0438 379 328 Office Phone : (03) 5272 1555 Email: amosc@amosc.com.au JADESTONE call out authorities to AMOSC are the following: • Country Manager (Australia); • Operations Manager (Australia); • Finance Manager (Australia); • Maintenance & Engineering Manager; and • Incident Management Team (IMT) Leader.	ASAP (< 60mins)
		Oil Spill Response Ltd (OSRL) Verbal	24hr Phone: +65 6266 1566 Email: dutymanagers@oilspillresponse.com	ASAP (< 60 mins)

		Call OSRL Duty Manager and provide initial incident notification Call is to be followed up with the OSRL Notification form and signed Mobilisation Authorisation form which are to be sent to OSRL once signed by an authorised member of staff.	JADESTONE authorised signatories (above)	
		Australian Marine Safety Authority (AMSA) Verbal Call AMSA and provide initial incident notification. An initial call should be completed as soon as possible for two reasons: a) Incident notification; and b) So that JSE can request mobilisation of AMSA resources as quickly as possible. This initial call is to be followed up with a written POLREP	Primary contact (Canberra) 1800-641-792 (02)6230-6811	ASAP (< 60 mins)
		Wild Well Control (WWC) Verbal If loss of control of a well had occurred, then notifications should be done as per the JSE Notification Process provided in the Blowout Contingency Plan [JS-70-PLN-D-00001 and included in Section 16.5. After verbal notification JADESTONE to complete and sign the appropriate WWC Data Acquisition Form (see Appendix G of the BCP) and submit it via email to WWC	Primary contact (Houston) 24hr Phone: +1 281 784 4700 Secondary contact (Aberdeen) 24hr Phone: +44 (0) 1224 215380 Email: wellcontained@wildwell.com Jadestone IMT Leader, Drilling Manager or Drilling Superintendent	ASAP (< 60 mins)
ONGOING RESPONSE ACTIONS	**Notification of Regulatory Organisations** IMT Leader to direct IMT staff to complete required regulatory/compliance notifications.	Complete verbal and written notifications to the following organisations (as required): NOPSEMA – verbal and written NOPTA – verbal or written summary of the incident by the next working day DoEE – Verbal WA DoT – dependant on potential impact on State Waters NT EPA – NT POLREP NT Department of Primary Industry and Resources – written report Parks Australia – verbal	OSR Arrangements Table 3.3 Associated forms within Appendices	To be commenced as soon as practicable, and no later than 2 hours of spill occurring

		DBCA – for oiled wildlife notification NT Department of Fisheries – verbal WA Department of Primary Industries and Regional Development- Fisheries Australian Fisheries Management Authority – verbal Department of Foreign Affairs and Trade – verbal		
	Secondary Response (Support Organisations) IMT Leader to direct designated IMT staff to conduct notification/activation of secondary support organisations	**Jacobs (Scientific Monitoring Programme)** Call to be made to Jacobs providing them with information relating to the incident and intention with respect to activation of the SMP. Call is to be followed up with written confirmation **Toxfree (Oil Spill Response Waste Management Plan)**	**Refer IMT Contact List** 24hr Contact details **Toxfree National Emergency Number (24/7):** 1 800 429 628	Within 24 hours of spill notification

16.5 Source Control Action Plan

For a total loss of well control event (blowout), a Blowout Contingency Plan (BCP) (JS-70-PLN-D-00001) has been developed to cover the management of Source control actions. These actions apply only to a LOWC Level 3 spill. Source control actions related to other credible scenarios will be managed in accordance with the facility/vessel SOPEP and Jadestone ERPs as described in Section 8.

The Initial JSE Notification Process for a loss of well control is shown below, and as provided in the BCP, Figure 1.

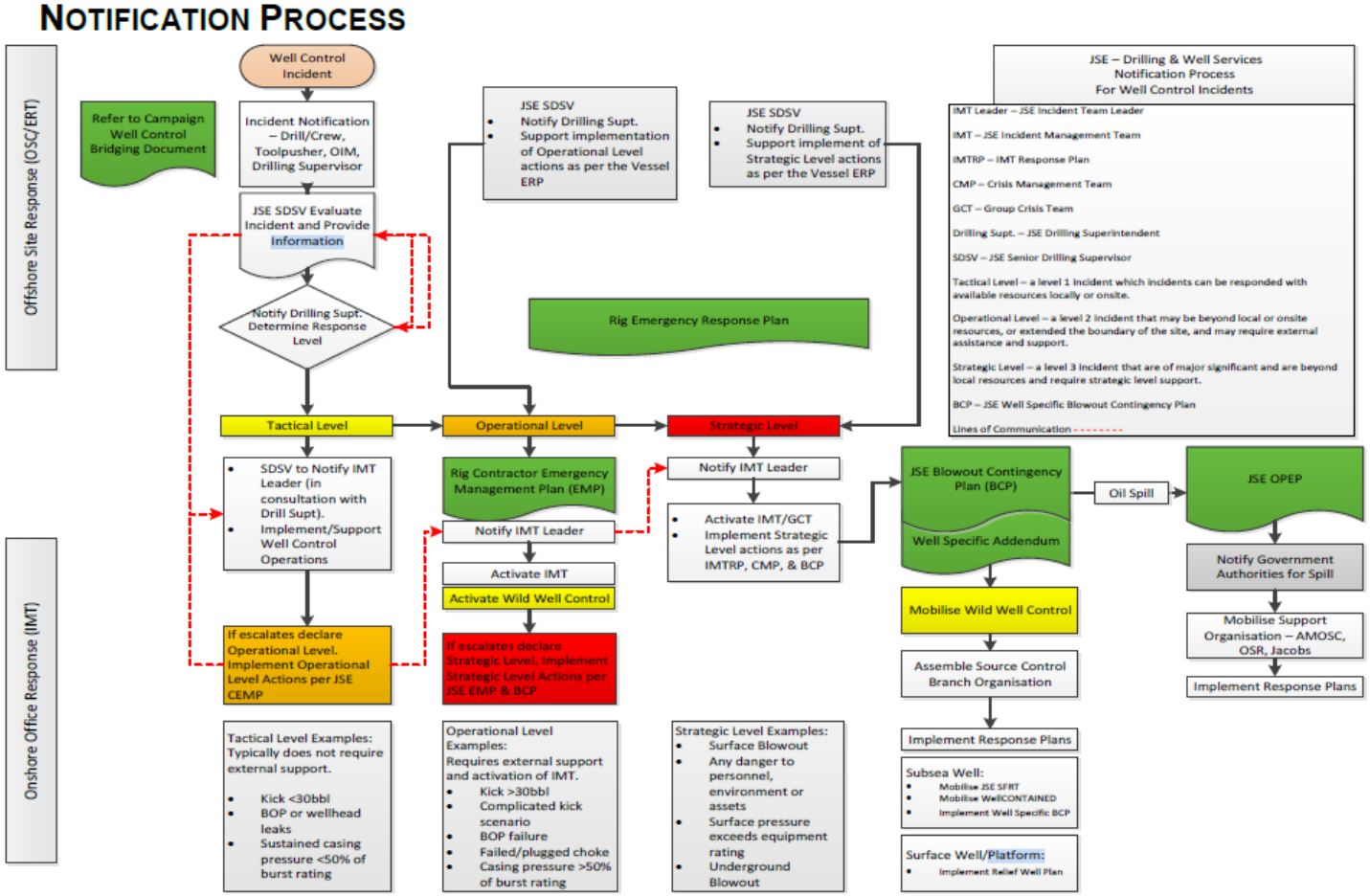


Figure 2 : Blowout Contingency Plan - Notification Process

ACTION PLAN: SOURCE CONTROL			
1. Commence initial response actions Responsible Person: OIM /IMT Leader (to delegate)			
Task		**Resources**	**Timeframe**
INITIAL RESPONSE ACTIONS	The following actions will be undertaken as an initial response to <u>any source</u> control incident: 1. Facility / vessel to undertake initial response actions as per their ERP / SOPEP. 2. Subsea flowline break, breakaway hose.	Shipboard Oil Pollution Emergency Plan (SOPEP) Montara Emergency Response Plan (ERP).	Immediately
2	**LOWC Incident Level 3 Only** **Source control actions relating to other credible scenarios such as surface release from breach of support vessel fuel tank or bunkering / refuelling will be managed in accordance with the facility / vessel ERP / SOPEP.**		

INITIAL RESPONSE ACTIONS	The following actions will be undertaken as an initial response to a LOWC incident resulting in a Level 3 spill: 1. Initiate first response actions as per the Blowout Contingency Plan; and 2. Notify / mobilise specialist personnel: a) AMOSC / Oceaneering Australia; b) Wild Well Control (WWC); and c) Others (OSRL, consultants etc as required)	**Personnel** Specialist personnel (ie from WWC, AMOSC / Oceaneering Australia etc) **Forms and Guidance** AMOSC General and SFRT Service Contracts Oceaneering Australia Master Contract WWC Master Service Agreement and Equipment Access Agreement Blowout Contingency Plan Notification / activation forms **Deliverables** Completed Drilling and Production Incident Data Checklist; Technical Data Archive Checklist; Personnel Debriefing Checklist.	ASAP: Notifications within 2 hours of spill Initial source control response actions within 12-24 hours
3. Mobilise source control resources (as appropriate) Responsible Person: Operations Lead			

INITIAL RESPONSE ACTIONS	NOTE SFRT ITEMS (3, 4 & 5) ARE FOR SUBSEA LOSS OF WELL CONTROL ONLY Mobilise AMOSC Subsea First Response Toolkit (SFRT) (for subsea LOWC): 1. Activate SFRT mobilisation with AMOSC (~2 hours) a. Jadestone provides AMOSC with proof of insurance and a copy of its Operations, Training and Advice (OTA) Agreement in place with Oceaneering b. Execute SFRT Contract Note between AMOSC and Jadestone 2. Contract suitable construction class vessel capable of deploying SFRT equipment (allow 7 days for vessel readiness in Darwin); 3. Arrange road freight of SFRT equipment from Jandakot to Darwin (24 hours to arrange, 72 hours to transport); 4. Arrange road freight of initial AMOSC SRFT dispersant from Hamilton Hill (60 hours) followed by ongoing supply; 5. Arrange load out of SFRT equipment and dispersant onto vessel in Darwin (8 hours); 6. Transit to field (36 hours); and 7. Mobilise trained personnel from Oceaneering Australia (Jandakot) to be in Darwin for loadout of vessel (5 above).	**Requirements** AMOSC SFRT equipment (Jandakot) and Dispersant (Fremantle) 1 x construction class vessel to deploy SFRT equipment 1 x vessel for WROVs & tooling - 2 x WROVs Jadestone contracted logistics provider (Road Transport) Toll Logistics (Darwin Supply Base) **Personnel** Oceaneering Australia personnel Construction class vessel crews ROV vessel crews Jadestone/Toll Logistics staff **Forms and Guidance** AMOSC SFRT Contract Note AMOSC SFRT Mobilisation Procedure Oceaneering Australia procedures	Commence activation of SFRT and contracting a vessel within 24 hours of spill notification SFRT equipment and vessel in Darwin within 7 days of spill notification Vessel loaded and commence transit within 7.5 days of spill notification Equipment infield within 9 days of spill of spill notification
	1. Mobilise a drill rig, support vessels and equipment for relief well drilling (for surface and subsea LOWC): 2. Source and contract a drill rig and support vessels to drill the well(s); a) Available to Jadestone via the AMOSPlan. Additionally, Jadestone monitors the availability of suitable drill rigs and support vessels during drilling campaigns and has signed the APPEA MOU for mutual assistance for relief well drilling. 3. Source and mobilise associated drilling consumables.	**Equipment** Drill rig Support vessels Wellhead and casing Kill fluid, cement and other bulk supplies Ranging equipment Drilling assemblies and steering tools **Personnel** Relief Well Group	Commence contracting drill rig within 24 hours of spill notification Estimated to have rig infield within 21 days of spill notification

		Forms and Guidance Source Control Plan Well Specific Addendum	
4. Commence survey and planning Responsible Person: Site Survey Unit Leader			
ONGOING RESPONSE ACTIONS	NOTE SFRT ITEMS (3, 4 & 5) ARE FOR SUBSEA LOSS OF WELL CONTROL ONLY 1. Undertake site survey to inform source control options: a) Deploy ROVs to inspect well site; b) Test surface air quality; c) Map debris field; d) Determine wellhead and blow out preventer (BOP) damage, subsea structure integrity and wellhead inclination; e) Determine source(s) of hydrocarbon release and geometry of release point(s); and f) Provide continuous ROV video and data feed to support facilities (intervention vessels, EMT etc.).	**Equipment** AMOSC SFRT survey equipment ROVs SFRT construction class vessels **Personnel** Site Survey Unit (WWC / Oceaneering Australia) **Forms and Guidance** Source Control Plan Site Survey Unit Source Control Response Decision Tree Site Survey Unit Leader Checklist Site Survey Procedure Well Control Data Sheet Site Survey Data checklist Oceaneering Australia procedures **Deliverables** Air quality results Infrastructure status reports Debris maps ROV video and data feed Completed Well Control Data Sheets Completed Site Survey Data checklists	Commence within 11 days of spill notification
5. Undertake well debris removal (if applicable) Responsible Person: Debris Removal Unit Leader			

	NOTE SFRT ITEMS (3, 4 & 5) ARE FOR SUBSEA LOSS OF WELL CONTROL ONLY A. Develop a debris removal plan.	**Personnel** Debris Removal Unit (WWC / Oceaneering Australia) **Deliverables** Debris Removal Plan	Commence within 12 days of spill notification
	B. Commence debris removal: a) Cut and remove choke and kill lines; b) Install rigging on riser, cut and remove riser sections; c) Install rigging on lower marine riser package (LMRP) / BOP, unlatch and remove connectors; d) Clear all other debris that could impede well control operations; e) Identify the chain of custody for any debris recovered; and f) Identify and maintain a "wet store" area.	**Equipment** AMOSC SFRT debris removal equipment WWC debris removal equipment: SFRT construction class vessels Capping stack construction class vessel **Personnel** Debris Removal Unit (WWC / Oceaneering Australia) Drill rig contractor / Construction class vessel crews **Forms and Guidance** Source Control Plan Oceaneering Australia procedures **Deliverables** Daily Operations Report	Commence light debris removal within 13 days of spill notification using AMOSC SFRT equipment Commence heavy debris removal within 21 days of spill notification using WWC equipment
6. Commence subsurface dispersant injection (SSDI) (if applicable) Responsible Person: Subsea Dispersant Unit Leader			
	NOTE SFRT ITEMS (3, 4 & 5) ARE FOR SUBSEA LOSS OF WELL CONTROL ONLY 1. Commence subsurface dispersant injection (SSDI): a) Develop dispersant application and monitoring plan to include detail on rates, injection location(s) and monitoring requirements; b) Commence subsea dispersant injection (ongoing); c) Conduct monitoring (ongoing); and d) Replenish dispersant stocks (ongoing). 2. Conduct daily re-evaluation of subsea dispersant effectiveness monitoring data to determine efficacy of response strategy and include the results in the operational	**Equipment** AMOSC SFRT dispersant injection equipment Dispersant ROVs SFRT construction class vessels **Personnel** Subsea Dispersant Unit (Oceaneering Australia) Construction class vessel crews **Forms and Guidance**	Commence within 10 days of spill notification using AMOSC SFRT equipment

	NEBA and IAP. Modify dispersant delivery rates and/or application method according to monitoring data (if applicable).	Oceaneering procedures Subsea Dispersant System Installation and Operation Manual Source Control Plan Subsea Dispersant Unit Leader Checklist Dispersant System Deployment Procedure Subsea dispersant effectiveness monitoring data NEBA	
7. Drill a relief well Responsible Person: Relief Well Group Leader			
	1. Finalise Relief Well Plan: a) Determine if impacted rig may be used for relief rig; b) Determine number of relief wells to be drilled; c) Update information on reservoir and wellbore geometry; d) Confirm available resources (i.e. rig, tubular goods, pumping fluids etc); e) Finalise surface location and rig move plan; f) Confirm any permit requirements and obtain (if applicable); and g) Issue Relief Well Drilling Program.	**Personnel** Relief Well Group (WWC / direction drilling contractor / drill rig contractor / other third parties) **Forms and Guidance** Blowout Contingency Plan Well Specific Addendum Preliminary Relief Well Plan **Deliverables** Relief Well Drilling Program Completed Information Needed for Preliminary Relief Well Planning and Dynamic Kill Strategy Checklists	Commence development within 48 hours of spill notification Plan finalised within 21 days of spill notification
	1. Drill a relief well: a) Mooring and rig positioning; and b) Drill relief well.	**Equipment** Drill rig Support vessels Wellhead and casing Kill fluid, cement and other bulk supplies Ranging equipment Drilling assemblies and steering tools **Personnel**	Commence within 22 days of spill notification Estimated installation time of 4 weeks

		Relief Well Group (WWC / direction drilling contractor / drill rig contractor / other third parties) Drill rig and support vessel crews **Forms and Guidance** Relief Well Drilling Program Blowout Contingency Plan Relief Well Group Relief Well Group Leader Checklist Relief Well **Deliverables** Daily Operations Report Well Construction Report	
8. Complete well kill Responsible Person: Well Kill Unit Leader			
	1. Finalise Relief Well Kill Plan: a) Review reservoir and wellbore data; b) Review kill weights and pumping rates; c) Assess options for well kill using capping stack (if applicable); d) Finalise the Well Kill Plan; and e) Finalise equipment and consumable requirements.	**Personnel** Well Kill Unit (WWC) **Forms and Guidance** Source Control Plan Well Specific Addendum Preliminary Relief Well Kill Plan **Deliverables** Relief Well Kill Plan Capping Stack Kill Plan (if applicable) Completed Information Needed for Preliminary Relief Well Planning and Dynamic Kill Strategy Checklists	Commence within 7 days of spill notification Plan finalised within 50 days of spill notification for Relief Well Kill Plan

	A. Conduct kill operations: i) Well abandonment.	**Equipment** Drill rig Support vessels Capping stack construction class vessel (if applicable) Pumping vessel / equipment (if applicable) Kill fluid **Personnel** Well Kill Unit (WWC / drill rig contractor / other third parties) Drill rig and support vessel crews Construction class vessel crew (if applicable) **Forms and Guidance** Blowout Contingency Plan Capping Stack Kill Plan (if applicable) **Deliverables** Daily Operations Report Well Construction Report	Commence within 51 days of spill notification for relief well kill
9. Decontaminate and demobilise Responsible Person: Decontamination and Demobilisation Unit Leader			
	1. Develop decontamination and demobilisation plan. 2. Undertake decontamination activities: a) Offshore decontamination of drill rig / facility / support vessels; b) Final decontamination at shipyards where required; and c) Hazardous waste disposal. 3. Demobilise drill rig / construction class vessels / support vessels / equipment / personnel as applicable.	**Equipment** Decontamination equipment **Personnel** Decontamination and Demobilisation Unit (WWC) Decontamination contractors Waste contractors **Forms and Guidance** Blowout Contingency Plan Decontamination and Demobilisation Unit	Ongoing throughout and after response until all equipment is decontaminated and demobilised

		Decontamination and Demobilisation Unit Leader Checklist Decontamination and Demobilisation Plan **Deliverables** Waste and decontamination records	

16.6 Operational Monitoring Plan

ACTION PLAN: MONITOR AND EVALUATE				
Aim: To build and maintain the most accurate picture regarding the spill and oil lost into the marine environment in the most effective and efficient manner				
Task		**Actions**	**Resources**	**Timeframe**
1. Deployment of satellite tracking buoy (TB) Responsible Person: OIM / IMT (Planning)				
INITIAL RESPONSE ACTIONS	**Deploy and access tracking buoy information** OIM to direct crew to deploy buoy from the facility or a vessel as close as is safe to the leading edge of the spill.	1. OIM (or Rep) to report to IMT as soon as TB has been deployed 2. OIM (or Rep) to provide IMT with current weather conditions at Montara (wind, sea state, current direction) – IMT to log information and add to Common Operating Picture (COP) **3.** IMT to confirm deployment via TB website using associated login information (ensure IMT Leader is briefed). **Refer IMT OneNote for Metocean - Login details for Tracker Buoys.** 4. IMT to ensure TB location is added to the COP 5. IMT to ensure deployment of TB is captured in Incident Log	Satellite tracking buoys - FPSO Support vessel if available	Deploy within 3 hours of spill and continually track thereafter
ONGOING ACTIONS	**Deployment of additional tracking buoy** OIM/Vessel Masters to liaise with IMT with respect to the continued deployment of TB.	1. As part the ongoing response the IAP is to include guidance to the OIM (of vessels) with respect to the continued deployment of available TB in support of operational monitoring of the spill 2. Deployed TB are to be continually monitored by the IMT (Planning) and added to the COP as a regular action 3. Deployment of the TB's to captured in Incident Log	Incident Action Plan (IAP)	As detailed within the IAP
2. Commencement of aerial surveillance operations (for Level 2 / 3 spills) Responsible Person: OIM / IMT				

INITIAL RESPONSE ACTIONS	**Activation of initial aerial surveillance flights** Source and mobilise available aircraft to commence aerial surveillance of the spill	1. IMT (Log) to contact Babcock to confirm availability of a helicopter to conduct an initial surveillance flights in vicinity of the spill a. Confirm approx. time flight can depart (or be re-tasked) b. Confirm crew composition – likely a trained observer will not be available. Flight can be conducted using a standard crew and should be flown as soon as practicable. 2. IMT (Plan or Ops) to contact AMOSC (requesting assistance with sourcing trained observers) 3. IMT (Ops) to liaise with the OIM regarding approval to commence surveillance flight in vicinity of the facility 4. IMT (Log/Ops) – once aircraft and crew have been confirmed, IMT Leader is to be updated. 5. IMT (Ops) ensure flight details are captured in the incident log (all details pertaining to the flight) 6. IMT (Ops) to assume primary coordination for flight. Provide Babcock with tasking information 7. IMT (Ops) to contact Babcock and confirm that all safety requirements have been met. Capture in incident log. 8. IMT (Ops) to monitor flight with Babcock ensuring that the IMT are briefed regularly. Once complete ensure that all relevant information is provided back to the IMT so that it can be assessed, included into the COP and further flights determined. 9. All information should be entered into an Aerial Surveillance Observation Log (refer Appendix A1) which will be sent to the OIM/IMT within an hour of the aircraft returning to its operating base. Where possible, a verbal report via radio/telephone en-route providing relevant information should be considered if the aircraft has long transits from the spill location to base. 10. Aerial Observers shall note fauna sightings in the Aerial Surveillance Marine Fauna Sighting Record Sheet. The location	**Equipment** Babcock helicopters (Truscott) Air North or other provider fixed wing aircraft (Darwin) **Personnel** 1 x Trained Aerial Observer (sourced from AMOSC, AMSA or OSRL). **Note:** Initial reconnaissance may be completed by an untrained observer while waiting for trained observers to arrive. **Forms and Guidance** Aerial Surveillance Tasking Form Aerial Surveillance Observation Log (refer Appendix A1) Aerial Surveillance Marine Fauna Sighting Record Sheet (refer Appendix A1) **Deliverables** Completed Aerial and Fauna Surveillance Forms Photographs / video footage	Mobilisation within 6 hours of spill notification (At least 1 aircraft available at airbase within 24 hours of mobilisation request)

ACTION PLAN: MONITOR AND EVALUATE				
		and details of each sighting should be recorded with a cross-reference to photographic imagery captured. The Aerial Surveillance Marine Fauna Sighting Record Sheet is provided in Appendix A1. **Note:** if Infield Support Vessel (ISV) is onsite and tasked to commence dispersant operations all surveillance flights are to be tasked to provide updates of spill location when operating in the same operational zone		

ACTION PLAN: MONITOR AND EVALUATE				
ONGOING RESPONSE ACTIONS	**Ongoing coordination of aerial surveillance flights** Development and coordination of surveillance flights **Note:** Coordination of aviation operations is essential. Therefore, flight-schedule is to cover ALL planned aviation operations on a daily basis.	IMT (Ops) to develop a flight schedule for ongoing surveillance as required: 1. Source fixed wing aircraft from Air North to commence aerial surveillance operations from Day 2 **Note:** A second fixed wing aircraft will be requested from Air North to support aerial dispersant operations from Day 3 2. Develop aerial surveillance flight schedule which includes the following operations: a. Aerial surveillance utilising Babcock helicopters (Truscott) - Day 1 & 2 b. Aerial surveillance using fixed wing (Air North) from Darwin – Day 2 onwards c. Aerial dispersant operations from Darwin (Air Tractor and Hercules) d. Aerial Spotter flights in support of the dispersant application 3. The frequency of flights will be sufficient to ensure that the information collected during each flight (i.e. observer log and spill mapping) meets the information needs to validate dispersion of the spill and supports ongoing response operations 4. Flight schedule is to ensure that ALL aircraft operations are conducted safely and support “other” response operations where necessary	Incident Action Plan (IAP)	As per operational period
INITIAL RESPONSE ACTIONS	**3. Commencement satellite imagery acquisition (for Level 2 / 3 spills)** Responsible Person: IMT (Planning)			

ACTION PLAN: MONITOR AND EVALUATE				
	Provision of satellite imagery to the IMT Mobilise KSAT (through AMOSC) to produce daily satellite images	1. IMT (Planning) to notify AMOSC Duty Officer to request initiation of satellite services via KSAT (OSRL subscription available as a secondary option) 2. IMT (Planning) to combine satellite data with optical imagery (e.g. aerial surveillance, vessel-based observations) to mitigate issues these optical imagery results may present with angle of insolation, thick cloud cover and night **Ongoing Response Actions** 3. Request satellite imagery be provided daily throughout the duration of the response and integrate data into COP. Receipt of all daily imagery is to be captured in the incident log.	AMOSC Activation to be completed Contract note executed Mobilisation of AMOSC resources needs to be coordinated across all response strategies where support is required. **Deliverables** Daily satellite images	Within 6 hours of spill notification Satellite data imagery will depend on satellite availability and location in orbit Repeat as required
4. Oil spill trajectory modelling (OSTM) Responsible Person: IMT (Planning)				
INITIAL RESPONSE ACTIONS	**Provision of OSTM to the IMT** Mobilise RPS to produce three day forecast model outputs.	1. IMT (Plan) to contact RPS and arrange for oil spill trajectory modelling to be provided. Will require completion of the RPS spill modelling request form 2. IMT (Plan) update incident log with request for OSTM and estimated time of delivery. 3. Provide RPS with data from aerial surveillance so that they can verify and adjust fate predictions of the spill and improve predictive accuracy. **Ongoing Response Actions** 4. IMT (Plan) to request ongoing OSTM to be provided on a daily basis. To ensure that COP is updated when provided. Receipt of all daily OSTM is to be captured in the incident log.	**Forms and Guidance** RPS trajectory modelling request form Email: Response@apasa.com.au Mobile: 0407 477 196 **Deliverables** OSTM three day forecast outputs daily	Within 24 hours of spill notification OSTM to commence within approximately two hours of request submission Repeat as required
5. Vessel surveillance Responsible Person: OIM or IMT (Operations & Logistics)				

ACTION PLAN: MONITOR AND EVALUATE				
INITIAL RESPONSE ACTIONS	**Mobilisation of vessels to conduct surveillance** Source and mobilise available vessels to commence surveillance of the spill	1. IMT (Ops & Log) to source available vessels to commence surveillance of the spill a) Contracted vessels b) Vessels of opportunity 2. IMT to liaise with OIM with respect to vessels operating in and around the facility 3. Vessels to be tasked to gather the following information about the spill: a) Location (latitude and longitude); b) Size and volume; c) Direction of movement; d) Visual appearance of the slick (colours, emulsification etc); e) Associated weather conditions in vicinity of the spill (wind speed/direction, sea state, swell); f) Any marine fauna or other activities observed; and g) Photographic images. 4. Vessel Master to provide information back to the IMT within 60 mins of completing surveillance: a) Complete Vessel Surveillance Observation Log b) Email completed logs to the IC within an hour of completion. Include photographs and GPS data where available.	**Deliverables** Completed Vessel Surveillance Observation Log and Marine Fauna Sighting Record Sheet (refer Appendix A1) Photographs / video footage	Within 24 hours of spill notification
6. Fluorometry Responsible Person: IMT (Planning & Logistics)				
	Mobilise fluorometry via Jacobs Environmental and CSIRO	1. IMT (Plan) to contact Jacobs Environmental and activate services. To confirm what logistical requirements will be required to support. 2. IMT (Logistics) to discuss with Planning requirements. Action as required.	**Personnel and equipment** 1 x person trained to interpret data 5 x fluorometers **Logistics**	Within 7 days of spill notification

ACTION PLAN: MONITOR AND EVALUATE				
		3. IMT (Plan) discuss need for additional fluorometers (multiple towed fluorometers are available from CSIRO)	Specific requirements to be discussed and confirmed with CSIRO	
7. Shoreline and Coastal Habitat Assessment Responsible Person: IMT (Planning & Logistics)				
	Mobilisation of personnel to conduct Shoreline and Coastal Habitat Assessment Surveys Source and mobilise available personnel and equipment to commence shoreline and coastal habitat assessment	1. IMT (Log) to contact AMOSC and OSRL to confirm availability of personnel to conduct assessment surveys in priority locations 2. IMT (Plan or Ops) to contact vessel and equipment providers to support assessment surveys 3. IMT (Ops) to arrange all safety requirements for shoreline assessment survey deployment. Capture in incident log. 4. IMT (Plan) to identify priority locations to deploy shoreline assessment survey teams by consulting the NEBA (e.g. location of priority receptors, seasonal presence) and existing operational monitoring data that will help confirm locations that will be/have been contacted by hydrocarbons. 5. IMT (Ops) to mobilise Survey Teams to commence assessment surveys prior to shoreline contact to obtain pre-contact data, where possible 6. IMT (Ops) to monitor assessment survey operations ensuring that the IMT are briefed regularly. Once initial surveys are complete ensure that all relevant information is provided back to the IMT so that it can be assessed, included into the COP and further surveys determined. 7. All information should be entered into a Shoreline and Coastal Habitat Assessment Survey Form (refer Appendix A3) which will be sent to the IMT within two hours of the Survey Team returning to its operating base. **Ongoing Response Actions** IMT (Plan) to arrange for ongoing Shoreline and Coastal Habitat Assessment Surveys for priority locations to be	**Equipment** Vessels Aircraft All-terrain vehicles **Personnel** Trained Personnel (sourced from AMOSC and/or OSRL) **Forms and Guidance** Shoreline and Coastal Habitat Assessment Survey Form (refer Appendix A3) **Deliverables** Completed Shoreline and Coastal Habitat Assessment Survey Form Photographs / video footage	Commence deployment of SCAT Teams within 48 hours of becoming aware of impacts to state / territory waters

ACTION PLAN: MONITOR AND EVALUATE				
		provided on a daily basis. To ensure that COP is updated when provided. Receipt of all daily Survey Forms are to be captured in the Incident Log.		

16.7 Surface Chemical Dispersant Action Plan

ACTION PLAN: DISPERSANT APPLICATION			
Task		**Resources**	**Timeframe**
NOTE: WA DoT must approve of dispersant application prior to commencement in WA state waters. Also notify WA DoT if any dispersant applied in Commonwealth waters are likely to enter WA waters.			
Task	**Actions**	**Resources**	**Timeframe**
1. **Mobilise dispersant resources** Responsible Person: IMT (Logistics and Operations)			
Aim: To mobilise equipment and resources in support of dispersant operations into Darwin			
INITIAL RESPONSE ACTIONS **Conduct NEBA**	Conduct operational NEBA to determine if dispersant application is likely to result in a net environmental benefit. **Ongoing Actions** Daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to apply dispersants and consideration of application rates and dispersant effectiveness.	Operational NEBA form Environment Unit Lead	Within 2 hours of spill notification

ACTION PLAN: DISPERSANT APPLICATION				
Task			**Resources**	**Timeframe**
INITIAL RESPONSE ACTIONS	**Mobilise resources to support dispersant operations** Commence mobilisation of ALL required resources to Darwin to support vessel/aerial dispersant operations	AMOSC Resources 1. Contact AMOSC Duty Officer (once notification/activation has been completed) and discuss the following support: a) Access to and mobilisation of ALL AMOSC dispersant stocks and associated equipment into Darwin (AMOSC will arrange through their contracted transport provider); b) Activation of the Fixed Wing Aerial Dispersant Capability (FWADC) from AMSA (AMOSC will activate this on behalf of JSE); and c) Provision of trained spill responders to support operations (AMOSC Staff and Core Group). 2. Ensure that all actions/details are captured in the Resource tracking and Incident log 3. Ensure wider IMT are briefed on actions **Ongoing Response Actions** Following initial activation/mobilisation of support as detail above: 2. Contact AMOSC Duty officer and request update on all requested actions. 3. Ensure that ALL logs are updated based on revised information 4. See "Commence vessel dispersant operations" below for ongoing operational guidance	AMOSC Activation to be completed Contract note executed Mobilisation of resources needs to be coordinated across all **PRIMARY** response strategies where support is required. Dispersant Stocks – Refer to Table 10-2	Within 4 hours of spill notification

ACTION PLAN: DISPERSANT APPLICATION				
Task			**Resources**	**Timeframe**
INITIAL RESPONSE ACTIONS		AMSA Resources 1. Contact AMSA and request mobilisation of dispersant stocks from ALL locations into Darwin (will likely require JSE to make transport arrangements) 2. Request AMSA assistance with mobilisation of Air Attack Supervisors into Darwin (JSE to arrange logistical support if required) 3. Ensure that all actions/details are captured in the Resource tracking and Incident log 4. Ensure wider IMT are briefed on actions **Ongoing Response Actions** Following initial activation/mobilisation of support as detail above: 5. Contact AMOSC Duty officer and request update on all requested actions. 6. Ensure that ALL logs are updated based on revised information	AMSA Initial notification to be competed FWADC JSOP (Air Ops Plan Template) Mobilisation of AMSA resources needs to be coordinated across all **PRIMARY** response strategies where support is required **Dispersant Stocks** – Refer to Table 10-2	Within 4 hours of spill notification
		OSRL Resources 1. Contact OSRL Duty Manager to commence mobilisation of the following support: a) Dispersant stocks (as per SLA and GDS) into Darwin b) Hercules aircraft into Australia (Darwin) c) Boeing 727 aircraft into Australia (Darwin) 2. Ensure that all actions/details are captured in the Resource tracking and Incident log 3. Ensure wider IMT are briefed on actions **Ongoing Response Actions** Following initial activation/mobilisation of support as detail above: 4. Contact AMOSC Duty officer and request update on all requested actions. 5. Ensure that ALL logs are updated based on revised information	OSRL Activation to be competed Contract requirements complete Mobilisation of OSRL resources needs to be coordinated across all **PRIMARY** response strategies where support is required	Within 4 hours of spill notification

ACTION PLAN: DISPERSANT APPLICATION				
Task			**Resources**	**Timeframe**
INITIAL RESPONSE ACTIONS	**Mobilise vessels and aircraft to support dispersant operations**	Aerial dispersant mobilisation 1. Activate Air Operations Plan (in accordance with JSOP) based on commencing aerial dispersant operations on Day 3 2. Confirm progress of FWADC activation from AMSA following activation by AMOSC (via AMOSC or AMSA) 3. Contact Air North to arrange for fixed wing aircraft to support aerial dispersant operations from Day 3 **Note:** Air North will provide two fixed wing aircraft to support operations: - Aerial surveillance flights (commencing Day 2); and - Aerial dispersant operations (commencing Day 3).	**FWADC JSOP** – primary reference **Air North – Base operations**	Within 4 hours of spill notification
		Vessel dispersant mobilisation IMT (Ops) to complete following actions: 1. Contact ISV - confirm location and ETA to spill location (maximum timeframe is 36 hours if alongside Darwin) a) If alongside, PR is to be directed to sail and head directly to spill location (confirm with IMT Leader) b) To test and prepare dispersant application system enroute c) Tasking to be provided to PR prior to arriving on location 2. Liaise with IMT (Log) to commence sourcing of additional vessels into Darwin to support dispersant operations. **Ongoing Response Actions** 4. Arrange for vessels to be loaded with equipment, dispersant and trained spill responders from AMOSC/AMSA once alongside Darwin. 5. All vessels to be designated with operational zones to conduct dispersant operations 6. Aerial surveillance sorties to provide vessels with updated locations for spills within operational zones.	**Dispersant Stocks** – Refer to Table 10-2 See Commence Vessel Dispersant Operations below **Incident Action Plan (IAP)** – to detail tasking for vessel dispersant operations	Within 2 hours of spill notification Within 24-48 hours of spill notification

ACTION PLAN: DISPERSANT APPLICATION				
Task			**Resources**	**Timeframe**
Ongoing Actions	**Activate Darwin logistic support arrangements**	Logistics Yard (Darwin) activation 1. Contact Logistics Yard (Darwin) and stand-up staff/facilities to support resource mobilisation. Provide relevant information regarding estimated arrival times/dates into Darwin once confirmed with service providers 2. Confirm all arrangements with respect to loading equipment/dispersant and embarking spill response personnel aboard vessels alongside Darwin. **Note**: ALL other response equipment required will be coordinated from the Logistics Yard (Darwin) throughout the response.	**Logistics Yard (Darwin)**	Within 6 hours of spill notification

2. Commence vessel dispersant operations

Responsible Person: IMT (Operations and Logistics)

Ongoing Actions	**Conduct of vessel dispersant operations** Following initial activation/mobilisation of required resources ongoing operations are to be commenced in support of the response	Vessel dispersant operations commencement 1. Support vessel (ISV) - If not already on station conducting dispersant operations vessel tasking is to be included in IAP for Day 2 2. Confirm build-up of dispersant stocks at Toll Yard in accordance with the Dispersant Mobilisation Plan. 3. Coordinate arrival and availability of vessels as they arrive in Darwin in accordance with Dispersant Mobilisation Plan. 4. Arrange and coordinate transport arrangements to mobilise dispersant and equipment to Darwin port 5. Ensure additional dispersant vessels (once operationally ready) become available from Darwin are to be included in the IAP for each operational period. **Note**: Clear guidance to be provided in IAP with respect to: 6. Vessel will be "operationally ready" once dispersant/equipment loaded and trained spill responders are embarked. 7. Focus on application to windrows / spots of surface slick which threaten priority environmental sensitivities. 8. Conduct of visual monitoring to assess effectiveness 9. Completion of dispersant application logs 10. Daily reporting back to IMT on conduct of operations	**Incident Action Plan (IAP)** – Task Assignment to be developed and disseminated in order to commence vessel dispersant operations **Dispersant Stocks** – Refer to Table 10-2	Ongoing from next Operational Period
3. Commence aerial dispersant application Responsible Person: IMT (Operations and Logistics)				

Ongoing Actions	**Conduct of aerial dispersant operations** Following initial activation/mobilisation of required resources ongoing operations are to be conducted in support of the response	Aerial dispersant operations commencement 1. Confirm status of air operations plan implementation in consultation with AMSA. 2. Confirm build-up of dispersant stocks at Toll Yard in accordance with the Dispersant Mobilisation Plan. 3. Coordinate arrival and availability of additional aircraft as they arrive in Darwin in accordance with Dispersant Mobilisation Plan. 4. Arrange and coordinate transport services to mobilise dispersant to Darwin airport 5. Support development of flight schedule (see Monitor & Evaluation Action Plan) to ensure inclusion of aerial dispersant operations and deconfliction from other planned operations (operational zones allocated). 6. Support ongoing coordination of aviation operations as response continues. **Note**: Clear guidance to be provided in IAP with respect to: - Focus on application to windrows / spots of surface slick which threaten priority environmental sensitivities. - Conduct of visual monitoring to assess effectiveness after sorties - Completion of dispersant application logs - Daily reporting back to IMT on conduct of operations	**Air Ops Plan** – to be implemented for Darwin **Incident Action Plan (IAP)** – Task Assignment to be developed and disseminated to commence vessel dispersant operations **Daily Flight Schedule** – for all aviation operations **Dispersant Stocks** – Refer to Table 10-2	Ongoing from Day 3 Operational Period

16.8 Containment and Recovery Action Plan

ACTION PLAN: CONTAINMENT AND RECOVERY				
Task		**Actions**	**Resources**	**Timeframe**
1. Mobilise containment and recovery resources Responsible Person: IMT (Logistics and Operations)				
Aim: To mobilise equipment and resources to Darwin in support of containment and recovery (C&R) operations				
INITIAL RESPONSE ACTIONS	**Mobilise containment and recovery resources** IMT to commence mobilisation of C&R resources into Darwin	1. Contact Darwin Supply Base and arrange for mobilisation of C&R equipment to Darwin port. <u>AMOSC/AMSA Resources</u> 2. Liaise with AMOSC / AMSA to commence mobilisation of containment and recovery equipment and personnel into Darwin. 3. Ensure each vessel has a minimum of two trained personnel onboard who are responsible for controlling operations, ensuring they are implemented safely and effectively **Note:** Ensure ALL equipment mobilisation is coordinated noting need for AMOSC/AMSA equipment in support of other response strategies 4. Commence mobilisation of vessels to support C&R operations into Darwin. a) Mermaid, Swire, Bhagwan Marine, Farstad, GO, Maersk and Siem will provide vessels under current Master Service Agreement (MSA) b) Additional vessels to be sourced through JSE approved broker (Clarksons) 5. Coordinate and activate arrangements to support loading and embarkation of equipment/personnel from Darwin port 6. Ensure that all actions/details are captured in the <u>Resource tracking</u> and <u>Incident</u> log 7. Ensure wider IMT are briefed on actions	**Equipment** Vessels Booms, skimmers, ancillary equipment **Personnel** Trained Personnel (sourced from AMOSC, AMSA and/or OSRL) – 2 per vessel **Forms and Guidance** Vessel Mobilisation Guide – to be used to support sourcing of vessels into Darwin	Commence mobilisation within 12 hours of spill notification

ONGOING RESPONSE OPERATIONS	**Commence containment and recovery operations** Following initial activation/mobilisation of required resources ongoing operations are to be commenced in support of the response	Containment and Recovery operations commencement IMT (Log): 1. Confirm build-up of C&R resources in Darwin (Toll Yard and Port). 2. Coordinate arrival and availability of vessels in Darwin. 3. Arrange and coordinate transport arrangements to mobilise equipment and personnel to Darwin port IMT (Ops and Plan) 4. Ensure additional vessels (once operationally ready) become available from Darwin are included in the IAP for each operational period. 5. Coordinate operational surveillance support to vessels to ensure they are being directed to priority locations 6. Assess daily operational surveillance information to drive future operational guidance 7. Coordinate vessel operations to support management of oily/water waste recovered by vessels 8. Support development and promulgation of the IAP to meet operational requirements 9. Coordinate daily operations in support of ongoing response. 10. Ensure that all actions/details are captured in the Resource tracking and Incident log 11. Ensure wider IMT are briefed on actions on a daily basis **Note**: Clear guidance to be provided in IAP with respect to: - Vessel movements to/from port as required to assist with resupply/waste management/operational maintenance - Vessel will be "operationally ready" once equipment loaded and trained spill responders are embarked. - Operations to be conducted in operational zones beyond dispersant operations and in areas which threaten priority environmental sensitivities. - Daily reporting requirements back to IMT on conduct of operations and operational status	**Equipment** Vessels Booms, skimmers, ancillary equipment **Personnel** Trained Personnel (sourced from AMOSC, AMSA and/or OSRL) – 2 per vessel **Incident Action Plan (IAP)** – Task Assignment to be developed and disseminated in order to commence containment and recovery operations	Ongoing from Day 2 operational period

ACTION PLAN: CONTAINMENT AND RECOVERY				
Task		**Actions**	**Resources**	**Timeframe**
	Manage waste from containment and recovery operations	IMT to assess viability of following options: 1. Option 1 (Preferred option): Subject to approvals from the relevant Jurisdictional Authority (refer to Section 11.2.3) and weather permitting, decant oil from water in tanks onboard the recovery vessels and discharge the water component overboard within the apex of the containment booms. 2. Option 2: Transfer oily-water waste to slops tanks onboard the Montara Operations FPSO, Stag Facility or other recovery vessels for treatment with their certified oil in water separators. 3. Option 3: Collect oily waste water (not decanted) into recovery vessels and transfer to mainland for treatment and disposal by a licensed contractor. **Note**: Environmental approvals must be obtained prior to liquid waste discharge to the environment. Records are to be retained of volumes discharged. 4. Manage solid waste generated: a. Can be temporarily stored on-board the support vessel or facility for transfer to mainland for disposal by a licensed contractor.	**Waste Management Plan** **IMT support** – to be provided by Toxfree **Waste Management** – controlled waste tracking to be managed throughout	Ongoing from Day 2 operational period

16.9 Protection and Deflection Action Plan

ACTION PLAN: PROTECTION AND DEFLECTION				
Task		**Actions**	**Resources**	**Timeframe**
1. Engage with relevant stakeholders and develop plan to conduct protection and deflection operations Responsible Person: IMT (Planning)				
ONGOING RESPONSE ACTIONS	**Commence stakeholder engagement**	1. Notify WA DoT / NT DNER if there are likely to be any impacts on state / territory waters. Refer to IMTRP for detail on regulatory notifications. a) All protection and deflection activities will be conducted within state / territory waters (includes waters around islands) and accordingly fall under the remit of WA DoT's IMT or NT DIPL's IMT and associated IAP's.	**Personnel** WA DoT IMT / NT DIPL IMT **Forms and Guidance** WA DoT Offshore Petroleum Industry Guidance Note - Marine Oil Pollution: Response and Consultation Arrangements (December 2017)	Within 2 hours of becoming aware of potential impacts to state / territory waters
NOTE: All protection and deflection activities in the following steps are indicative only – at the direction of the state / territory IMT who will be the Control Agency for the spill in State /Territory waters				
	Conduct SCAT	2. Conduct an initial shoreline assessment (ie SCAT) (ground / aerial survey depending on access):	Refer to Section 9.5 for detail.	Commence deployment of SCAT Teams within 48 hours of becoming aware of impacts to state / territory waters
	Conduct NEBA	3.Using the latest results of operational monitoring activities, conduct operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit. **Ongoing Actions** Daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct protection and deflection activities	Operational NEBA form Environment Unit Lead	Conduct within 2 hours of becoming aware of potential impacts to state / territory waters

	Develop Protection & Deflection Plan	3. If NEBA indicates that there is an overall environmental benefit, develop a Protection and Deflection Plan to include the following data: a) Priority near-shore and shoreline areas for protection (liaise with HMA for direction on locations and consult latest operational monitoring data, including SCAT surveys); b) Locations to deploy protection and deflection equipment; c) Method of deployment for each location i.e., exclusion, diversion, river, shore-line sealing booing etc) d) List of resources (personnel and equipment) required; e) Timeframes to undertake deployment; f) Access / egress locations from land or sea; g) Frequency of boom inspections and maintenance (noting tidal cycles).	**Personnel** Environmental Advisor / AMOSC to assist with state / territory IMT with development of Protection and Deflection Plan **Deliverables** Protection and Deflection Plan	Develop a plan, if required, within 12 hours of NEBA confirming an overall environmental benefit
		4. Obtain approvals to access the following areas if response activities are required within: a) World Heritage Areas (from DoEE); b) Commonwealth reserves including AMPs (from DoEE / DNP); c) State/Territory reserves (from WA DBCA / NT DNER); d) Aboriginal heritage areas (from WA DAA / NT APAA); and e) International waters (from DFAT). 5. Refer IMTRP Arrangements for regulatory notification and reporting requirements.	**Deliverables** Copy of access approvals	Within 3 days of spill or 48 hours prior to estimated contact with shoreline environment
2. Mobilise protection and deflection resources Responsible Person: IMT (Logistics and Operations)				

	Mobilisation of resources to support operations	1. Commence mobilising protection and deflection equipment in readiness for potential use.	**Equipment** Booming systems Sorbent materials PPE	Commence mobilising within 48 hours of spill notification Commence receiving AMOSC / AMSA equipment within 96 hours
		2. Mobilise support vessels with capabilities to deploy protection and deflection teams and equipment to remote locations via: a) Vessel deployment; and b) Land-side deployment.	**Equipment** <u>Vessels:</u> Flat bottomed or vessels with tenders Capable of accommodating vessel crew plus 12 additional personnel and equipment Capable of deploying booms in waterways and shallow seas **Personnel** <u>Per vessel:</u> Vessel crew 2 x Trained operator / Team Leader(s) (AMOSC, AMSA, OSRL) 5 x Labourers	Onsite within 6 days of spill or Onsite 24 hours prior to estimated contact with near-shore and shoreline environments
3. Commence protection and deflection operations Responsible Person: IMT (Operations)				

	Conduct Protection and Deflection operations	1. Deploy protection and deflection equipment as per the IAP 2. Nominated Shoreline Response Team Leader to report back on effectiveness to IMT Leader	**Equipment** Booming systems Sorbent materials PPE Vessels **Personnel** Per vessel: Vessel crew 2 x Trained operator / Team Leader(s) (AMOSC, AMSA, OSRL) 5 x Labourers **Deliverables** Records of equipment used and personnel employed	Onsite 24 hours prior to estimated contact with near-shore and shoreline environments

16.10 Shoreline Clean-up Action Plan

ACTION PLAN: SHORELINE CLEAN-UP				
Task		**Actions**	**Resources**	**Timeframe**
1. Engage with relevant stakeholders and develop plan to conduct shoreline clean-up if appropriate Responsible Person: IMT (Planning)				
ONGOING RESPONSE ACTIONS	**Commence stakeholder engagement**	1. Notify WA DoT / NT DNER if there are likely to be any impacts on state / territory shorelines. Refer to IMTRP for detail on regulatory notifications. a) All shoreline clean-up operations will be conducted within state / territory waters (includes waters around islands) and accordingly fall under the remit of WA DoT's IMT or NT DIPL's IMT and associated IAP's. Refer to IMTRP for further information on cross jurisdictional arrangements.	**Personnel** WA DoT IMT / NT DIPL IMT **Forms and Guidance** WA DoT Offshore Petroleum Industry Guidance Note - Marine Oil Pollution: Response and Consultation Arrangements (December 2017)	Within 2 hours of becoming aware of potential contact to state / territory waters

NOTE: All shoreline clean-up operations in the following steps are indicative only – at the direction of the State / Territory IMT who will be the Control Agency for the spill in State /Territory waters				
	Conduct shoreline assessment	2. Conduct an initial shoreline assessment (ie SCAT) (ground / aerial survey depending on access):	Refer to Section 13.	Commence deployment of SCAT Teams within 48 hours of becoming aware of impacts to state / territory waters
	Conduct NEBA	3. Using the latest results of operational monitoring activities, conduct operational NEBA to determine if shoreline clean-up is likely to result in a net environmental benefit. **Ongoing Actions** 4. Daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct shoreline clean-up activities	Operational NEBA form Environment Unit Lead	Conduct within 2 hours of becoming aware of potential impacts to state / territory waters
	Develop Shoreline Clean-up plan	5. If NEBA indicates that there is an overall environmental benefit develop a Shoreline Clean-up Plan to include the following data: a) Priority near-shore and shoreline areas for protection (liaise with HMA for direction on locations and consult latest operational monitoring data, including SCAT surveys); b) Locations to deploy shoreline clean-up personnel equipment; c) Method of deployment for each location ie, exclusion, diversion, river, shore-line sealing booing etc) d) List of resources (personnel and equipment) required; e) Timeframes to undertake deployment; f) Health and Safety constraints; g) Access / egress locations from land or sea; and h) Waste management.	**Personnel** Environmental Advisor / AMOSC to assist with state / territory IMT with development of Shoreline Clean-up Plan **Deliverables** Shoreline Clean-up Plan	Develop a plan, if required, within 12 hours of NEBA confirming an overall environmental benefit

		6. Obtain approvals to access the following areas if response activities are required within: a) World Heritage Areas (from DoEE); b) Commonwealth reserves including AMPs (from DoEE / DNP); c) State reserves (from WA DBCA / NT DNER); d) Aboriginal heritage areas (from WA DAA / NT APAA); and e) International waters (from DFAT). 7. Refer OSR Arrangements for regulatory notification and reporting requirements.	**Deliverables** Copy of access approvals	Within 3 days of spill or 48 hours prior to estimated contact with shoreline environment
2. Mobilise shoreline clean-up resources Responsible Person: IMT (Logistics and Operations)				
	Mobilisation of all required resources	1. Commence mobilising shoreline clean-up equipment in readiness for potential use.	**Equipment** Manual equipment (ie shovels, rakes, buckets, wheelbarrows etc) Mechanical equipment (ie tiller, skid steer etc) Sorbent materials Decontamination kit Access vehicles (if required) (ie quad bikes, 4WD's etc) Personnel facilities (ie PPE, food, water, temporary accommodation, communications network, amenities etc) Waste storage (ie portable tanks, IBC's, plastic bags, skip bins etc) and transport **Forms and Guidance** Shoreline Clean-up Plan	Commence mobilising within 48 hours of spill Onsite within 7 days of spill notification or 24 hours prior to shoreline contact

		2. Commence mobilising shoreline clean-up teams: a) Clean-up teams to consist of 10 responders, including one trained Shoreline Responder to act as Team Lead 3. Contact labour hire agencies in Darwin to source labour hire personnel.	**Personnel** Trained Shoreline Responder Team Leads (one per team) Labourers (9 per team) **Forms and Guidance** Shoreline Clean-up Plan	Specialists: Onsite within 6 days of spill notification or 24 hours prior to shoreline contact Labour hire: Notified of spill within 24 hours of spill notification
		4. Mobilise vessels with capabilities to deploy shoreline clean-up teams and equipment to remote locations.	**Equipment** <u>Vessels:</u> Flat bottomed or vessels with tenders Capable of accommodating vessel crew plus a minimum of 10 additional personnel and equipment **Personnel** Vessel crew Clean-up team as stated above **Forms and Guidance** Shoreline Clean-up Plan	Onsite within 6 days of spill notification or Onsite 24 hours prior to estimated contact with shoreline environments

3. Coordinate shoreline monitoring Responsible Person: IMT (Operations)				
	Prepare to commence Shoreline Clean-up operations	1. Undertake shoreline assessment (SCAT) ground / aerial survey (depending on access) and sampling as per AMSA / ITOPF / NOAA guidelines (included in Key References above): a) Undertake pre-impact survey to obtain baseline information. b) Undertake post-impact survey to confirm: i. Levels of oil stranding; ii. Actual impacts to environmental sensitivities; iii. Priorities for clean-up; iv. Resources required to implement a clean-up operation; v. Appropriate cleaning methods according to shoreline conditions and oil loading, ie: 1. Natural recovery with monitoring; 2. Beach pre-cleaning; 3. Low pressure flushing; 4. Manual oil/sediment removal; and 5. Vacuum pumping. vi. Safe access locations. 2. Update IAP as appropriate. 3. Undertake routine surveys during shoreline clean-up operation to assess effectiveness of response.	**Equipment** Camera GPS Spades Tape measures Sampling equipment Vehicles (as required) Aerial survey equipment (e.g. Unmanned Aerial Vehicles (UAVs)) **Personnel** Trained Shoreline Responder Team Leads (one per team) Labourers (9 per team) **Forms / Guidance** Shoreline Assessment Ground Survey Shoreline Assessment Guideline – Ground Surveys AMSA / ITOPF / NOAA guidelines and forms (included in Key References above) Shoreline Clean-up Methods table (below) **Deliverables** Shoreline assessment survey reports Lab reports	Pre-impact survey prior to shoreline contact (where possible) Post-impact survey within 24 hours of shoreline contact Routine surveys as appropriate during response (ie weekly)

4. Set up shoreline clean-up operations Responsible Person: IMT (Operations)				
	Complete preparations for Shoreline Clean-up operations	1. Establish base: a) Set up shelter, communications, amenities, food, water etc; b) Organise equipment and PPE; c) Deliver inductions and training to all personnel as appropriate; d) Define pathways for access / egress to minimise damage to the environment.	**Equipment** As per Shoreline Clean-up Plan **Personnel** Shoreline clean-up assessment team Government specialists Labour hire **Forms and Guidance** Shoreline Clean-up Plan **Deliverables** Induction records	Onsite within 6 days of spill, or 24 hours prior to shoreline contact (where possible)
5. Commence shoreline clean-up operations Responsible Person: IMT (Operations)				
	Implement plan and conduct Shoreline Clean-up operations	1. Commence shoreline clean-up activities as per the IAP ensuring that the following will occur: a) Adequate supervision of teams; b) Minimise damage to flora and fauna; c) Schedule oil removal activities for cooler times of the day when it is more solid / waxy to minimise the amount of waste that is generated; d) Site is set up suitably to minimise secondary contamination; and e) Correct waste management is implemented.	**Personnel** Shoreline clean-up team leaders and crews WA DoT specialists / NT DENR specialists Labour hire	Commence within 7 days of spill, or within 24 hours after shoreline contact

		2. Monitor the following parameters during implementation to assess effectiveness: a) Ongoing shoreline monitoring; b) Ongoing availability on sufficient resources (personnel and equipment); and c) Waste management (ie predicted volumes, minimisation, temporary storage, transport and waste disposal). d) Report back on effectiveness to IMT Leader.	**Deliverables** Progress reports Records of equipment used and personnel employed Records of waste generated Waste disposal receipts	Ongoing until termination of response

16.11 Oiled Wildlife Plan

ACTION PLAN: OILED WILDLIFE RESPONSE				
Task		**Actions**	**Resources**	**Timeframe**
1. Make regulatory notifications and activate the Oiled Wildlife Response Division Responsible Person: IMT (Planning)				
INITIAL RESPONSE ACTIONS	**Complete initial notifications**	Notify WA DBCA / NT EPA / DoEE if there are likely to be any impacts on wildlife.	**Forms and Guidance** Refer to OSR Arrangements for detail on regulatory notifications	<2 hours of becoming aware of potential impacts to wildlife
	Activate OWR capability	1. Activate the oiled wildlife response sub-division within the Operations Division with the support of the IMT Leader: a) IMT Operations Co-ordinator to appoint a JSE Oiled Wildlife Advisor (OWA) to be part of the EMT. b) Government resources: i. WA jurisdiction: WA DBCA will appoint a WA DBCA OWA to be embedded within the WA DoT IMT to assist the JSE OWA. ii. NT jurisdiction: JSE IMT OWA to liaise with NT DENR Oiled Wildlife Co-ordinator (OWC). iii. Commonwealth jurisdiction: DoEE rely on support from respective state / territory statutory authority. 2. Refer to OSR Arrangements for further information on cross jurisdictional arrangements. 3. Refer to Appendix A in the WA OWRP for a description of roles and responsibilities for all positions in the OWR division.	**Personnel** OWA from PTTEP AA staff or AMOSC WA DBCA OWA (if in WA State waters) NT NRETAS **Forms and Guidance** WA OWRP NT OWRP Kimberley OWRP (in draft)	<2 hours of becoming aware of potential impacts to wildlife

ACTION PLAN: OILED WILDLIFE RESPONSE				
Task		**Actions**	**Resources**	**Timeframe**
ONGOING RESPONSE ACTIONS	**Assess potential impact of OWR operations**	1. Conduct a NEBA based on available information to determine if there is an overall environmental benefit in conducting oiled wildlife response activities. This will depend on the following: a) Conservation status of fauna likely to be affected; b) Relevant EPBC Management Plans and specific protection measures for wildlife protected under Part 3 of the EPBC Act, including their habitat; c) Number of wildlife likely to be affected; d) Estimated success of oiled wildlife response activities; and e) Regulator and community expectations.	**Personnel** OWAs to assist with NEBA **Forms and Guidance** NEBA template WA OWRP NT Emergency Plan Wildlife reconnaissance data **Deliverables** NEBA report	Conduct NEBA within 24 hours of risk being identified Ongoing every 24 hours thereafter or as required
	Establish OWR structure within IMT	1. If NEBA determines that there is an overall benefit to activating an oiled wildlife response, OWA(s) to assign a Wildlife Division Co-ordinator to establish an appropriately sized OWR division within the IMT: a) Refer to Oiled Wildlife Command Structure b) Consult with OWA on State/Territory protection priorities c) Refer to Table 7 in the WA OWRP for indicative wildlife response personnel resourcing. d) Refer to Table 9 in the WA OWRP for personnel numbers available to respond to the various oiled wildlife response levels from WA DBCA and AMOSC. e) Refer to Attachment A in the WA OWRP for a description of roles and responsibilities for all positions in the OWR Division. **Note:** the NT OWC may establish a NT Wildlife Unit with support from JSE's OWA. The command structure and functions will be similar to that detailed in the WA OWRP.	**Personnel** Wildlife Division Co-ordinator (WA) Wildlife Division Personnel (WA) Wildlife Unit (NT) **Forms and Guidance** WA OWRP NT Oil Spill Contingency Plan	Within 24 hours of risk being identified

2. Wildlife first strike response Responsible Person: Oiled Wildlife Advisor with assistance from Wildlife Division Co-ordinator				
	Stand up OWR capability	1. Refer to Section 4.1 of the WA/NT OWRP: a) Assess the situation; b) Determine the potential response level (refer to Table 6 Indicative Oiled Wildlife Response Levels in the WA OWRP); c) Determine resources required and available; and d) Mobilise first strike OWR kits.	**Equipment** First strike OWR kits **Forms and Guidance** WA/NT OWRP	Commence within 48 hours of risk being identified Onsite / infield within 7 days of risk being identified
3. Mobilisation of wildlife resources Responsible Person: Wildlife Division Co-ordinator / Wildlife Logistics Co-ordinator				
	Mobilisation of required resources to support OWR operations	1. Refer to Section 4.2 of the WA OWRP: a) Mobilise key personnel within the OWR Division: b) Wildlife Planning Officer to lead planning the OWR response. c) Wildlife Operations Officer to lead the mobilisation of operational resources on site where oiled wildlife is present. d) Wildlife Logistics Officer to mobilise equipment as appropriate for the scale of incident 2. Refer to WA OWRP Section 7 for indications of resources needed for each stage of the OWR.	**Equipment** WA ORWP **Personnel** Wildlife Planning Officer Wildlife Operations Officer Wildlife Logistics Officer **Forms and Guidance** WA OWRP	Mobilise key personnel and commence mobilising equipment within 48 hours of risk being identified

4. Coordinate wildlife reconnaissance Responsible Person: Wildlife Operations and Planning Officer				
	Conduct ALL preparations in support of OWR operations	1. Refer to Section 4.3 of the WA OWRP: a) Wildlife Operations Officer to oversee the Wildlife Reconnaissance Unit and determine the best means for monitoring fauna (via plan, vessel or shoreline survey). b) Wildlife Planning Officer to create a geo-plot of all known wildlife communities in the local area that may be affected. 2. The shoreline clean-up assessment team may be able to have a dual function as the wildlife reconnaissance team.	**Equipment** General: Handheld GPS unit / Digital Camera Binoculars / Spotting scope Field notebook and pencil Geo-plot output including animal communities at risk. Transport: Quad motorbikes or 4wd vehicles Small vessels (less than 12m length) Aerial support (fixed wing or helicopter) **Personnel** Wildlife Reconnaissance Unit **Forms and Guidance** WA OWRP **Deliverables** Survey logs	Commence within 7 days of risk being identified
5. Develop IAP subplan for oiled wildlife response Responsible Person: Wildlife Planning Officer with assistance from Wildlife Division Coordinator				
	Incident action planning to support OWR operations	1. Refer to Section 4.4 of the WA OWRP: a) Based on information from wildlife reconnaissance develop the IAP oiled wildlife response sub-plan including information on: i. Wildlife priorities for protection from oiling; ii. Deterrence measures; iii. Recovery and treatment of oiled wildlife; and iv. Resourcing of equipment and personnel. v.	**Personnel** • Wildlife Division Co-ordinator **Forms and Guidance** • WA OWRP **Deliverables** IAP	Within 24 hours of wildlife reconnaissance confirming potential or realised impacts to wildlife

6. Wildlife rescuing and staging Responsible Person: Wildlife Operations Officer and Wildlife Logistics Officer				
		1. Refer to Section 4.5 of the WA OWRP: a) Wildlife Operations Officer to oversee the Wildlife Rescue and Wildlife Staging / Holding Units to undertake the following: i. Pre-emptive capture (refer to Appendix H in WA OWRP) ii. Hazing; and iii. Oiled wildlife rescue, transport and staging (refer to Appendix B, C and D in the WA OWRP). 2. Any deterrence / hazing / pre-emptive capture activities will require licensing authority from WA DBCA / NT DENR / DoEE through the OWA.	**Equipment** Wildlife capturing equipment Hazing equipment Staging site Oiled wildlife facility Transport for personnel and wildlife **Personnel** Wildlife Rescue Unit (minimum 3 people) Wildlife Staging / Holding Unit **Forms and Guidance** Wildlife SITREP Form (WA OWRP Appendix J) **Deliverables** Wildlife handling licences / approvals	Wildlife to be transported to the oiled wildlife facility within 4 days of being captured
		3. Record keeping is a critical part of the management of captured wildlife whether pre-emptive or following oiling. Records must be kept from the point of capture and travel with each individual animal. On arrival at the rehabilitation centre the wildlife should be tracked through the system on the treatment record. a) An Australian OWR record keeping system known as the National Plan OWR Database (NPOWRD) has been developed and can be implemented for tracking wildlife during a spill event. b) Important components of the system are an access database, fauna data sheets and a database manual. c) A copy of this system's components can be downloaded from the AMSA website under National Plan, General Information section, via the following link:	**Forms and Guidance** Wildlife Status / SITREP Form (WA OWRP Appendix J) **Deliverables** National Plan OWR Database (NPOWRD)	Ongoing after commencement of capturing wildlife

		http://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/General-Information/oiled-wildlife/database/index.asp		
7. Establishment of an oiled wildlife facility Responsible Person: Wildlife Operations Officer				
		1. Refer to Section 4.6 of the WA OWRP: Wildlife Operations Officer to oversee the Wildlife Facilities Team to undertake the following: a) Install the oiled wildlife containers (suitable for <50 animals per day). b) Establish an oiled wildlife facility (on land or on vessel) if the response is escalated > 50 animals per day. The procedure for setting up and using an oil wildlife facility is in Appendix E of the WA OWRP. 2. Broome, Derby and Wyndham are the most suitable locations for large scale OWR Facilities in the Kimberley region. On water facilities utilising barges may be established to service more remote areas including the offshore islands.	**Equipment** Refer to WA OWRP Section 7 **Personnel** Wildlife Facilities Unit (minimum 6 people) to include facility development specialist and trades (plumber, electrician and carpenter) **Forms and Guidance** WA OWRP	Initial oiled wildlife containers to be onsite / infield within 7 days of risk being identified Oiled wildlife facility to be established ASAP, time will vary depending on response level
8. Wildlife rehabilitation Responsible Person: Wildlife Operations Officer				
		1. Refer to Section 4.7 of the WA OWRP: Wildlife Operations Officer to oversee the Wildlife Rehabilitation Unit to treat undertake the following: a) Initial treatment of oiled wildlife using the oiled wildlife containers (suitable for <50 animals per day). b) Treat oiled wildlife using oiled wildlife facility. Refer to: i. Figure 12 in WA OWRP: Overview of Oiled Wildlife Rehabilitation	**Equipment** Oiled wildlife containers Oiled wildlife facility **Personnel** Wildlife Rehabilitation Unit **Forms and Guidance** WA OWRP	Ongoing during response

		ii. Appendix F: Triage and First Aid SOP iii. Appendix G: Cleaning and Drying Wildlife SOP. 2. Release rehabilitated fauna back to their natural habitat. 3. Maintain records of fauna treatment and release.	Wildlife Status / SITREP Form (WA OWRP Appendix J) Wildlife Rescue and Release Form (WA OWRP Appendix J) **Deliverables** National Plan OWR Database (NPOWRD)	
9. Oiled wildlife response termination Responsible Person: IMT Leader				
		1. Refer to Section 4.8 of the WA OWRP: Once the decision has been made to terminate oiled wildlife operations (as per termination criteria), the EMT Leader will initiate a staged stand down of functions through the Wildlife Division Co-ordinator in the following order: a) Termination of Wildlife Rescue Unit. b) Termination of Wildlife Staging / Holding Unit. c) Termination of Rehabilitation Unit. d) Dismantling or demobilisation of or from temporary oiled wildlife facilities by Wildlife Facilities Unit. 2. Termination of Wildlife Facilities Unit.	**Personnel** Wildlife Facilities Unit (minimum 6 people) to include trades (plumber, electrician and carpenter) **Forms and Guidance** WA OWRP	When termination criteria have been met
		3. Once the Wildlife Division has been demobilised, the Wildlife Division Co-ordinator will arrange a hot debrief to analyse their involvement in the wildlife response. Once the major operational phase of the response is completed an 'all agencies' debrief will be organised followed up with a formal report.	**Deliverables** Incident specific OWR report	After termination of oiled wildlife response

2. Wildlife first strike response Responsible Person: Oiled Wildlife Advisor with assistance from Wildlife Division Co-ordinator				
	Stand up OWR capability	1. Refer to Section 4.1 of the WA/NT OWRP: a) Assess the situation; b) Determine the potential response level (refer to Table 6 Indicative Oiled Wildlife Response Levels in the WA OWRP); c) Determine resources required and available; and d) Mobilise first strike OWR kits.	**Equipment** First strike OWR kits **Forms and Guidance** WA/NT OWRP	Commence within 48 hours of risk being identified Onsite / infield within 7 days of risk being identified
3. Mobilisation of wildlife resources Responsible Person: Wildlife Division Co-ordinator / Wildlife Logistics Co-ordinator				
	Mobilisation of required resources to support OWR operations	1. Refer to Section 4.2 of the WA OWRP: a) Mobilise key personnel within the OWR Division: b) Wildlife Planning Officer to lead planning the OWR response. c) Wildlife Operations Officer to lead the mobilisation of operational resources on site where oiled wildlife is present. d) Wildlife Logistics Officer to mobilise equipment as appropriate for the scale of incident 2. Refer to WA OWRP Section 7 for indications of resources needed for each stage of the OWR.	**Equipment** WA ORWP **Personnel** Wildlife Planning Officer Wildlife Operations Officer Wildlife Logistics Officer **Forms and Guidance** WA OWRP	Mobilise key personnel and commence mobilising equipment within 48 hours of risk being identified

4. Coordinate wildlife reconnaissance Responsible Person: Wildlife Operations and Planning Officer				
	Conduct ALL preparations in support of OWR operations	1. Refer to Section 4.3 of the WA OWRP: a) Wildlife Operations Officer to oversee the Wildlife Reconnaissance Unit and determine the best means for monitoring fauna (via plan, vessel or shoreline survey). b) Wildlife Planning Officer to create a geo-plot of all known wildlife communities in the local area that may be affected. 2. The shoreline clean-up assessment team may be able to have a dual function as the wildlife reconnaissance team.	**Equipment** General: Handheld GPS unit / Digital Camera Binoculars / Spotting scope Field notebook and pencil Geo-plot output including animal communities at risk. Transport: Quad motorbikes or 4wd vehicles Small vessels (less than 12m length) Aerial support (fixed wing or helicopter) **Personnel** Wildlife Reconnaissance Unit **Forms and Guidance** WA OWRP **Deliverables** Survey logs	Commence within 7 days of risk being identified
5. Develop IAP subplan for oiled wildlife response Responsible Person: Wildlife Planning Officer with assistance from Wildlife Division Coordinator				
	Incident action planning to support OWR operations	1. Refer to Section 4.4 of the WA OWRP: a) Based on information from wildlife reconnaissance develop the IAP oiled wildlife response sub-plan including information on: i. Wildlife priorities for protection from oiling; ii. Deterrence measures; iii. Recovery and treatment of oiled wildlife; and iv. Resourcing of equipment and personnel. v.	**Personnel** • Wildlife Division Co-ordinator **Forms and Guidance** • WA OWRP **Deliverables** IAP	Within 24 hours of wildlife reconnaissance confirming potential or realised impacts to wildlife

6. Wildlife rescuing and staging Responsible Person: Wildlife Operations Officer and Wildlife Logistics Officer				
		1. Refer to Section 4.5 of the WA OWRP: a) Wildlife Operations Officer to oversee the Wildlife Rescue and Wildlife Staging / Holding Units to undertake the following: i. Pre-emptive capture (refer to Appendix H in WA OWRP) ii. Hazing; and iii. Oiled wildlife rescue, transport and staging (refer to Appendix B, C and D in the WA OWRP). 2. Any deterrence / hazing / pre-emptive capture activities will require licensing authority from WA DBCA / NT DENR / DoEE through the OWA.	**Equipment** Wildlife capturing equipment Hazing equipment Staging site Oiled wildlife facility Transport for personnel and wildlife **Personnel** Wildlife Rescue Unit (minimum 3 people) Wildlife Staging / Holding Unit **Forms and Guidance** Wildlife SITREP Form (WA OWRP Appendix J) **Deliverables** Wildlife handling licences / approvals	Wildlife to be transported to the oiled wildlife facility within 4 days of being captured
		3. Record keeping is a critical part of the management of captured wildlife whether pre-emptive or following oiling. Records must be kept from the point of capture and travel with each individual animal. On arrival at the rehabilitation centre the wildlife should be tracked through the system on the treatment record. a) An Australian OWR record keeping system known as the National Plan OWR Database (NPOWRD) has been developed and can be implemented for tracking wildlife during a spill event. b) Important components of the system are an access database, fauna data sheets and a database manual. c) A copy of this system's components can be downloaded from the AMSA website under National Plan, General Information section, via the following link:	**Forms and Guidance** Wildlife Status / SITREP Form (WA OWRP Appendix J) **Deliverables** National Plan OWR Database (NPOWRD)	Ongoing after commencement of capturing wildlife

		http://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/General-Information/oiled-wildlife/database/index.asp		
7. Establishment of an oiled wildlife facility Responsible Person: Wildlife Operations Officer				
		1. Refer to Section 4.6 of the WA OWRP: Wildlife Operations Officer to oversee the Wildlife Facilities Team to undertake the following: a) Install the oiled wildlife containers (suitable for <50 animals per day). b) Establish an oiled wildlife facility (on land or on vessel) if the response is escalated > 50 animals per day. The procedure for setting up and using an oil wildlife facility is in Appendix E of the WA OWRP. 2. Broome, Derby and Wyndham are the most suitable locations for large scale OWR Facilities in the Kimberley region. On water facilities utilising barges may be established to service more remote areas including the offshore islands.	**Equipment** Refer to WA OWRP Section 7 **Personnel** Wildlife Facilities Unit (minimum 6 people) to include facility development specialist and trades (plumber, electrician and carpenter) **Forms and Guidance** WA OWRP	Initial oiled wildlife containers to be onsite / infield within 7 days of risk being identified Oiled wildlife facility to be established ASAP, time will vary depending on response level
8. Wildlife rehabilitation Responsible Person: Wildlife Operations Officer				
		1. Refer to Section 4.7 of the WA OWRP: Wildlife Operations Officer to oversee the Wildlife Rehabilitation Unit to treat undertake the following: a) Initial treatment of oiled wildlife using the oiled wildlife containers (suitable for <50 animals per day). b) Treat oiled wildlife using oiled wildlife facility. Refer to: i. Figure 12 in WA OWRP: Overview of Oiled Wildlife Rehabilitation	**Equipment** Oiled wildlife containers Oiled wildlife facility **Personnel** Wildlife Rehabilitation Unit **Forms and Guidance** WA OWRP	Ongoing during response

		ii. Appendix F: Triage and First Aid SOP iii. Appendix G: Cleaning and Drying Wildlife SOP. 2. Release rehabilitated fauna back to their natural habitat. 3. Maintain records of fauna treatment and release.	Wildlife Status / SITREP Form (WA OWRP Appendix J) Wildlife Rescue and Release Form (WA OWRP Appendix J) **Deliverables** National Plan OWR Database (NPOWRD)	
9. Oiled wildlife response termination Responsible Person: IMT Leader				
		1. Refer to Section 4.8 of the WA OWRP: Once the decision has been made to terminate oiled wildlife operations (as per termination criteria), the EMT Leader will initiate a staged stand down of functions through the Wildlife Division Co-ordinator in the following order: a) Termination of Wildlife Rescue Unit. b) Termination of Wildlife Staging / Holding Unit. c) Termination of Rehabilitation Unit. d) Dismantling or demobilisation of or from temporary oiled wildlife facilities by Wildlife Facilities Unit. 2. Termination of Wildlife Facilities Unit.	**Personnel** Wildlife Facilities Unit (minimum 6 people) to include trades (plumber, electrician and carpenter) **Forms and Guidance** WA OWRP	When termination criteria have been met
		3. Once the Wildlife Division has been demobilised, the Wildlife Division Co-ordinator will arrange a hot debrief to analyse their involvement in the wildlife response. Once the major operational phase of the response is completed an 'all agencies' debrief will be organised followed up with a formal report.	**Deliverables** Incident specific OWR report	After termination of oiled wildlife response

17. REFERENCES

American Petroleum Institute (API) (2013) Industry Recommended Subsea Dispersant Monitoring Plan. API Technical Note 1152.

AMSA (2015a) Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities Australian Maritime Safety Authority, January 2015

AMOSC (2019). Kimberley Shoreline Response Plan

Australian Marine Oil Spill Centre (AMOSC). 2017. AMOSPlan: Australian Industry Cooperative Oil Spill Response Arrangements. Accessed 12 October 2018 at https://amosc.com.au/wp-content/uploads/2018/01/AMOSPlan-2017.pdf

Australian Maritime Safety Authority (AMSA). 2017. National Plan for Maritime Environmental Emergencies. Accessed 12 October 2018 at https://www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies/national-plan-maritime

Australian Maritime Safety Authority (AMSA). No date. National Plan Guidance: Coordination of Cross-Border Incidents (NP-GUI-023). Accessed 12 October 2018 at https://www.amsa.gov.au/file/403/download?token=HWCCMdn3

Australian Maritime Safety Authority (AMSA). 2017. National Plan Guidance: Management and Disposal of Oil Spill Debris (NP-GUI-015). Accessed 9 October 2018 at https://www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies/np-gui-015-national-plan

Australian Maritime Safety Authority (AMSA). 2015. National Plan Guidance: Response, Assessment and Termination of Cleaning for Oil Contaminated Foreshores (NP-GUI-025). Accessed 9 October 2018 at https://www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies/np-gui-025-national-plan

Australian Maritime Safety Authority (AMSA). 2010. Response to the Montara Wellhead Platform Incident. Report of the Incident Analysis Team. Accessed 4th December 2019.

Australian Maritime Safety Authority (AMSA). No date. National Plan Oil Spill Control Agent Register. Accessed 9 October 2018 at https://www.amsa.gov.au/marine-environment/pollution-response/register-oil-spill-control-agents

Bonn Agreement (1998). The Bonn Agreement. Accessed: 12 October 2018 http://www.bonnagreement.org/eng/html/welcome.html).

Brandvik, P. J., Johansen, Ø., Farooq, O., Angell, G. and Leirvik, F. 2014. Subsurface oil releases - Experimental study of droplet distributions and different dispersant injection techniques Version 2. A scaled experimental approach using the SINTEF Tower basin. SINTEF report no. A26122. Trondheim, Norway. Accessed 19 February 2019 at http://www.oilspillprevention.org/~/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/sintef-api-d3-phase-i-effectiveness-repo.pdf

International Petroleum Industry Environmental Conservation Association (IPIECA) and International Association of Oil and Gas Producers (IOGP). 2015. Dispersants: subsea application - Good practice guidelines for incident management and emergency response personnel. Accessed 19 February 2019 at http://www.oilspillresponseproject.org/wp-content/uploads/2016/02/GPG-Dispersants-Subsea.pdf

Inpex (2018). Browse Island Oil Spill Incident Management Guide.

WA DoT (2017) Offshore Petroleum Industry Guidance Note Marine Oil Pollution: Response and Consultation Arrangements, January 2017.

WA DoT (2016). WestPlan Marine Oil Pollution. Prepared by the WA Department of Transport, May, 2016.

WA DoT (2015). Oil Spill Contingency Plan. Prepared by the WA Department of Transport, January, 2015.

DPaW and AMOSC (2014) WA Oiled Wildlife Response Plan https://www.dpaw.wa.gov.au/images/documents/conservation-management/marine/wildlife/West_Australian_Oiled_Wildlife_Response_Plan_V1.1.pdf

AMOSC (2019) NT Oiled Wildlife Response Plan (Draft)

International Tanker Owners Pollution Federation (ITOPF). 2014. Technical Information Pape: Clean-up of Oil from Shorelines (TIP07). Accessed 26 March 2018 at http://www.itopf.com/knowledge-resources/documents-guides/document/tip-7-clean-up-of-oil-from-shorelines/

ITOPF (2014) Technical Information Paper 4 (TIP 4) Dispersant Use http://www.itopf.com/knowledge-resources/documents-guides/document/tip-4-use-of-dispersants-to-treat-oil-spills/

ITOPF (2015). ITOPF Members Handbook 2011/12. Prepared by the International Tanker Owners Pollution Federation Ltd. http://www.itopf.com/news-and-events/documents/itopfhandbook2011.pdf

International Petroleum Industry Environmental Conservation Association (IPIECA). 2016. Oil Spill Waste Minimisation and Management: Good Practice Guidelines for Incident Management and Emergency Response Personnel. Accessed 12 October 2018 at http://www.ipieca.org/resources/good-practice/oil-spill-waste-minimization-and-management/
MARPOL Annex 1, Regulation 4.3. Accessed 9 October 2018 at http://www.marpoltraining.com/MMSKOREAN/MARPOL/Annex_I/r4.htm

National Oceanic Atmospheric Administration (NOAA). 2013. Shoreline Assessment Manual. Accessed 9 October 2018 at https://response.restoration.noaa.gov/sites/default/files/manual_shore_assess_aug2013.pdf

National Offshore Petroleum Safety and Environmental Management Authority (NOPSMEA). 2018. Guidance Note: Oil Pollution Risk Management. Accessed on 9 October 2018 at https://www.nopsema.gov.au/assets/Guidance-notes/A382148.pdf
Northern Territory Department for Lands and Planning (NT DoLP). 2012. Northern Territory Oil Spill Contingency Plan. Accessed 9 October 2018 at https://dipl.nt.gov.au/__data/assets/pdf_file/0006/165462/northern-territory-oil-spill-contingency-plan.pdf
UniQuest Pty Ltd. 2010. Shoreline Ecological Assessment Aerial and Ground Surveys 7-19 November 2009.
Western Australian Parks and Wildlife (DPaW). 2014. Western Australian Oiled Wildlife Response Plan (WA OWRP). Accessed 9 October 2018 at https://www.dpaw.wa.gov.au/images/documents/conservation-management/marine/wildlife/West_Australian_Oiled_Wildlife_Response_Plan_V1.1.pdf
Western Australian Department of Transport (DoT). 2017. Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements. Accessed 9 October 2018 at https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf
Western Australian Department of Transport (DoT). 2016. State Plan for Hazardous Materials Emergencies (WestPlan-HAZMAT). Accessed 12 October 2018 at https://www.transport.wa.gov.au/imarine/state-emergency-management-plans.asp
Western Australian Department of Transport (DoT). 2016. State Plan for Marine Oil Pollution (WestPlan-MOP). Accessed 12 October 2018 at https://www.oem.wa.gov.au/Documents/Resources/LegislationPolicyPlansProcedureandGuidelines/Plans/Westplans2016/WestplanHazardousMaterialSEMCapproved04042018.pdf

Western Australian Department of Transport (DoT) 2015. Oil Spill Contingency Plan. Prepared by the WA Department of Transport, January 2015.

18. ABBREVIATIONS

AIIMS	Australian Inter-Service Incident Management System
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
ALARP	As Low As Reasonably Practicable
AMOSPLAN	A voluntary oil industry mutual aid plan intended to supplement the National Plan, administered by Australian Institute of Petroleum through AMOSC
Approved Dispersant	Means dispersant approved by the National Plan
ATV	All-Terrain Vehicles
BCP	Blowout Contingency Plan
CPF	Central Processing Facility
Dispersant	Chemical used to “break up” surface oil slicks
DMIRS	Department of Mines, Industry Regulation and Safety (Previously Department of Mines and Petroleum)
DBCA	Department of Biodiversity Conservation and Attractions
DoT	Department of Transport
DoF	Department of Fisheries
DoE	Department of the Environment
ERT	Emergency Response Plan
EP	Environment Plan
FWADC	Fixed Wing Aerial Dispersant Contract
GIS	Geographic Information System
HAT	Highest Astronomical Tide
HMA	Hazard Management Agency
IAP	Incident Action Plan
IBC	Intermediate Bulk Container
IMO	International Maritime Organisation
ICT	Incident Command Team
IMT	Incident Management Team
ITOPF	International Tanker Owners Pollution Federation
JSE	Jadestone Energy
JSA	Job Safety Analysis
kL	Kilolitres
NEBA	Net Environmental Benefit Assessment
NRT	National Response Team – a group of interstate based individuals with spill response experience across all areas of response activities available to provide support to an Incident Controller
NATPLAN	National Plan, to Combat Pollution of the Sea by Oil and Noxious and other Hazardous Substances.
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
OIM	Offshore Installation Manager
OIW	Oil in Water
OPEP	Oil Pollution Emergency Plan
OSRA	Oil Spill Response Atlas. National CRA, developed by various State agencies. In WA, WA Transport holds the State OSRA
OSTM	Oil Spill Trajectory Model

OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
POLREP	Pollution Report. A report, reporting a pollution incident
PPE	Personal Protective Equipment
ppm	Parts per million
RCC	Rescue Coordination Centre (Canberra, Australia)
SCAT	Shoreline Clean-up Assessment Techniques
SFRT	Subsea First Response Toolkit. A system available ex Perth to provide an initial response to a Macondo style of blowout (subsea wells and subsea flows). Primarily debris clearance and delivery of dispersant at the point of loss of containment under water.
SITREP	Means a Situation Report on an actual or potential marine oil pollution incident or response.
SMP	Scientific Monitoring Program
SOPEP	Ship Onboard Pollution Emergency Plan
SRT	State Response Team
Staging Area	A prearranged strategically placed area at which response personnel and equipment are located
WWC	Wild Well Control – A specialist worldwide Blowout Response organisation with whom Jadestone have a contract to cover support in the event of a blowout.

19. APPENDICES

- A1. Observer Logs (vessel, aerial, shoreline)
- A2. Bonn Agreement Oil on Water Classification
- A3. Shoreline Assessment Form
- A4. Effectiveness of dispersant operations
- A5. Montara Crude Assay
- A6. Skua Crude Assay

Appendix A1 – Observer Logs

VESSEL VISUAL OBSERVER LOG

Survey Details										
Date	Start time	End Time	Observers							
Incident			Area of Survey							
Vessel type	Call sign									
Weather Conditions										
Wind speed (knots)			Wind direction							
Cloud cover (%)			Visibility							
Time high water			Current direction							
Time low water			Current speed (nM)							
Slick Details										
Slick grid parameters by lat/long			Slick grid parameters (vessel 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		essel Speed (knots)			Vessel 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

AERIAL VISUAL OBSERVER LOG

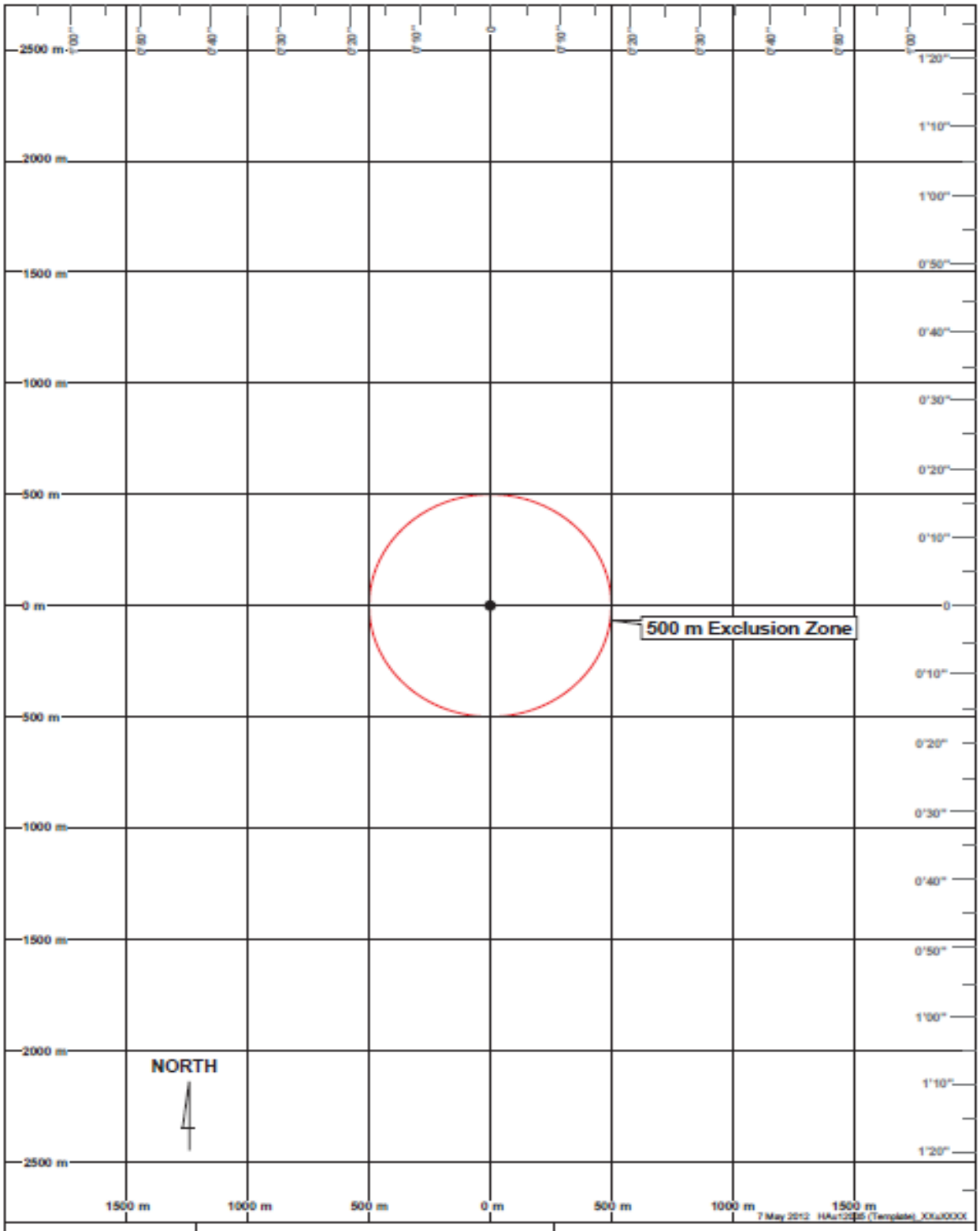
Survey Details				
Date	Start time	End Time	Observers	
Incident			Area of Survey	
Aircraft type	Call sign		Average Altitude	Remote sensing used

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 by 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	%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

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



Vessels				

Other Details for each observation location			
Ambient conditions at each location	Date	Photographic record	Date and Time of each
	Time		Photo/video clip number
	Weather Conditions		Brief description
	Visibility (atmospheric)		
	Water turbidity		

MARINE MEGAFAUNA ASSESSMENT SURVEYS

Triggers

1. Observed proximity of marine megafauna to oil slick or response operations combined with suggestion of significant harm (i.e. not an isolated incident), or
2. Observed incident of harm attributable to oil or the response.

Objectives

1. To quantify the presence of megafauna in the response area (i.e. near the oil slick, response vessels or aircraft) or wider region in order to determine the level of potential exposure to oil.
2. To observe and if possible quantify exposure of megafauna to surface oil or to the response.
3. To detect and quantify lethal effects.
4. Observe and to assess the significance of sub-lethal effects (e.g. avoidance behaviour) of this exposure or interactions.

Data Collection and Management

Data to be recorded from aerial megafauna surveys is outlined in the table below.

Resource	**Species**	**Numbers observed**	**Location**	**Behaviour/Comment**
Cetaceans		Adult_____ Juvenile_____ Calf_____	Lat_____ Long____	Direction of movement Proximity to oil Proximity to vessels Identify marks Aversion or other behaviour Carcases
Birds			Lat_____ Long____	Direction of movement Proximity to oil Proximity to vessels Identify marks Aversion or other behaviour Carcases
Other Details for each Observation Location				
Ambient Conditions at Each Location	Date		Photographic/Video Record	Date and time of each
	Time			Photo/video clip number
	Weathering conditions			Brief description
	Visibility			GPS link

Methodology

It is proposed that observations are made during dedicated monitoring flights supported where necessary by ground (vessel-based) surveys. Flights would normally be dedicated to the monitoring of only one fauna group but multi-objective flights may be required.

Observers must have relevant skills and expertise in the identification of the subject fauna and in interpreting their behaviour. Aircraft must have adequate downward visual capability.

A photographic or video record should be taken of each sighting and precise locations recorded on GPS.

A detailed methodology must be developed prior to commissioning this study. The scope and design of the detailed must include the following:

- State objectives;
- Reflect the level and distribution of observed or anticipated exposure and effects i.e.;
  - Geographic distribution
  - Study duration
- Stipulate replicate sampling, statistical analyses, and scientific rigour;
- Stipulate the expected flight frequency; and
- Indicate comparison to be made between impacted and unimpacted (control) habitats/biota, before and after spill observations.

The plane should follow line transects which are surveyed in passing mode (e.g. the plane did not deviate from the flight path.

Pre-implementation Actions

- Identify personnel or agencies with skills to design and undertake scientific monitoring of cetaceans, dugongs, birds, turtles;
- Undertake detailed study including design, budget, schedule and resource requirements;
- Identify and assign responsibilities for management of the study; and
- Secure identified resources.

Resource Requirements Checklist

- Aircraft
- Species identification manuals
- Aerial camera (still and video). Video to be GPS linked
- Expert megafauna observers

Supporting Documents

AFMA Protected Species Identification Guide: http://www.afma.gov.au/wp-content/uploads/2010/06/id_guide.pdf

SHORELINE OBSERVATION LOG

Survey Details				
Incident	Date	Start time	End Time	Observers

Area of Survey			
Start GPS: LAT_____deg._____LONG_____deg._____min		End GPS: LAT_____deg._____LONG_____deg._____min	
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 A2 - Bonn Agreement Oil Appearance Code

At the thirteenth National Plan Operations Group meeting the Bonn Agreement Oil Appearance Code was adopted as the standard method for assessing the volume of oil on water for the purposes of response and prosecution.
The Bonn Agreement Oil Appearance Code is explained in the following pages, taken from Annex A of the Bonn Agreement Aerial Surveillance Handbook, 2004. The full Handbook can be downloaded from the Bonn Agreement website: http://www.bonnagreement.org/eng/html/welcome.html.

1. The Theory of Oil Slick Appearances

The visible spectrum ranges from 400 to 750 nm (0.40 – 0.75 µm). Any visible colour is a mixture of wavelengths within the visible spectrum. White is a mixture of all wavelengths; black is absence of all light.

The colour of an oil film depends on the way the light waves of different lengths are reflected off the oil surface, transmitted through the oil (and reflected off the water surface below the oil) and absorbed by the oil. The observed colour is the result of a combination of these factors; it is also dependant on the type of oil spilled.

An important parameter is optical density: the ability to block light. Distillate fuels and lubricant oils consist of the lighter fractions of crude oil and will form very thin layers that are almost transparent. Crude oils vary in their optical density; black oils block all the wavelengths to the same degree but even then there are different 'kinds of black', residual fuels can block all light passing through, even in thin layers.

2. The Bonn Agreement Oil Appearance Code

Since the colour of the oil itself as well as the optic effects is influenced by meteorological conditions, altitude, angle of observation and colour of the sea water, an appearance cannot be characterised purely in terms of apparent colour and therefore an 'appearance' code, using terms independent of specific colour names, has been developed.

The Bonn Agreement Oil Appearance Code has been developed as follows:
In accordance with scientific literature and previously published scientific papers,
Its theoretical basis is supported by small scale laboratory experiments,
It is supported by mesoscale outdoor experiments,
It is supported by controlled sea trials

Due to slow changes in the continuum of light, overlaps in the different categories were found. However, for operational reasons, the code has been designed without these overlaps.

Using thickness intervals provides a biased estimation of oil volumes that can be used both for legal procedures and for response.

Again for operational reasons grey and silver have been combined into the generic term 'sheen'.

Five levels of oil appearances are distinguished in code detailed in the following table:

Code Description – Appearance	Layer Thickness Interval (µm)	Litres per km2
1 – Sheen (silvery/grey)	0.04 to 0.30	40 – 300
2 – Rainbow	0.30 to 5.0	300 – 5000

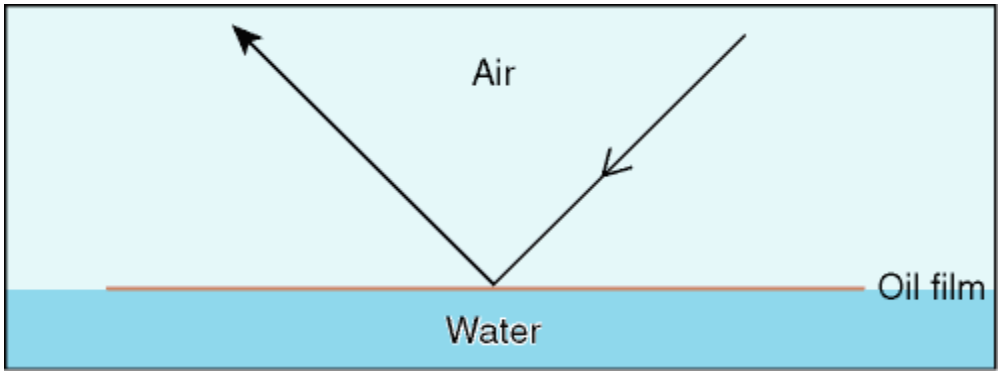
3 – Metallic	5.0 to 50	5000 – 50,000
4 – Discontinuous True Oil Colour	50 to 200	50,000 – 200,000
5 – Continuous True Oil Colour	200 to More than 200	200,000 – 200,000+

The appearances described cannot be related to one thickness; they are optic effects (codes 1 – 3) or true colours (codes 4 – 5) that appear over a range of layer thickness. There is no sharp delineation between the different codes; one effect becomes more diffuse as the other strengthens. A certain degree of subjective interpretation is necessary when using the code *and any choice for a specific thickness within the layer interval MUST be explained on the Standard Pollution Observation Log*.

3. Description of the Appearances

Code 1 – Sheen (0.04 µm – 0.3 µm)

The very thin films of oil reflect the incoming white light slightly more effectively than the surrounding water (Figure 1) and will therefore be observed as a silvery or grey sheen. The oil film is too thin for any actual colour to be observed. All oils will appear the same if they are present in these extremely thin layers.



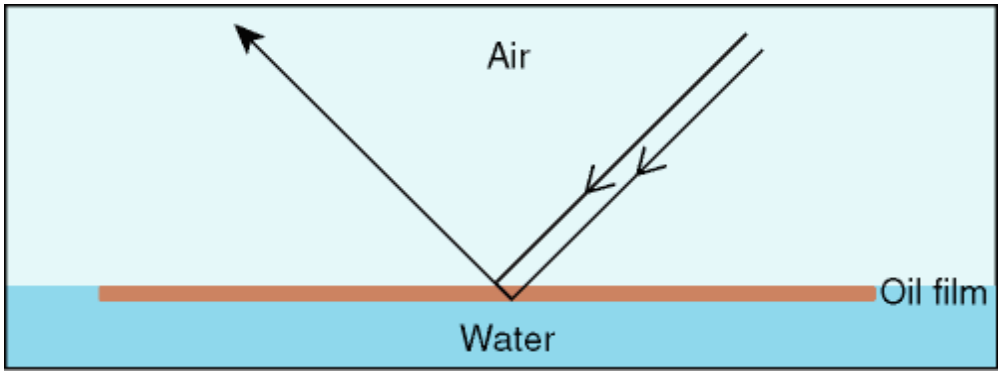
Light Reflecting From Very Thin Oil Films

Oil films below approximately 0.04-µm thickness are invisible. In poor viewing conditions even thicker films may not be observed.

Above a certain height or angle of view the observed film may disappear.

Code 2 – Rainbow (0.3 µm – 5.0 µm)

Rainbow oil appearance represents a range of colours: yellow, pink, purple, green, blue, red, copper and orange; this is caused by constructive and destructive interference between different wavelengths (colours) that make up white light. When white light illuminates a thin film of oil, it is reflected from both the surfaces of the oil and of the water (Figure 2).



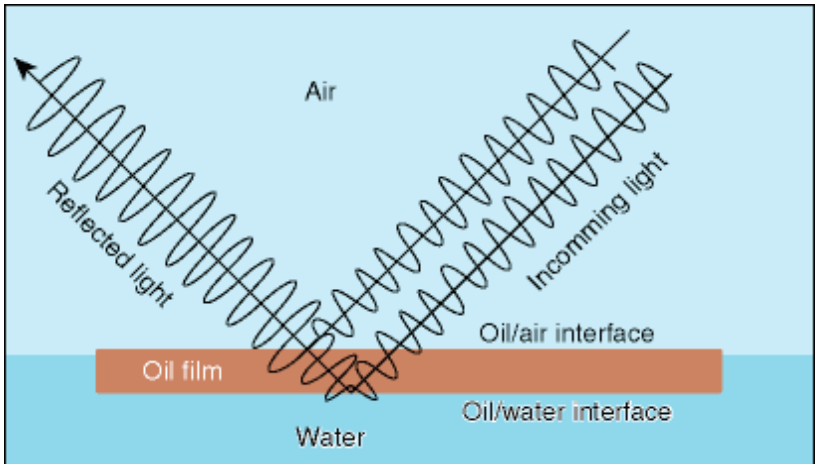
The Rainbow Region

Sheen and Rainbow

Constructive interference occurs when the light that is reflected from the lower (oil / water surface combines with the light that is reflected from the upper (oil / air) surface. If the light waves reinforce each other the colours will be present and brighter (Figure 3).

Constructive Interference

During destructive interference the light waves cancel each other out and the colour is reduced in the reflected light and appears darker (Figure 4).



Destructive Interference

Oil films with thicknesses near the wavelength of different coloured light, 0.2 µm – 1.5 µm (blue, 400nm or 0.4 µm, through to red, 700nm or 0.7 µm) exhibit the most distinct rainbow effect. This effect will occur up to a layer thickness of 5.0 µm.

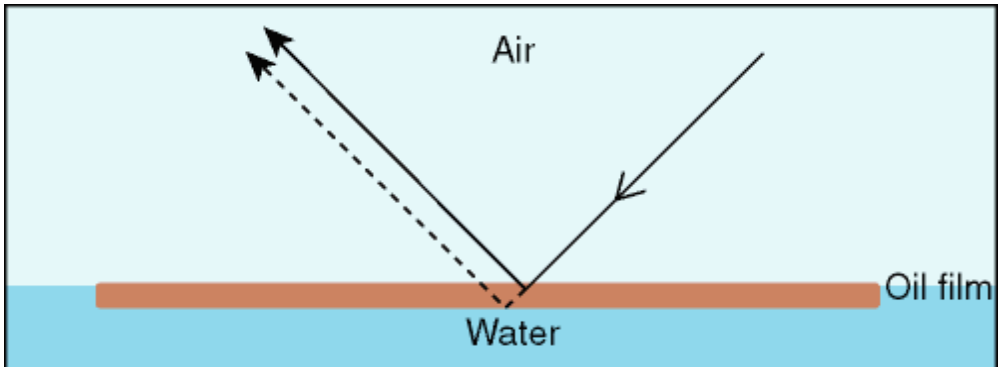
All oils in films of this thickness range will show a similar tendency to produce the 'rainbow' effect.

A level layer of oil in the rainbow region will show different colours through the slick because of the change in angle of view. Therefore if rainbow is present, a range of colours will be visible.

Code 3 – Metallic (5.0µm – 50 µm)

The appearance of the oil in this region cannot be described as a general colour. The true colour of the oil will not be present because the oil does not have sufficient optical density to block out all the light.

Some of the light will pass through the oil and be reflected off the water surface. The oil will therefore act as a filter to the light
(Figure 5).



The Metallic Region

The extent of filtering will depend on the optical density of the oil and the thickness of the oil film.

The oil appearance in this region will depend on oil colour as well as optical density and oil film thickness. Where a range of colours can be observed within a rainbow area, metallic will appear as a quite homogeneous colour that can be blue, brown, purple or another colour. The 'metallic' appearance is the common factor and has been identified as a mirror effect, dependent on light and sky conditions. For example blue can be observed in blue-sky.

Metallic, with Sheen and Rainbow

Code 4 – Discontinuous True Colours (50 µm – 200 µm)
Code 4 is intermediate between Code 3 and Code 5, and consists of small areas, or patches, of Code 5, Continuous True Oil Colour in a background of Code 3, Metallic. This is an accurate description of the

behaviour of the oil layer – it does not spread as an even thickness layer, but consists of thicker patches in a thinner layer.

Observation of Code 4 - On a number of occasions aircrews have reported difficulty seeing DCTC both in field trials, Bonnex 2002, and operationally. The following explanation with regard to the problem is an extract from a recent report by Alun Lewis:

'Code 4 is intermediate between Code 3 and Code 5; it is a hybrid of Codes 3 and 5. "Discontinuous" refers to the Code being used to describe patches of Code 5 - Continuous True Oil Colour against a background of Code 3 - Metallic. The size of the thicker oil (Code 5
– Continuous True Oil Colour) patches that can be seen will depend on the distance from which they are observed and the visual acuity of the observer.

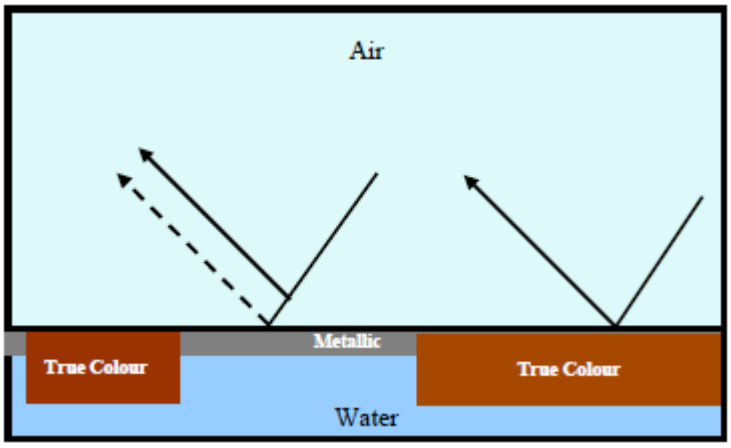
Visual acuity refers to the clarity or clearness of one's vision, a measure of how well a person sees. The word "acuity" comes from the Latin "acuitas," which means sharpness. A person with normal, or average, visual acuity can correctly identify a 9 mm high black letter on a white background on a standard Snellen eye chart that subtends 5 minutes of arc (0.04167°) at a distance of 6 metres (the standard distance for eye tests). They can discriminate the shape of the letter and can therefore easily see a black line or dot that subtends half this angle, 2.5 minutes of arc (0.0208º). A person with normal visual acuity would therefore have no difficulty in seeing individual 4 mm diameter black dots on a white background from a distance of 6 metres.

As was demonstrated at the BONNEX 2002 and NOFO 2006 Oil on Water Exercise, observers in small boats, who looked at the spilled oil from a distance of a metre or so, were able to easily see small patches of Code 5 in a background of Code 3 and reported this as Code 4 - Discontinuous True Oil Colour.

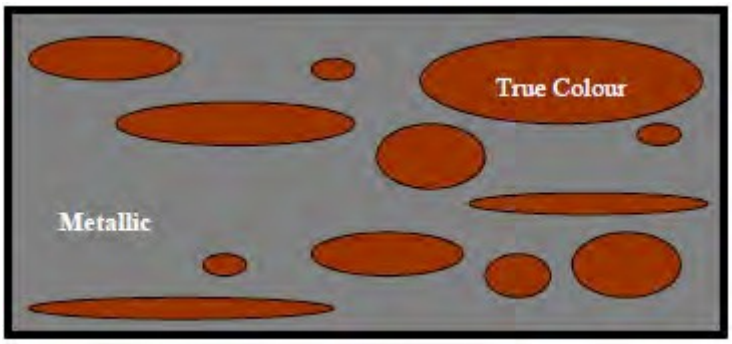
Surveillance aircraft conducting visual observations of oil slicks on the sea surface normally operate at altitudes of approximately 500 ft, 1500 ft or 2500 ft. The equivalent sizes of a black dot that could be seen on a white background by a person with normal acuity vision would be 110 mm, 330 mm and 550 mm from these altitudes. In addition, the contrast between black and white will normally be a lot more than the contrast between the true colour of an oil (black or brown) and the metallic, almost mirror-like effect and appearance of oil of the Code 3 thickness. Observers in aircraft will not be able to see small patches of Code 5 in a background of Code 3, but should be able to see much larger patches of Code 5, perhaps 0.5 to 1 metre across, in a background of Code 3.

From an aircraft, the appearance of a slick containing a large area of Code 4 - Discontinuous True Oil Colour – composed of individually small areas of Code 5 - Continuous True Oil Colour against a background of Code 3 – Metallic - will therefore be a function of the concentration of the Code 5 patches. At low concentrations (5 to 10% of the total area) they will probably be invisible and the area will be observed as Code 3 – Metallic. At some increased concentration (perhaps 40 or 50% of the total area), the appearance of that area of the slick will probably 'flip' from being all Code 3 – Metallic to being all Code 5 - Continuous True Oil Colour.'

In addition, to the issue of visual acuity, the human brain needs sufficient time to register and interpret what the eye sees; going lower to solve the height/distance (visual acuity) difficulty will only reduce the time available due to the increase in the relative speed of the aircraft to the object.

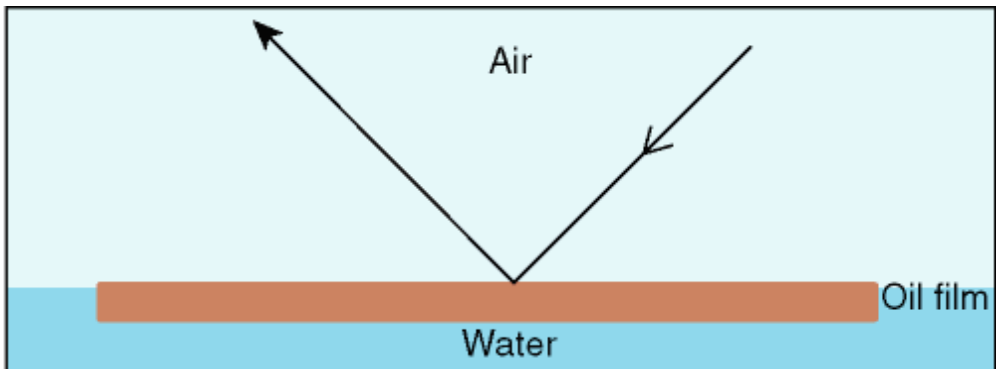


The Discontinuous True Colour Region Plan (Overhead) View



The Discontinuous True Colour Region

For oil thicker than 50 µm the light is being reflected from the oil surface rather than the sea surface (Figure 7). The true colour of the oil will gradually dominate the colour that is observed. Brown oils will appear brown, black oils will appear black.



Thick Oil Films

Code 5 – True Colours (>200 µm)

The true colour of the specific oil is the dominant effect in this category and the area will be generally homogenous (continuous). It is strongly oil type dependent and colours may be more diffuse in overcast conditions.

There is no maximum thickness value for True Colours since it is not possible by visual observation from above to estimate the thickness of oil layers above 200 microns. A spilled oil layer on water that is 0.5 mm thick will look, from the top, exactly the same as an oil layer that is several millimetres thick. The light is reflected from the top surface of the oil; this gives information about the colour and

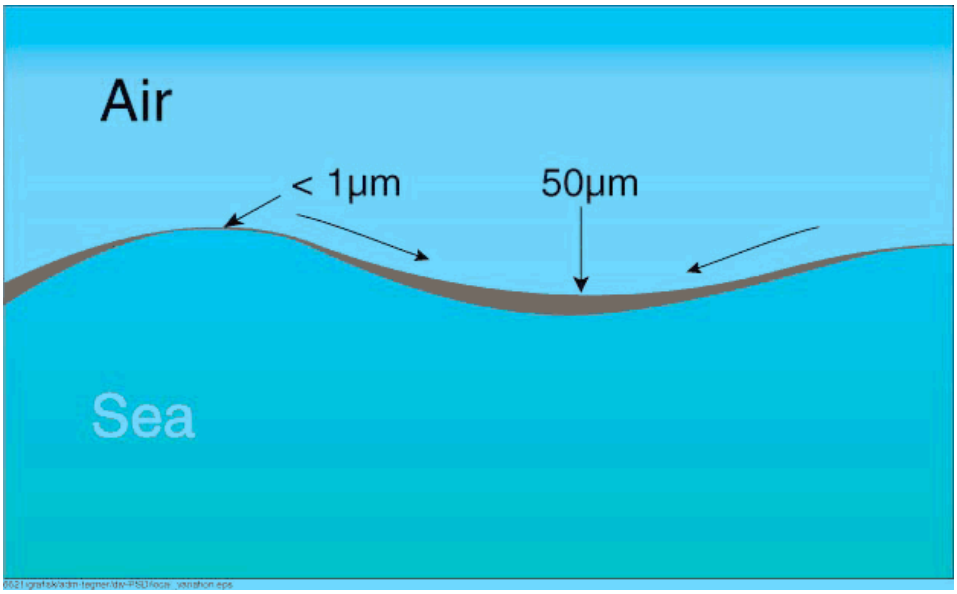
texture of the surface of the oil, but cannot give any direct information about the thickness of the oil layer.

True colour

Local Variation of Oil Film Thickness at Sea - When observing oil in wave conditions on the sea the thickness of a layer of oil on water at a particular location will not remain constant. The sea surface is not static and is often a dynamic environment.

As a non-breaking wave passes underneath the oil slick, the oil layer will be:

- Stretched and thinned on the wave crest
- Compressed and thickened in the wave trough



Local Variations of Oil Film Thickness at Sea

An area of oil that is of a thickness that is close to the minimum or maximum thickness of a particular BAOAC Code may therefore appear to alternate between two BAOAC Codes.

If there are breaking waves, the situation is more extreme. As the breaking wave passes through the oil slick, the area of oil affected by the wave will be temporarily dispersed below the surface as large oil droplets. The area of water surface will be temporarily cleared of oil. The large oil droplets will then rapidly re-surface and, as they reach the water surface, will rapidly spread out to form a layer of oil of rapidly diminishing thickness.

The oil layer thickness, and the BAOAC Codes associated with the particular thickness, will therefore not be constant when waves are present.

Emulsion - Spills of crude oil and some fuel oil are frequently attended by the rapid formation of water-in-oil emulsions (mousse) which are often characterised by a brown / orange colouration and a cohesive appearance. The Appearance Code SHOULD NOT be used to quantify areas of emulsion.

Reliable estimates of water content in an 'emulsion' are not possible without laboratory analysis, but accepting that figures of 50% to 80% are typical, approximate calculations of oil quantity can be made, given that most floating emulsions are 1 mm or more thick.

Supplementary Oil Thickness Data - As there is no maximum thickness value for Code 5, True Colour, since it is not possible by visual observation from aircraft to estimate the thickness of oil layers above 200 µm, the overall estimated maximum oil volume will 'always' be prefixed as being 'more than' or 'at least' so many metric tonnes. To improve the estimated maximum value it is recommended that 'supplementary oil thickness data' or 'ground truth' on the 'true colour' areas should be used to calculate volumes.

Appendix A3 – Shoreline Assessment Form

Department of Transport

Shoreline Assessment Form

This form should be submitted to the Shoreline Division Coordinator (SC). A summary of the information will be forwarded by the SC to the Operations Officer, Planning Officer and Management Support Unit.

Purpose

This form is for shoreline responders who are required to complete a shoreline assessment.

It is recommended that such responders have completed oiled shoreline training as a minimum. This form is not intended to be used in isolation.

Purpose

Human health and safety is **always** the number one priority in any incident.

Priorities

Protection priorities under Australia's National Plan to Combat Pollution of the Sea by Oil and other Noxious and Hazardous Substances (The National Plan) are:

- Human health and safety
- Habitat and cultural resources
- Rare and/or endangered flora and fauna
- Commercial resources
- Recreational and amenity areas

Complete

- Take Five and
- Job Safety Analysis (JSA)

Prior to and as part of your operations

What is a shoreline assessment?

A shoreline assessment:

- Is a simple and comprehensive survey of a shoreline
- Provides data to enable decision making for shoreline protection, clean-up and monitoring and
- Employs a systematic approach using standardised terminology

What information needs to be gathered?

Purpose

- Shoreline description
  - Shoreline type, substrate and energy
  - Biological character of shoreline
- Oil description
- Oil location, character and behaviour

Additional information that may be required:

- Access
- Site hazards and constraints
- Sensitive areas
- Features/landmarks
- Potential sites for
  - Decontamination/waste
  - Helicopter landing

Dividing the shoreline

Sectors

Where there is a geographical barrier and restricted access between two areas, they will be split into separate sectors. Different sectors may have separate field command centres, catering, ablutions, decontamination, etc. Sectors will be further spilt into segments.

Segments

A segment is a piece of shoreline that's a workable size for a team and could be defined based on:

- Shoreline type
- Substrate type
- Access points
- Features e.g. breakwater
- Jurisdiction e.g. shire boundaries
- Presence of particular flora and/or fauna
- Distance e.g. every 50m

Item Category	Item	Check
Recording	Camera	☐
Navigation	Maps and charts	☐
	GPS	☐
	Compass	☐
Communication	Mobile phone	☐
	Radio	☐
	Confirm phone/radio coverage	☐
Personal	First aid kit	☐
	Hat	☐
	Sun-cream	☐
	Drinking water	☐
	Rubber boots (non-slip)	☐
	Wet weather gear	☐
Documentation	Field booklet	☐
	Shoreline assessment forms	☐
	JSA forms	☐
	Log	☐
Other	Tape measure	☐
	Shovel	☐
	Sampling kit	☐

Ensure you advise command of your planned operation and establish reporting expectations for while you are in the field.

Objective ID: A8525747 Page 1 of 4

Shoreline descriptors:

Shoreline Type	Abbr.		Note
Cliff	Cl		Height and slope
Platform	Pl		Height relative to tide
Reef	Re		Reef is an intertidal platform
Beach	Be		
Dune	Du		
Flats	Fl		
Artificial	A		e.g. wharf, sea wall
Shoreline substrate	**Abbr.**	**Size**	**Note**
Bedrock or rock	R		
Boulder	B	Larger than head	
Cobble	C	Fist to head size	
Pebble	P	Pen diameter to fist size	
Gravel	G	2-4mm diameter	
Mud/silt/clay	M	Less than 0.6mm	Mix with water, if it goes cloudy = mud, if it sinks = sand
Earth	E		Usually cliffs only
Shellgrit	Sh		Usually with sand (i.e. Sh/S)
Coral	Co		Dead coral, i.e. coral rubble *(if corals are live, record as coral in both substrate type and biological character)*
Artificial	A		e.g. rip-rap

Note: S/B would indicate boulders and sand in equal amounts. S(B) would indicate sand was the dominant substrate.

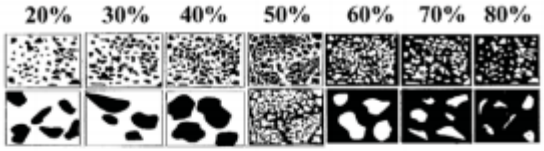
Biological character

This is flora and fauna living on the shoreline. Document this and indicate location on sketch map.

Oil description/character

- **Colour**
- **Viscosity: Solid** *(doesn't flow)*, **Viscous** *(flow slowly)*, **Fluid** *(flows easily)*
- **Stickiness: Very sticky** *(can't be wiped/washed off)*, **Sticky** *(partly removed by wiping/washing)*, **Non sticky** *(wipes of easily)*

Percentage oil cover

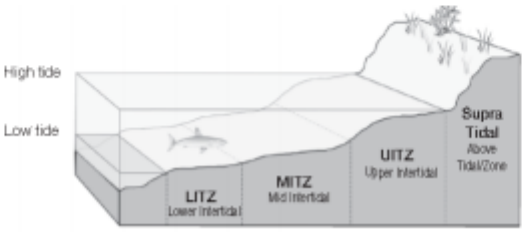


Oil thickness

Name	Abbr.	Thickness	Description
Pooled	Po	Can be measured in mm or cms	Pooled fresh or emulsified oil
Cover	Co	Over 1mm	Coverage of oil of measurable thickness but not pooled
Coat	Ct	Less than 1mm	This coach of oil that masks colour of substrate and can be scratched off with fingernail.
Stain	St	Less than 1mm	Very thin stain of oil which cannot be scratched off substrate with fingernail
Film or sheen	Fi or Shn	Extremely thin film or sheen	Substrate can usually be seen through oil. Can be described as brown, rainbow or silver.
Tar balls	Tb	Variety of sizes	Ball or clumps of weathered oil.

- To describe thickness of subsurface oil:
  - Depth = distance from substrate surface to top of buried layer
  - Thickness of lens = distance between top and bottom of buried layer

Shoreline tidal zones



Incident		**Ref No.**	
REPORTING DETAILS			
Assessment Team Leader		**Position/ Organisation**	
Team Members (name/org)			
Date Completed		**Time Completed**	
Reporting to		**Position/ Organisation**	
Date Received		**Time Received**	
LOCATION DETAILS			
Sector		**Segment**	
Name of Beach/Location		**Description (e.g. slope)**	
Topography/ Other Map		**Map Reference**	
Access Via	☐ Foot Only ☐ Road ☐ 4WD ☐ Boat ☐ Helicopter ☐ Gator/OUV		
Hazards			
TIMING			
First Assessment	☐ Yes ☐ No	**Last Assessment**	☐ Yes ☐ No
Timing	☐ Pre Impact ☐ Post Impact Before Clean-Up ☐ Post Impact After Clean-Up		
Time Since	Impact (days/hrs.):	Last Clean-up (days/hrs.):	

ASSESSMENT				
Parameter	**LITZ**	**MITZ**	**UITZ**	**Supratidal**
Shoreline Description				
Shoreline type				
Substrate type				
Length of shoreline				
Width of shoreline				
Biological character				
Oil Distribution and Character				
Oil band length				
Oil band width				
% cover in band				
Surface oil thickness				
Oil appearance/character				
Depth of buried oil (from surface)				
Description of buried oil				
Other				
Un oiled debris				
Oiled debris				

Sketch Map
Please include North point and scale

Notes

Appendix A4 - Effectiveness of Dispersant Operations

In support of the Jadestone Montara EP/OPEP submission, the following information is provided to support the use and effectiveness of dispersant in the event of a spill from the Montara field.
Noting the unique circumstances associated with the Montara, in that a large scale oil spill response operation led by AMSA was undertaken in 2009 there is evidence in support of the use of dispersant.
In 2010 AMSA released a report into the incident:

"The Response to the Montara Wellhead Platform Incident Report of the Incident Analysis Team - March 2010" *https://www.amsa.gov.au/marine-environment/incidents-and-exercises/response-montara-wellhead-platform-incident*

The report provided favourable feedback relating to the dispersant operations undertaken (see extract below):

Dispersant spraying operations commenced on 23 August 2009 and continued until 1 November 2009:

- the Hercules C-130 sprayed a total of 12,000 litres of dispersant on 23 and 24 August;
- aircraft contracted to AMSA as part of Australia's Fixed Wing Aerial Dispersant Capability continued spraying operations based out of Truscott-Mungalalu aerodrome from 25 August until 2 September, spraying 32,000 litres of dispersant; and,
- vessel spraying operations were carried out from 30 August to 1 November, with 118,000 litres of dispersant sprayed.

Courtesy Mark Hamilton photography

Based on comments provided to the IAT, observations made by experienced personnel during the response indicated that the use of dispersant was highly effective in assisting the natural process of biodegradation and minimising the risk of oil impacts on reefs or shorelines. The six types of dispersant used, Slickgone NS, Slickgone LTSW, Ardrox 6120, Tergo R40, Corexit 9500 and Corexit 9527 were all prior approved for use within Australian waters, having passed laboratory acute toxicity testing requirements applied under the National Plan arrangements.

An additional factor that supports the use of dispersant relates directly to sea state. The following extract is from the IPIECA – Dispersants surface application (Good Practice Guide) - http://www.ipieca.org/resources/good-practice/dispersants-surface-application/
The information discusses the limitations caused by prevailing conditions. A key point of information is the following:

"Rapid dispersion of dispersant-treated oil begins at a wind speed of approx. 7 knots (3m/s, a light gentle breeze) with wave heights of 0.2-0.3 metres."

Limitations caused by prevailing conditions

Sea state

The prevailing sea conditions have a great influence on the effectiveness of response techniques.

The effectiveness of booms used to corral floating oil prior to recovery with skimmers or ignition in controlled in-situ burning is greatly reduced in rougher seas. Booms can be overwhelmed by waves, related to the size (draft and freeboard) of the boom as well as its buoyancy and ability to respond to, or ride on, waves. Even large sea booms can become ineffective at wave heights of approximately 1.4 to 1.8 metres and wind speeds in excess of around 20 knots. Many skimmers are limited by sea state, with some types becoming increasingly ineffective at wave heights greater than 0.6 to 1 metres.

Rapid dispersion of dispersant-treated oil begins at a wind speed of approximately 7 knots (3 m/s, a light to gentle breeze) with wave heights of 0.2 to 0.3 metres. However, dispersants can be sprayed onto floating oil in flat calm conditions, and dispersion will begin when appropriate sea conditions occur. Gale-force winds with speeds greater than 35 knots (18 m/s) and wave heights of 5 metres are generally the upper limits for spraying dispersant from aircraft, although dispersants have been applied from aircraft in winds greater than 50 knots (ESGOSS, 1994). Also, targeting the dispersant becomes challenging in high winds, and floating oil will be over-washed or temporarily submerged in rough seas. The limiting conditions for spraying dispersants from ships will be less for the same reasons.

Extremely rough sea conditions may prevent any at-sea oil spill response. However, these conditions can cause extensive natural dispersion of lighter spilled oils.

Based on the historic wind conditions used in determining the OSTM, it is also highly likely that the prevailing sea state will greatly enhance dispersant operations.

Wind Conditions – from Jadestone OSTM
Summer approx. 74% @ 4m/s up to 12-14m/s (20+knots) = Beaufort Scale 5
Transition approx. 50% @ 6-8 m/s (12+knots) = Beaufort Scale 4
Winter approx. 80% @ 4m/s up to 10-14 m/s (20+knots) = Beaufort Scale 5
(See Beaufort Scale descriptions below)

		Wind Speed		Wave height		
3	Gentle breeze	7–10 knots 8–12 mph 12–19 km/h 3.4–5.5 m/s	2–4 ft 0.6–1.2 m	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses	Leaves and small twigs in constant motion; light flags extended.	
4	Moderate breeze	11–16 knots 13–18 mph 20–28 km/h 5.5–7.9 m/s	3.5–6 ft 1–2 m	Small waves becoming longer; fairly frequent white horses	Raises dust and loose paper; small branches moved.	
5	Fresh breeze	17–21 knots 19–24 mph 29–38 km/h 8–10.7 m/s	6–10 ft 2–3 m	Moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray	Small trees in leaf begin to sway; crested wavelets form on inland waters.	

Appendix A5 – Montara Crude Assay

Intertek

Properties of Whole Crude Oil

Sample ID	3402		Whole Crude
Crude ID	Montara		
Client ID	PTTEP		
Date	30.9.12		
Test	Method	Units	
Density @15°C	D5002	Kg/L	0.8520
Specific Gravity @ 60/60F		Kg/L	0.8524
API Gravity		°API	34.50
Rapid Yield Analysis	D7169+LE	°C	Pg 2 & 6
Arsenic	ICPMS	wt ppb	< 10
Ash	D482	% Mass	0.007
Asphaltenes	IP143	% Mass	< 0.50
Carbon Residue - Micro	D4530	% Mass	0.09
Characterisation Factor	UOP375	-	11.8
Flash Point	D93	°C	< 25.5 (note 3)
Hydrogen Content	D5291	% Mass	14.2
Hydrogen Sulphide	UOP163	wt ppm	< 1
Kinematic Viscosity @20°C	D445	cSt	NA
Kinematic Viscosity @ 30C	D445	cSt	4.695
Kinematic Viscosity @40°C	D445	cSt	3.782
Kinematic Viscosity @50°C	D445	cSt	3.099
Lead	ICPMS	wt ppb	10
Mercury Content	UOP938	wt ppb	1.00 (note 6)
Metal - Nickel	ICPOES	wt ppm	< 1
Metal - Sodium	ICPOES	wt ppm	29
Metal - Iron	ICPOES	wt ppm	< 2
Metal - Copper	ICPOES	wt ppm	< 1
Metal - Vanadium	ICPOES	wt ppm	< 1
Nitrogen - Total	D4629	wt ppm	74
Nitrogen - Basic	UOP269	wt ppm	24
Pour Point - Upper	D5853	°C	+9
Reid Vapour Pressure	D323	kPa	11.00 (note 8)
Salt Content	D3230	wt ppm	97
Sediment By Extraction	D473	% Mass	0
Sulphur - Mercaptan	UOP163	wt ppm	< 1
Sulphur - Total	IP336	wt ppm	800
Total Acid Number	D664	mg KOH/g	0.09
Water by Distillation	D4006	% Volume	0.075
Wax Appearance Temp	CPM	°C	31.1
Wax Content	UOP46	% Mass	18.4

Notes:

3)Sample flashed at ambient. Unable to perform lower flashpoint due to pour point temperature of sample.

6)Analysis performed on a subsample from 20L epoxy lined container supplied by the client for assay.

8)RVP result from analysis on a subsample taken at time of charging the distillation flask. Analysis from a subsample of a separate 20L bulk tin (not agitated & mixed) was 17.00 kPa.

Appendix A6 – Skua Crude Assay

SKUA CRUDE OIL ASSAY

GENERAL CHARACTERISTICS

The assay presented in this report has been performed on a production sample of crude oil from the Skua Venture located at BHP Petroleum's Skua field in Northern Australia.

It will replace the September 1991 Assay which was performed on a pre-production sample from the Skua-8 well.

A comparison of whole crude properties from both assays is presented below.

Property		Jan 1993 Assay	Sept 1991 Assay
API Gravity	°API	41.9	42.5
Sulphur	wgt %	0.06	0.08
Nitrogen	ppm	205	216
Pour Point	°C	12	9
Wax Content	wgt %	5.5	4.3
Viscosity @ 20°C	cSt	3.11	2.96
UOP K Factor		12.1	12.1
Nickel	ppm	0.5	3.0
Vanadium	ppm	<0.5	<0.5

The crude oil analysed in this report is slightly heavier and this is reflected in the higher values obtained for viscosity, pour point and wax content. The yield structure of the crude has not changed significantly.

General Characteristics

Skua is a premium light sweet crude oil which produces excellent yields of high quality transport fuels.

Fraction		Volume % Jan 1993	Sept 1991
C4 Minus	C4 Minus	2.8	3.2
LSRN	C5-70°C	4.9	4.9
HSRN	70-135°C	13.8	14.3
Jet/Kero	135-250°C	27.9	26.0
ADO	250-360°C	29.2	29.5
Long Residue	360°C	21.4	22.1