Stag Field Operations Oil Pollution Emergency Plan
GF-70-PLN-I-00001
Revision 6

FACILITY	GF - Stag Field
REVIEW INTERVAL	12 Months

Rev No	Date	Approval		
		Owner	Reviewer	Approver
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0	4/11/2016	D. Uden	M. Patt	M. Robertson
1	21/12/2016	D. Uden	M. Patt	M. Robertson
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REVISION HISTORY

Revision	Author / Editor	Amendment
0	M. Walker	Document creation
1	M. Walker	Revision 1 for submission to NOPSEMA.
2	M. Walker	Arrangements for oil spill response moved to Jadestone Energy Australia Oil Spill Response Arrangements document [JS-70-PLN-I-00037]. Stag Field Operations-specific Oil Pollution Emergency Plan (OPEP) detail remains in this document.
3	M. Walker / M. Patt	Revision 3 for submission to NOPSEMA.
4	M. Walker / M. Patt	Updates to chemical dispersion strategy and address NOPSEMA OMR comments.
5	H. Astill	Updates to contractual changes (TSA completion, RPS APASA); alignment with updates to OSRA
5a	H. Astill	Updates after review of legislative framework elements. No MoC required.
5.01	M. Patt	Updates after annual review. No MoC required.
5.02	S. Kenwery	Annual review – Table 7-1. Tracker buoy logins. S9.4 & Table 15-1. No MoC required.
6	L. Sands / M. Patt	Revision for submission to NOPSEMA for tanker operations

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Figures

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KEY DOCUMENTS

Company-wide:

JADESTONE ENERGY INCIDENT MANAGEMENT TEAM RESPONSE PLAN (IMTRP) JS-70-PLN-F-00008	Risks and Hazards Incident Management Structure Incident Management Process Incident Management Team Incident initial assessment and orientation Information management Stand down and debrief Administration Statutory requirements Defining the spill level Oil spill response cycle Termination and recovery Oiled Wildlife Response Scientific Monitoring Waste Management

Facility-specific:

[This document] **STAG FIELD OPERATIONS OIL POLLUTION EMERGENCY PLAN (OPEP)** JS-70-PLN-I-00001	Incident Action Plan (First 48-hour operational period) Stag Facility Operations and oil spill risks Sensitivities and Response Priorities Resource Requirements Response Strategies: Source Control Operational Monitoring Chemical Dispersant Containment and Recovery Protection and Deflection Shoreline Clean-up Oiled Wildlife Response Operational Performance Standards and Measurement Criteria Appendices: Observation logs Oil on Water Classification Diesel fuel properties Stag Crude Assays Spill response planning scenario assumptions FWADC Joint Standard Operating Procedure Shoreline Assessment Form Stakeholder Consultation

1. INITIAL INCIDENT ACTION PLANS

In the event of a spill:

Define the spill level (1, 2 or 3) (as per Appendix A of the Jadestone Incident Management Team Response Plan (IMTRP) (JS-70-PLN-F-00008))

Activate Incident Action Plan for the first 48-hour operational period:

- Section 1.1 for Level 1 spills; or
- Section 1.2 for Level 2/3 spills.

1.1 Level 1 Initial Incident Action Plan

LEVEL 1 SPILL INITIAL INCIDENT ACTION PLAN	**Operational Period: First 48 Hours**
Objectives for operational period:	1. Maintain situational awareness
Protection Priorities:	**Spill Response Strategies:**
N/A	1. Source control 2. Operational monitoring

LEVEL 1 SPILL: INITIAL IAP		**Operational Period: First 48 Hours**		
Timeframe (Within)	**Strategies and timeframe**	**Tactics (what is to be done)**	**Task guidance (ref.)**	
			Appendix A IMTRP	**OPEP**
30 mins	Activate the Notifications Plan	Verbal and written notifications	**Section 3**	-
60 mins	Activate source control – vessel or platform release	Shipboard Oil Pollution Emergency Plan (SOPEP) Jadestone's Stag Incident Response Plan (Offshore component) (GF-00-PR-F-00041) Isolate hydrocarbon leak source/shut down equipment as per normal operating practice	-	**Section 8.2**
60 mins	Activate source control – hydrocarbon storage or fuel tank rupture	Jadestone's Stag Incident Response Plan (Offshore component) (GF-00-PR-F-00041)	-	**Section 8.4**
60 mins	Activate operational monitoring to confirm floating oil location and extent, and to inform development of response strategies.	Surveillance from tanker / platform	-	**Section 9.4**

1.2 Level 2/3 Initial Incident Action Plan

LEVEL 2/3 SPILL INITIAL INCIDENT ACTION PLAN	Operational period: First 48 Hours
Objectives for operational period	1. Maintain situational awareness 2. Prevent oiling of Protection Priorities
Protection Priorities:	**Spill Response Strategies:**
Montebello Islands Dampier Archipelago Barrow Island Lowendal Islands 80 Mile Beach	1. Source control 2. Operational monitoring 3. Chemical dispersion 4. Containment and recovery 5. Nearshore protection and deflection 6. Shoreline clean-up 7. Oiled wildlife response 8. Scientific monitoring

LEVEL 2/3 SPILL: INITIAL IAP		Operational period: First 48 Hours		
Timeframe (Within)	**Strategies and timeframe**	**Tactics (what is to be done)**	**Task guidance (ref.)**	
			OSRA	**OPEP**
30 mins	Activate the **Notifications Plan**	Verbal and written notifications	**Appendix A IMTRP**	-
60 mins	Activate **Source Control** – vessel or platform release	Shipboard Oil Pollution Emergency Plan (SOPEP)	-	**Section 8.2**
		Jadestone's Stag Incident Response Plan (Offshore component) (GF-00-PR-F-00041)		
60 mins	Activate **Source Control** – hydrocarbon storage or fuel tank rupture	Isolate hydrocarbon leak source/shut down equipment as per normal operating practice.	-	**Section 8.4**
		Jadestone's Stag Incident Response Plan (Offshore component) (GF-00-PR-F-00041)		
60 mins	Activate **Operational Monitoring** to confirm floating slick location and extent; and to inform and develop response strategies.	Vessel surveillance	-	**Section 9.5**
		Aerial surveillance	-	**Section 9.6**
		Tracking buoys	-	**Section 9.4**
		Spill fate modelling	-	**Section 9.7**
2 hours	Activate **Chemical Dispersion Strategy** to accelerate the process of natural dispersion, reduce surface volume of slick and	Mobilise dispersant	-	**Section 10.5**
		Prepare for aerial operations	-	**Section 10.6**
		Prepare for vessel-based operations out of Dampier	-	**Section 10.7**

LEVEL 2/3 SPILL: INITIAL IAP		Operational period: First 48 Hours		
Timeframe (Within)	**Strategies and timeframe**	**Tactics (what is to be done)**	**Task guidance (ref.)**	
			OSRA	**OPEP**
	minimise impacts to shorelines and wildlife.	Monitor dispersant effectiveness	-	**Section 10.8**
3 hours	Activate **Containment and Recovery Strategy** to minimise impacts to water quality, habitats, and wildlife.	Offshore operations - 6 teams conducting containment and recovery operations guided by aerial surveillance to thickest parts of the slick.	-	**Section 11.3**
12 hours	Activate the nearshore **Protection and Deflection Strategy** to protect shoreline sensitive receptors at Protection Priorities.	Booming configurations to protect sensitivities or deflect oil away from sensitivities	-	**Section 12.3**
12 hours	Activate **Scientific Monitoring Plan** to prepare for assessing and managing impacts from spill and response.	Scientific monitoring plans to be conducted throughout spill response activities as directed by ongoing IAPs.	**Section 9**	-
12 hours	Activate the **Shoreline Clean-Up Strategy** to prepare for and reduce potential shoreline impact	Shoreline assessment and selection of suitable clean-up techniques.	-	**Section 13.3**
12 hours	Activate the **Oiled Wildlife Response** plan to prepare for managing oiled wildlife.	First response tactics	-	**Section 14**
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.	**Section 10**	-
36 hours	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. Transition to Incident Management Team Response Plan (Onshore component) (JS-70-PLN-F-00008).	**Section 6**	-

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 Stag Field Operations.

2. OBJECTIVES

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

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

3. SCOPE

This OPEP applies to oil spill risks associated with operational activities at the Stag Field only described in

Hydrocarbon Characteristics and Behaviour

During the Stag operations activities, the following hydrocarbons may be unintentionally released to the marine environment: oily water, marine Diesel, hydraulic oils and lubricating fluids, or crude oil. The following sub-sections describe the spill modelling parameters.

3.1.1 Diesel

In the marine environment, diesel will behave as follows:

- Diesel will spread rapidly in the direction of the prevailing wind and waves;
- Evaporation is the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
- The evaporation rate of diesel will increase in warmer air and sea temperatures such as those present around Stag platform; and
- Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

ITOPF (2018) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering. For details on the properties of diesel, refer to Appendix A3. Refer to Section 8.6.2 of the EP for a further description of diesel properties, modelling and impact.

3.1.2 Stag Crude Oil

Stag oil is a medium crude with a density slightly lower than seawater and a high viscosity. The oil has a low proportion of volatile compounds due to microbial degradation within the reservoir. Testing of Stag crude (Neff et al.,1996) found that the oil had very low solubility in seawater, with less than 0.3 mg/L of fresh oil being accommodated in seawater (the water accommodated fraction; WAF) at 20°C. This property results from the low concentration of saturated hydrocarbons in the oil. Approximately 44% of the volume is made up of semi-volatile components (boiling point >180 to <265°C) that would likely evaporate over the first three to four days and a further 43% of the volume has a low volatility (boiling point >265 to <380°C), requiring weeks to evaporate. A further 13% is composed of non-volatile (persistent) components (boiling point >380°C) that will disperse in the marine environment over a longer time period. Further detail on Stag Crude oil is provided in Appendix A4.

The viscosity of this oil type would increase through weathering from approximately 112 cP to over 500 cP through the loss of shorter chain components and the uptake of water to form an oil-in-water emulsion. Weathering tests also indicate that the oil will tend to form a stable emulsion by the uptake of up to 81%, by volume, of sea water which will further slow the loss of oil components to the atmosphere. For further information, refer to Environment Plan Section 8.5.1.3.

Table 4-1. Oil spill risks associated with drilling activities are not within the scope of this plan. A schematic of the Stag Field is provided in Figure 3-1.

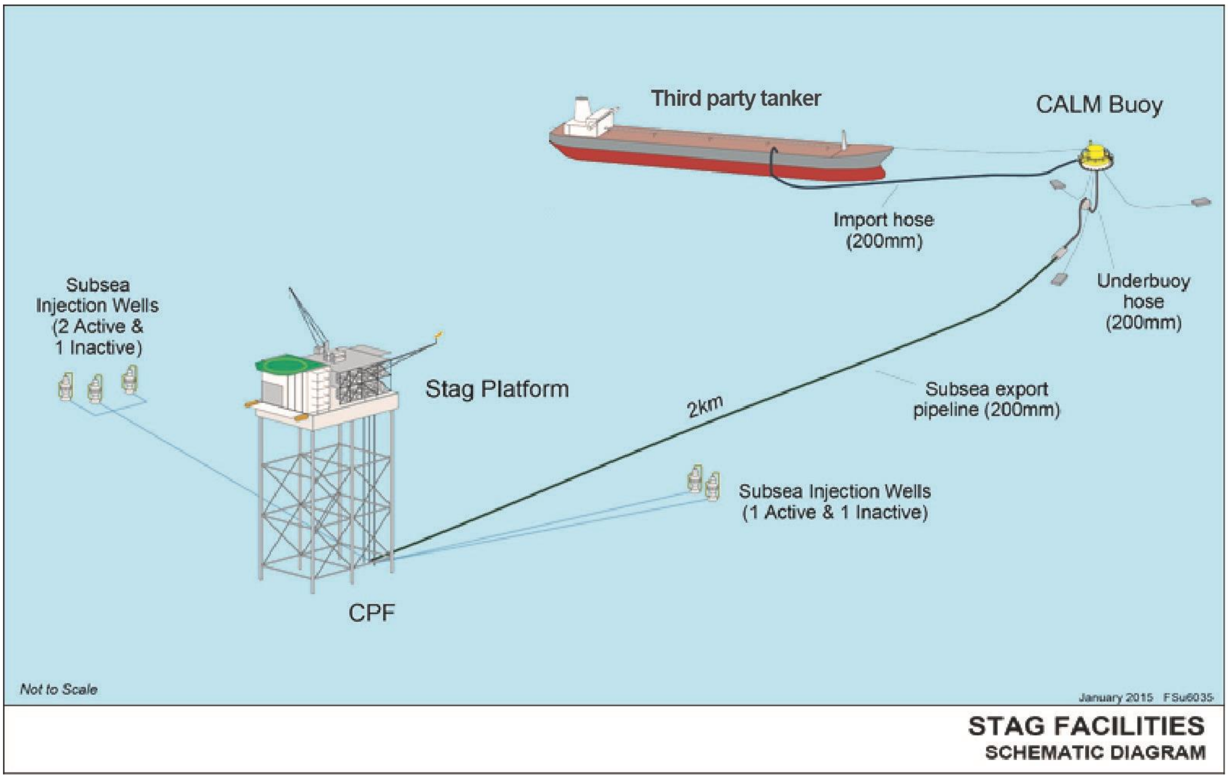

Figure 3-1: Schematic of the Stag Field Facilities

The Stag Field is located approximately 32 km northwest of the Dampier Archipelago and 82 km northeast from Varanus Island, in approximately 49 m water depth. Latitude and Longitude of Stag Central Processing Facility (CPF) and the CALM buoy are provided in Table 3-1.

Table 3-1: Stag CPF and the CALM Buoy Coordinates

Facility	Latitude	Longitude
Stag CPF	20º 17.413' South	116º 16.517' East
CALM Buoy	20° 16.315' South	116° 16.571' East

The geographical scope of this OPEP, which effectively covers the greatest area identified by stochastic spill modelling, extends approximately 500 km north, 500 km west, 350 km north-east, 300 km south-west and 40 km south of the Operational Area.

Section 5 of the Stag Field Environment Plan (GF-70-PLN-I-00002) (the Stag EP) includes a comprehensive description of the existing environment in the Operational Area and the potential spill trajectory area (as predicted by spill fate modelling). A list of the nearest regional features is provided in Table 3-2.

Table 3-2: Distances from Stag Facility to Key Regional Features

Regional Feature	Distance from Stag CPF
Dampier Archipelago	32 km (17.3 Nm)
Closest Montebello Island	75 km (40.5 Nm)
Varanus Island	82 km (44.3 Nm)
Barrow Island	96 km (51.8 Nm)

4. SPILL SCENARIOS AND CONTEXT

An environment risk assessment (ERA) was undertaken as part of the Stag 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 of hydrocarbon losses to the marine environment to ALARP. Refer to Sections 8.4, 8.5 and 8.6 of the Stag EP which contain a summary of all the spill scenarios identified and assessed.

This OPEP has been prepared for the spill scenarios as summarised in

Hydrocarbon Characteristics and Behaviour

During the Stag operations activities, the following hydrocarbons may be unintentionally released to the marine environment: oily water, marine Diesel, hydraulic oils and lubricating fluids, or crude oil. The following sub-sections describe the spill modelling parameters.

4.1.1 Diesel

In the marine environment, diesel will behave as follows:

- Diesel will spread rapidly in the direction of the prevailing wind and waves;
- Evaporation is the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
- The evaporation rate of diesel will increase in warmer air and sea temperatures such as those present around Stag platform; and
- Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

ITOPF (2018) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering. For details on the properties of diesel, refer to Appendix A3. Refer to Section 8.6.2 of the EP for a further description of diesel properties, modelling and impact.

4.1.2 Stag Crude Oil

Stag oil is a medium crude with a density slightly lower than seawater and a high viscosity. The oil has a low proportion of volatile compounds due to microbial degradation within the reservoir. Testing of Stag crude (Neff et al.,1996) found that the oil had very low solubility in seawater, with less than 0.3 mg/L of fresh oil being accommodated in seawater (the water accommodated fraction; WAF) at 20°C. This property results from the low concentration of saturated hydrocarbons in the oil. Approximately 44% of the volume is made up of semi-volatile components (boiling point >180 to <265°C) that would likely evaporate over the first three to four days and a further 43% of the volume has a low volatility (boiling point >265 to <380°C), requiring weeks to evaporate. A further 13% is composed of non-volatile (persistent) components (boiling point >380°C) that will disperse in the marine environment over a longer time period. Further detail on Stag Crude oil is provided in Appendix A4.

The viscosity of this oil type would increase through weathering from approximately 112 cP to over 500 cP through the loss of shorter chain components and the uptake of water to form an oil-in-water emulsion. Weathering tests also indicate that the oil will tend to form a stable emulsion by the uptake of up to 81%, by volume, of sea water which will further slow the loss of oil components to the atmosphere. For further information, refer to Environment Plan Section 8.5.1.3.

Table 4-1 with a focus on the Level 3 scenario. The scenarios modelled represent most likely and worst case scenarios as defined by the National Plan for Maritime Emergencies (AMSA, 2020), however Jadestone understands that other scenarios are possible, such as a Level 2 crude oil spill, and as such Jadestone has made provisions in spill response to guide decision makers for all types of hydrocarbon spillages, at any Level.

When considering the likely behaviour of the hydrocarbons in the receiving marine environment and the total potential volumes of the spill scenarios listed in

4.2 Hydrocarbon Characteristics and Behaviour

During the Stag operations activities, the following hydrocarbons may be unintentionally released to the marine environment: oily water, marine Diesel, hydraulic oils and lubricating fluids, or crude oil. The following sub-sections describe the spill modelling parameters.

4.2.1 Diesel

In the marine environment, diesel will behave as follows:

- Diesel will spread rapidly in the direction of the prevailing wind and waves;
- Evaporation is the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
- The evaporation rate of diesel will increase in warmer air and sea temperatures such as those present around Stag platform; and
- Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

ITOPF (2018) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering. For details on the properties of diesel, refer to Appendix A3. Refer to Section 8.6.2 of the EP for a further description of diesel properties, modelling and impact.

4.2.2 Stag Crude Oil

Stag oil is a medium crude with a density slightly lower than seawater and a high viscosity. The oil has a low proportion of volatile compounds due to microbial degradation within the reservoir. Testing of Stag crude (Neff et al.,1996) found that the oil had very low solubility in seawater, with less than 0.3 mg/L of fresh oil being accommodated in seawater (the water accommodated fraction; WAF) at 20°C. This property results from the low concentration of saturated hydrocarbons in the oil. Approximately 44% of the volume is made up of semi-volatile components (boiling point >180 to <265°C) that would likely evaporate over the first three to four days and a further 43% of the volume has a low volatility (boiling point >265 to <380°C), requiring weeks to evaporate. A further 13% is composed of non-volatile (persistent) components (boiling point >380°C) that will disperse in the marine environment over a longer time period. Further detail on Stag Crude oil is provided in Appendix A4.

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Table 4-1, the persistent or remaining volumes of hydrocarbon that will require longer-term spill response and biodegrade over time have also been outlined with the residual fraction (and volume) estimates also provided.

4.3 Hydrocarbon Characteristics and Behaviour

During the Stag operations activities, the following hydrocarbons may be unintentionally released to the marine environment: oily water, marine Diesel, hydraulic oils and lubricating fluids, or crude oil. The following sub-sections describe the spill modelling parameters.

4.3.1 Diesel

In the marine environment, diesel will behave as follows:

- Diesel will spread rapidly in the direction of the prevailing wind and waves;
- Evaporation is the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60 to 80% reduction of the net hydrocarbon balance;
- The evaporation rate of diesel will increase in warmer air and sea temperatures such as those present around Stag platform; and
- Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

ITOPF (2018) categorises diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering. For details on the properties of diesel, refer to Appendix A3. Refer to Section 8.6.2 of the EP for a further description of diesel properties, modelling and impact.

4.3.2 Stag Crude Oil

Stag oil is a medium crude with a density slightly lower than seawater and a high viscosity. The oil has a low proportion of volatile compounds due to microbial degradation within the reservoir. Testing of Stag crude (Neff et al.,1996) found that the oil had very low solubility in seawater, with less than 0.3 mg/L of fresh oil being accommodated in seawater (the water accommodated fraction; WAF) at 20°C. This property results from the low concentration of saturated hydrocarbons in the oil. Approximately 44% of the volume is made up of semi-volatile components (boiling point >180 to <265°C) that would likely evaporate over the first three to four days and a further 43% of the volume has a low volatility (boiling point >265 to <380°C), requiring weeks to evaporate. A further 13% is composed of non-volatile (persistent) components (boiling point >380°C) that will disperse in the marine environment over a longer time period. Further detail on Stag Crude oil is provided in Appendix A4.

The viscosity of this oil type would increase through weathering from approximately 112 cP to over 500 cP through the loss of shorter chain components and the uptake of water to form an oil-in-water emulsion. Weathering tests also indicate that the oil will tend to form a stable emulsion by the uptake of up to 81%, by volume, of sea water which will further slow the loss of oil components to the atmosphere. For further information, refer to Environment Plan Section 8.5.1.3.

Table 4-1: Identified Scenarios for Hydrocarbon Releases to the Marine Environment

Scenario Level; Spillage Type and NatPlan Defined Level	Hydrocarbon Type	Source / Cause	Total Potential Volume
Level 1 / Most Likely Spill (MLS)			
An incident which will not have an adverse effect on the public or the environment which can be controlled using resources normally available at the facility or vessel concerned without the need to mobilise the Jadestone Incident Management Team or other external assistance. Up to about 10 m³.	Diesel fuel	Release of diesel fuel from bunker transfer	5 m³
Level 2 / Most Likely Spill (MLS)			

Scenario Level; Spillage Type and NatPlan Defined Level	Hydrocarbon Type	Source / Cause	Total Potential Volume
An incident that cannot be controlled using facility resources alone and requires external support and resources to combat the situation; or An incident that can be controlled by the facility but which may have an adverse effect on the public or the environment. About 10 m^3 – 1,000 m^3.	Diesel fuel	Vessel collision/ Loss of integrity: Release of Diesel Fuel from support vessel	350 m^3
	Stag Crude	Vessel collision: Accidental discharge of Stag crude oil from CPF fuel oil tank	15 m^3
	Stag Crude	Accidental discharge of Stag crude oil from process upset on CPF (liquid carryover to flare)	20 m^3
	Stag Crude	Unplanned release of Stag crude oil from import transfer hose (CALM buoy to third-party tanker)	477 m^3
	Stag Crude	Unplanned discharge of Stag crude oil from CPF production equipment	615 m^3
	Stag Crude	Unplanned discharge of Stag crude oil from sub-sea pipeline	546 m^3
Level 3 / Worst Case Spill (WCS)			
Above 1,000 m^3. A large spill requiring national and international assistance OR High environmental impact (oil ashore at sensitive areas)	Stag Crude	Vessel collision/ Loss of integrity: Release of Crude Oil from third-party tanker	6,000 m^3

5. PREDICTED SPILL TRAJECTORY AREA, SENSITIVITIES AND RESPONSE PRIORITIES

Potential shoreline contact and response priorities were identified using spill modelling results and this information has been used to inform the spill assessment process and development of an Incident Action Plan (IAP). The five shoreline locations that were identified as priority protection areas based on modelling thresholds described in the Stag EP, as shown in Figure 5-1 are:

- Dampier Archipelago;
- Montebello Islands;
- Lowendal Islands;
- Barrow Island; and
- 80 Mile Beach.

The response strategies identified in this OPEP will be adopted in the IAP process as required to protect the environmental values of this area.

Refer to the Stag EP for protection priorities and spill modelling summary including impact descriptions of sensitive locations from surface oil, entrained oil and dissolved aromatic threshold concentrations. Section 5 of the Stag EP describes the existing environment at the operational area and within the potential spill trajectory area, and identifies the protected areas and fauna that may be impacted by a spill.

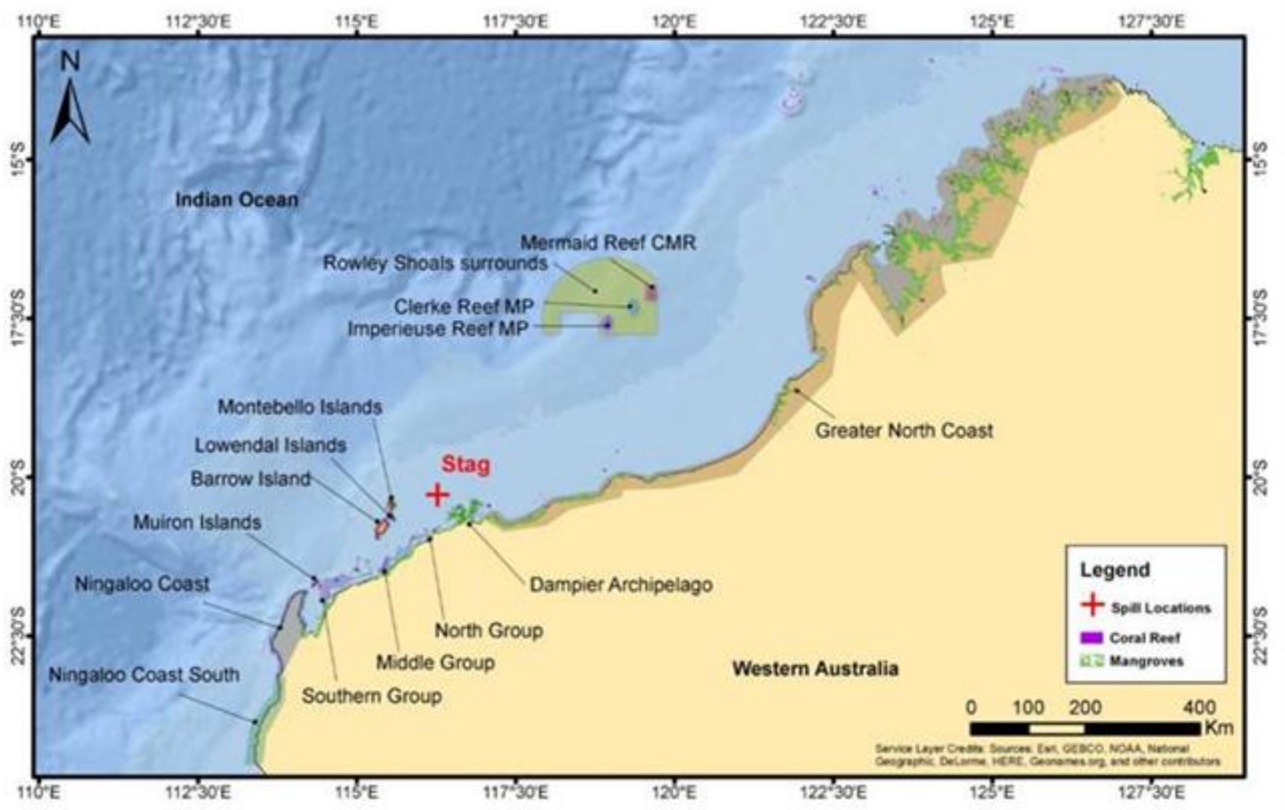

Figure 5-1: Location of Sensitive Receptors Used in Spill Modelling

5.1 The Influence of Chemical Dispersant Use on Projected Spill Trajectory Area

APASA was commissioned by Quadrant Energy to prepare a report, the Net Environmental Benefit Analysis for the Use of Dispersants (APASA, 2012), to assess whether the application of chemical dispersants reduced the probability of contact to shorelines. Key findings of this report at the time included a reduction in the predicted probabilities for shoreline contact, and greater prediction times to sensitive locations following the application of chemical dispersant, particularly effective during the summer months.

Jadestone commissioned APASA to reanalyse the 2012 study (APASA, 2017) to further assess the effects of hydrocarbon dispersant application for the WCS spill scenario and the proposed dispersant treatment plan (refer Section 10 of the OPEP for the plan). Mass balance distribution results show that the application of the proposed dispersant treatment is predicted to reduce the proportion of released oil that would remain floating on the surface. Therefore, the proportion of oil predicted to be entrained in the water column slightly increases with dispersant application, while the proportion of oil that evaporates is slightly reduced. For the modelling replicate with maximum oil accumulation on shorelines a reduction of the proportion of oil ashore is predicted in some locations.

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 8-9 in the EP describes the decision to adopt or not a spill response strategy, and the potential environmental benefit of that strategy for Stag crude. An ALARP discussion regarding each oil spill response strategy is provided in the Stag EP.

Table 6-1 shows the operational tactics for adopted strategies and applicability to the two potential oil types that could be spilled, and operational considerations for incident action plans (IAPs).

The response plans described in Sections 8 to 0 contain both a description of the response strategy and decision-making criteria; and guidance for implementation of the response strategy and mobilisation of resources to respond to the spill and is presented in the form of IAP strategies, tactics and tasks.

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.

Assumptions underlying the response resource planning for dispersant application and containment and recovery are outlined in Appendix A5. Capability to support the minimum resources required has been planned for and is presented in Table 7-1.

The short timeframe for shoreline contact places a priority on response strategies that contribute to reducing the volume of oil to shore. Chemical dispersant application is the first response strategy implemented because of the window of opportunity for efficacy, the area of oil that can be treated and the predicted benefit demonstrated through spill fate modelling.

The containment and recovery strategy complements the dispersant strategy by being able to target areas of floating oil that have not been treated with dispersant. Given the nature and scale of a WCS event from the Stage Facility, it is not realistic to expect to be able to protect all sensitivities or prevent shoreline contact. The mix of resources presented in Table 7-1 provides a basis from which complementary response strategies can be undertaken for protection priorities with a reasonable prospect for positive outcomes.

Spill response planning assumptions have been described in Appendix A5 and take into consideration that:

The weathering properties of Stag Crude are well understood however this does not negate the influence of real time variables on the rate of evaporation and emulsification.
Approximately 44% of the volume of Stag oil spilled is expected to evaporate over the first three to four days.

Of the remaining oil, it is expected to form a stable emulsion by the uptake of up to 81%, by volume, of sea water which will further slow the loss of oil components to the atmosphere.

Table 6-1: Oil Spill Response Strategies and Tactics

OSR strategy	Tactic	Acceptability/ Applicability		Operational Considerations
		Stag crude	Diesel	
Source Control	Refueling: watch alert	⍰	✓	Relevant for spillage during refueling activities
	Bunded areas around machinery and engines	✓	✓	Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment on board the vessels or platform. Bunded areas will minimise the volume of hydrocarbons escaping to marine waters.
	Pipeline isolation and repair	✓	⍰	Relevant for subsea infrastructure failure. E.g. pipeline, flowline or SCM failure
	Securing cargo / trimming	✓	✓	In the event a vessel fuel tank is ruptured, cargo of the affected tank is to be secured via transfer to another storage area on-board the vessel, transfer to another vessel, or through pumping in water to affected tank to create a water cushion (tank water bottom). Trimming the vessel may also be used to avoid further damage to intact tanks. These actions will minimise the volume of fuel spilt.
Operational Monitoring	Aerial, Vessel, Tracking Buoys, Trajectory Modelling Fluorometry Shoreline and coastal habitat assessment	✓	✓	Surveillance actions are used to monitor and evaluate the dispersion of the released hydrocarbon, and to identify and report on any potential impacts to flora and fauna that may occur while the spill disperses. Surveillance results may also be used to assist in escalating or de-escalating response strategies as required. Fluorometry for dispersant monitoring. Shoreline and coastal habitat assessment provides intelligence to the IMT regarding oil contact to shorelines, validation of known sensitivities and potential shoreline cleanup activities.

<table>
<tr><th rowspan="2">OSR strategy</th><th rowspan="2">Tactic</th><th colspan="2">Acceptability/ Applicability</th><th rowspan="2">Operational Considerations</th></tr>
<tr><th>Stag crude</th><th>Diesel</th></tr>
<tr><td>Chemical Dispersion</td><td>Enhance the dispersion rates of hydrocarbon into marine waters</td><td>✓</td><td>⍰</td><td>Stag Crude: Applicable for large crude oil spills. A range of dispersants have been tested for efficacy on Stag crude to enable selection of the most effective dispersant over the weathering period of the crude. Dispersants can be effective to reduce floating slick, and therefore the potential for shoreline contact and oiled wildlife.
Diesel: Diesel is not considered a persistent hydrocarbon, and has high natural dispersion rates in the marine environment. Chemical dispersant application is not recommended as a beneficial option for Diesel as it has a low probability of increasing the dispersal rate of the spill while introducing more chemicals to the marine environment.</td></tr>
<tr><td>Containment and Recovery</td><td>Booms and skimming</td><td>✓</td><td>⍰</td><td>Stag Crude: Applicable for crude oil spills.
Diesel: Given the fast spreading nature of Diesel, and the expected moderate to high sea states of the area causing the slick to break up and disperse, this response is not considered to be effective in reducing the net environmental impacts of a Diesel spill. The ability to contain and recover spreading Diesel on the ocean water surface is extremely limited due the very low viscosity of the fuel.</td></tr>
<tr><td>Nearshore and Shoreline Protection and Deflection</td><td>Deflection and protection booms</td><td>✓</td><td>✓</td><td>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.</td></tr>
<tr><td>Shoreline Clean-up</td><td>Physical removal, surf washing, rock flushing, bioremediation, natural dispersion</td><td>✓</td><td>✓</td><td>Intrusive response that requires careful site-specific planning in order to reduce secondary impacts of beach erosion and secondary contamination beyond shorelines. Flushing may be considered if the oil enters high priority/slow recovery habitats such as mangroves. Natural dispersion will occur as the hydrocarbon is remobilised from rock shelves and hard substrates, while residual 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.</td></tr>
<tr><td>Oiled Wildlife Response</td><td>First response and mobilisation of resources</td><td>✓</td><td>✓</td><td>Applicable 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</td></tr>
</table>

OSR strategy	Tactic	Acceptability/ Applicability		Operational Considerations
		Stag crude	Diesel	
	Reconnaissance, IAP OWR subplan development, hazing, rescue, rehabilitation, release, monitoring.			flocks. Applicable 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	✓	✓	Applicable for marine environment contacted by hydrocarbons either by floating, dissolved or entrained.

7. RESOURCES REQUIRED FOR A WCS SPILL EVENT AT STAG

Table 7-1: IMT Resources Required for a WCS Spill Event at Stag

IMT role	Initial Capability (<48hrs)	Resource Pool	Surge Capability (>2 days)	Contract, MOU or other arrangements in place
IMT Leader	4	Jadestone: • General/Country Manager • Functional Managers	N/A	Jadestone staff
Planning Lead	4	Jadestone: • HSE Staff • Operations Staff • Drilling Staff	>5 AMOSC Mutual Aid AMOSC Core Group	Jadestone staff External resources: • AMOSC MSC
Operations Lead	4	Jadestone: • HSE Staff • Operations staff	>5 AMOSC Mutual Aid AMOSC Core Group	Jadestone staff/contract External resources: • AMOSC MSC
Logistics Lead	4	Jadestone: • Procurement & Supply Chain Staff	>5 AMOSC Mutual Aid/AMOSC Core Group	Jadestone staff External resources: • AMOSC MSC
Finance/ Admin Lead	4	Jadestone: • Finance/Tax Staff • HR Staff	>5 AMOSC Mutual Aid/AMOSC Core Group	Jadestone staff/contract External resources: • AMOSC MSC
Media Support Team	3	Clarity Communications (contractor)	2 Clarity Communications	External resources: • Clarity Communications

Table 7-2: Resources Required for a WCS Spill Event at STAG

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
Operational monitoring							
Satellite tracking	Satellite tracking buoy	2 buoys	None	None	2 buoys	Satellite buoy provider	Metocean Services International
Modelling	OSTM	2 trajectory and weathering models	7 trajectory and weather models	None	9 model outputs	RPS	AMOSC MSC
Aerial surveillance	Aircraft	1 aircraft	2 aircraft	None	2 aircraft	Jadestone aviation contract	CHC / Bristows
	Aerial observers	1 observer	2 observers	None	2 observers	AMOSC Core group	AMOSplan
Vessel surveillance	Vessel of opportunity or contracted	1 vessel	None	None	1 vessel	Jadestone marine contracts	MSAs with vessel providers subject to availability
	1 observer	1 observer	None	None	1 observer	Vessel of opportunity	Master of vessel
Fluorometry	Towable fluorometers	5 fluorometers	None	None	5 fluorometers	Jacobs Environmental or CSIRO	Scientific Monitoring Plan PO and CSIRO via AMSA MOU
UAVs	Short range UAVs with cameras/video	2 UAVs	2 UAVs	None	4 UAVs	Approach service providers at the time when required.	Readily sourced and mobilised.

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
Shoreline and coastal habitat assessment	Trained team leaders and team members trained on site.	5 team leaders, 10 team members (total 15 people).	As determined by OSTM	As determined by OSTM	15 people (5 team leaders, 10 team members)	DoT, AMOSC and AMSA trained shoreline assessment team leaders.	AMOSplan, DoT State Response Team, AMSA MOU.
Chemical dispersant application							
Aerial application	FWADC and pilots	6 spray aircraft	None	None	Rollout plan timing indicates that 3 aircraft on-site at Karratha within 18hrs and additional 3 aircraft onsite by 48hrs. Therefore 6 aircraft within Window of Opportunity, and available for operations according to real-time diminishing effectiveness	FWADC contractor	AMSA, AMOSC, Aerotech 1st Response JSOP

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
	Dispersant (at Karratha airport)	90m^3	144m^3	None	234m^3	AMSA 100m^3 Fremantle AMOSC 110m^3 Exmouth and Fremantle AMOSC 137m^3 Geelong AMSA 40 m^3 from Adelaide and Darwin Refer to Appendix A5 for dispersant budget.	AMSA MOU AMOSC membership
	Air attack observation	1 aircraft 1 observer	None	None	1 air attack surveillance aircraft 1 observer	Jadestone aircraft contracts	CHC / Bristows
	Search and rescue	1 aircraft and pilot	None	None	1 aircraft and pilot.	Jadestone aircraft contracts	CHC / Bristows
Vessel application	Support vessels	4 spray vessels	None	None	4 spray vessels	Jadestone marine contracts	MSAs with vessel providers subject to availability
	Personnel	4 trained responder (1 per vessel) Vessel crew to assist with deployment	None	None	4 trained responder (1 per vessel) Vessel crew to assist with deployment	AMOSC Jadestone marine contracts	AMOSC membership MSAs with vessel providers subject to availability

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
	Spray systems afedo spray system per vessel	8 (2 systems per vessel)	None	None	8 (2 spray systems per vessel)	AMOSC	AMOSC membership
	Dispersant (at Dampier port)	None	32m^3	None	4m^3/day for 4 vessels (16m^3) 2 days spraying = 32m^3	See aerial application	AMSA MOU AMOSC membership
	Spotter plane	1 aircraft 1 observer			1 aircraft 1 observer	Jadestone aerial contracts	CHC / Bristows
Containment and recovery							
Booms	Open water booms	2400 m Ocean Boom and associated hydraulic systems 6 x power packs, tow bridles and 6 x Anchor Kits	None	None	2400 m Ocean Boom and ancillaries	AMOSC AMSA	AMSA MOU AMOSC membership
Vessels	Support vessels	12 vessels	None	None	12 vessels	Jadestone marine contracts	MSAs with vessel providers subject to availability
Skimmers	Open water skimmers	6 x Ocean Weir Skimmer	None	None	6 skimmers	AMOSC AMSA	AMSA MOU AMOSC membership

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
Waste	Waste storage	240 m^3 (IBCs and isotainers)	240 m^3 (IBCs and isotainers)	None	480 m^3 (IBCs and isotainers)	Waste contractor	NWA
Personnel	Trained oil spill responders	6 x trained responder team leaders 42 team members	None	None	48 trained responders	AMOSC core group AMSA NRT	AMSA MOU AMOSC membership
Protection and deflection							
Booms	Nearshore and land sea booms	2,850 m Shoreline protection boom 1,700 m Intertidal protection boom and ancillaries	2,400 m shoreline protection boom 1,200 m intertidal protection boom 1,800 m solid flotation boom 10 x Shoreline and intertidal boom ancillaries	None	9,950 m boom	AMOSC AMSA	AMSA MOU AMOSC membership
Nearshore skimmers	Skimmers capable of operating in nearshore marine environment.	None	5	None	10	AMOSC AMSA	AMSA MOU AMOSC membership
Vessels	Small support craft	6 vessels	4 vessels	None	10 vessels	Jadestone marine contracts	MSAs with vessel providers subject to availability

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
Personnel	Trained oil spill responders	12 trained responders 24 labour hire and/or AMOSC mutual aid personnel	8 trained responders 16 labour hire and/or AMOSC mutual aid personnel	None	20 trained responders 40 labour hire and/or AMOSC mutual aid personnel	AMOSC core group AMSA NRT	AMSA MOU AMOSC membership
Shoreline clean-up							
Personnel	22 trained shoreline team leaders and 198 team members/labourers trained on site.	Mobilise to site ready for deployment from day 3.	As determined by OSTM	As determined by OSTM	220 people (22 trained shoreline team leaders and 198 team members/labourers trained on site).	Labour hire contract Global Spill Control AMOSC core group DoT AMSA	Access Human Talent Global Spill Control AMOSC membership AMSA MOU
Waste	Bins, containers, bags	Mobilise to site ready for deployment from day 3.	22 x 3 kL Waste skips 22 x IBCs	As determined by OSTM	22 waste skips 22 IBCs	Waste contractor	NWA

Response tactic	Capability details	Capability required within 48hrs	Additional capability required within 7 days	Additional capability required within 14 days	Total required	Providers and quantities	Contract #, MOU or arrangement
Shoreline clean up equipment	Kits		Shoreline Clean-up Kits (Decontamination, Beach Wash Down, Initial IAP Support and Beach Clean-up Kits) Rope Skimmer and Collection Trailer 4 x Fast tanks Oil Vacuum Collection	Shoreline Clean-up Kits (Decontamination, Beach Wash Down, Initial IAP Support and Beach Clean-up Kits)		AMOSC AMSA	AMSA MOU AMOSC membership
Oiled wildlife response	Refer to section 14						AMSA MOU AMOSC membership DBCA and DBCA network

Personnel required to support the IMT functions and response strategies are grouped according to source and skill base. The Jadestone group are those who are sourced from Jadestone directly, they are staff based in the Perth office and offshore on the Stag facility. 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. Mutual Aid/contractors/service providers group is made up of industry members, i.e. staff of other operators; 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 7-3 provides a summary of the cumulative personnel resource requirement across the three sources.

Table 7-3: Cumulative Personnel Requirement Across Response Activities and Source

Function	TOTAL Personnel required – team members or labour hire	Jadestone	AMOSC Core Group	Mutual Aid /Contractors/Service providers
IMT functions	**57**	24	33	-
Monitor and evaluate	**20**	-	5	15
Chemical dispersant operations	**18**	-	6	12
Containment and recovery	**48**	-	6	42
Protection and deflection	**60**	-	20	40
Shoreline clean-up	**220**	-	22	198
TOTAL personnel required and source	**365**	**24**	**105**	**236**

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 team involved in the response.

8.1 Initiation and Termination Criteria

Tactics	Initiation criteria	Termination criteria
Vessel or platform release	Spill observed.	Release of oil ceased, spilled oil that has been contained is cleaned up and disposed of.
Hydrocarbon storage or fuel tank rupture		

8.2 Tactics

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

- Vessel and CPF/third-party tanker releases - minor spills with small volumes of hydrocarbons such as bilge/ oily wastewater, hydraulic fluids, or diesel;
- Fuel tank release from vessel collision (diesel for support vessels);
- Stag crude release from vessel collision with third-party tanker; and
- Subsea pipeline rupture – release of Stag crude.

The IMT 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 and Platform 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 60 m^3/h pump rate and a release duration of up to five mins) as bunkers are taken with a watchman on deck of the supply vessel and a pump stop at the bunker station. For a rupture to the import hose the worst-case release volume is estimated at 477 m^3 Stag crude. For a subsea pipeline release the worst-case release volume is estimated at 546 m^3.

If a rupture or leak occurs in the topside processing equipment, the wellhead and topside valves will automatically close and production will cease in accordance with the Safety Critical Elements Performance Standards Report (GA-70-REP-F-00007). Shut off valves are regularly serviced and tested to ensure they will work properly if required. Released oil will be captured in the CPF's bunds, which have closed drainage systems that deliver drainage water (which may contain hydrocarbon contamination) to a designated storage tank. The third-party tanker and support vessels also have closed drainage systems for capture of onboard leaks.

The spilt hydrocarbons contained onboard the third-party tanker 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.

Collected fluids are processed and treated to meet the OIW content specification of <30 mg/l prior to discharge. 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. Closed drains on the platform and third-party tanker will isolate a spill that falls in these areas from the marine environment.

In the event hydrocarbon is spilt onto the decks of the vessel/ platform, the relevant SOPEP, or Jadestone's Stag Incident Response Plan (GA-90-PR-F-00041) in the case of the CPF, will be implemented. Sorbent materials are used from spill kits onboard 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/ Vessel Master will confirm that the drainage network is closed and will not discharge to the ocean.

Section 8 of Stag 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 (Fuel source)

Stag Crude from the third-party tanker (Product)

Stag crude oil export offtake activities (from third-party tanker to offtake tanker) will take place as per the requirements of the Stag Marine Tanker Operations Manual (GF-00-MN-H-00037).

In the event hydrocarbon (diesel or Stag crude) is released from the third-party tanker due to a ruptured cargo or bunker tank, 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.

Accidental release of hydrocarbons from the third-party tanker or support vessels to the marine environment is managed 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 Resource Rationale for Source Control

Response resources required for Level 1 spill response capability are consistent with the tasks that can be undertaken on the CPF and third-party tanker.

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 Initiation and Termination Criteria

Tactic	Initiation Criteria	Termination Criteria
Tracking buoys	Immediately once Level 2/3 oil spill is confirmed	Tracking buoy no longer required to inform common operating picture.
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
Spill fate modelling	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 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
UAV deployment	OSTM predicts shoreline impact to inaccessible area not able to be covered by aerial or vessel surveillance tasks.	UAV surveillance no longer required to inform common operating picture.

9.2 Tactics

The following tactics are sufficient for supplying all required information to inform response decisions to reduce impacts resulting from the worst-case potential spill, from the Stag Operations, to ALARP:

- Vessel surveillance;
- Aerial surveillance;

- Tracking buoys;
- Spill fate modelling;
- Fluorometry;
- Shoreline and coastal habitat assessment using Shoreline Clean-up Assessment Technique (SCAT) surveys; and
- UAVs.

9.3 Operational Monitoring Action Plan

Table 9-1: Operational Monitoring Action Plan

OPERATIONAL MONITORING ACTION PLAN						
Time from Incident	**Who to activate**	**Equipment Mobilisation and Owner**		**Personnel**	**Vessels/ aircraft**	**Deployment Location**
1 hour	Jadestone OIM	Satellite tracking buoy deployed	Deployed from Stag CPF	Jadestone OIM		Stag CPF
1 hour	PlanningTeam Lead	Submission of OSTM request to RPSAPASA via AMOSC (call off contract with RPS Group)	RPS APASA(via AMOSC call off contract)	RPS APASA (via AMOSC call off contract)	n/a	Perth IMT
4 hours	Operations Team Lead	Aerial surveillance mobilised and en route for first observation. Then 2 x per day.	Jadestone aerial contractors	AMOSC core group aerial observer or industry MOU aerial observer for routine passes.	Helicopter or fixed wing aircraft with over wing configuration for visibility.	Karratha airport.
4 hours	Operations Team Lead	Vessel surveillance mobilised and en route for first observation. Then as directed by IMT	Jadestone vessel contractors	AMOSC core group observer or industry MOU observer.	Jadestone support vessel/vessel of opportunity.	Dampier port
24 hours	Planning Team Lead	Fluorometry if chemical dispersant applied.	Deployed by service provider (CSIRO)	Service provider	Jadestone support vessel	Dampier port
36 hours	Operations Team Lead	Shoreline and coastal habitat assessment teams deployed to protection priorities ready for assessment activities by day 3.	AMOSC core group (SCAT team leaders) WA DoT State Response Team (SCAT team	3 people per team - 1 SCAT team leader and 2 team members. 5 teams making up a total of 15 people (see Table 9-2).	Vessels depending on location such as remote islands. Vehicles for mainland locations.	TBD based on OSTM

OPERATIONAL MONITORING ACTION PLAN						
Time from Incident	**Who to activate**	**Equipment Mobilisation and Owner**		**Personnel**	**Vessels/ aircraft**	**Deployment Location**
			members)			
36 hours	Planning Team Lead	UAVs	UAV service provider	Service provider	n/a	TBD based on OSTM

9.4 Tasks for Tracking Buoy Deployment

Deployment of satellite tracking buoys is to be initiated by support vessels within one hour of spill notification, and then placed within the plume to follow the movement of a surface spill in the marine environment.

Satellite tracking buoys are to be mobilised via the support vessels. A loadmaster/ crewman is to accompany the support vessel and deploy the tracking buoy from the support vessel once on location as directed by the OIM. The buoys are not to be dropped from a height of greater than 10 m to water surface.

The time taken to deploy the tracking buoys will depend on the location they are sourced from and steam time for the vessels to retrieve and deploy. Initiation of deployment will occur within one hour of notification then 24 hours after spill.

If weather conditions are not amenable to support vessel deployment, the tracking buoys located on the Stag Platform can be deployed under the direction from the IMT Leader. When deploying buoys the following steps are to be taken:

- Remove buoy from packaging;
- Remove On/Off magnet and place in safe location (back in the box);
- Deploy buoy into the water from height not greater than 10 metres; and
- Inform On-Scene Commander that the buoy has been deployed.

Tracking 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 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.

One satellite tracking buoys deployed day 1 and then one more on day 2. Two buoys are used to capture metocean conditions and as a backup if one does not work. The buoys can be collected and redeployed if needed. This is not anticipated because there is also aerial surveillance available and the WCS scenario is not continuous.

9.5 Tasks for Vessel Surveillance

Direct observations from the third-party tanker and 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 inform response strategies.

If the IMT determine metocean conditions are conducive for vessel surveillance, they will initiate available (undamaged) support vessels and crew. Vessel surveillance is to be instructed by the OIM (Level 1) or IMT Leader (Level 2 or 3). Vessel surveillance observations will be used by the IMT in conjunction with Aerial Surveillance information and satellite tracking buoys (Level 2 or 3) to confirm floating slick location and extent to inform and develop response strategies.

Reports will be provided to the OIM (Level 1) or IMT Leader (Level 2 or 3) providing information on spill location, weather conditions, marine fauna sighting's and visual appearance of the slick. This information is to be included in the Vessel Surveillance Observer Log (refer Appendix A1.) Photographic images are to be taken and included with log report, as well as marine fauna sightings. Completed logs will be emailed to the IMT following each hourly recording.

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

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.

9.6 Tasks for Aerial Surveillance

Mobilise the trained Aerial Observers through the AMOSplan arrangements. Aerial surveillance is used to record the presence of floating hydrocarbon as well as other environmental observations including weather conditions, marine fauna and sensitive receptors in the area.

Develop an overflight schedule consisting of two passes separated by six hours per day of aerial surveillance over the spill location. The frequency of flights is 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. Flights are only to occur during daylight and in weather conditions that do not pose significant safety risks.

Aerial observers supply data to the IMT to enable the assessment of the spill and decisions on response strategies. Aerial Observers are required to complete the Aerial Surveillance Observation Log supplied in Appendix A1 and submit to the IMT for each flight. The directions for use of the log are contained within the log. Valuable information will be contained within the photographic images taken by the Aerial Observer and provided to the IMT. It is within the IMT that the images and information is disseminated to provide for response strategy direction.

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 Code (Bonn Agreement, 1998) (Appendix A2).

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.

Completed aerial surveillance logs, including the completed log form, marine fauna sighting record, photographs/ video footage, and map showing extent of slick is forwarded to Jadestone IMT Leader and spill fate modelling service provider within one hour of surveillance flight return.

Mobilise personnel from the AMOSC Aerial Observer Core Group or industry members which Jadestone has an MOU with for resources to helicopter launch sites.

Initial helicopter support will be provided from Karratha using on-contract helicopters to Jadestone.

9.7 Tasks for Spill Fate Modelling

Spill fate modelling will be provided by RPS via a call off contract with AMOSC. The fate modelling service is to be initiated by submission of the RPS trajectory modelling request. Fate modelling would start within two hours of submission of the request.

Contact AMOSC Duty Manager to arrange access to fate modelling service.

Daily updates on the spill's behaviour will be provided 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 to verify and adjust fate predictions of the spill and improve predictive accuracy.

9.8 Tasks for 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.

Sub surface gliders containing fluorometers built into the body of the glider will be used preferentially for this monitoring. 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, fluorometers towed behind vessels will be used as an alternative or complementary approach. Jadestone has engaged Jacobs 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 available, within 24 hours five fluorometers will be used in surveys around protection priorities.

9.9 Tasks for 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 A7 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

9.9.1 Reconnaissance – Aerial Survey

Shoreline information collected via aerial surveillance will be recorded as geo-referenced digital imagery (video and/ or still images) and through completion of a Shoreline Aerial Surveillance Log (Appendix A1). These outputs will be used to guide ground survey activities. UAVs may be used instead of aerial surveillance.

9.9.2 Reconnaissance – Ground Survey

Ground surveys undertaken on foot, by vehicles or by small vessel will occur at prioritised areas to provide a close-range assessment of shoreline physical characteristics, coastal habitats/ fauna, scale and character of oiling and safety/ access constraints.

Ground surveys of shorelines and coastal habitats/ fauna may employ the use of unmanned aerial vehicles (UAVs) and operators, deployed locally, for providing close range surveillance (video and still imagery) on terrain that is difficult to access. Ground surveys are to be provided by trained oil spill responders as per those required for managing shoreline clean-up operations (AMOSC, SRT, NRT). The deployment of ground survey teams will be informed by the IMT in consultation with DoT as the Hazard Management Agency (HMA) marine oil pollution incidents in State Waters.

Shoreline surveys will be undertaken within segments that are recorded and/ or mapped that share common traits based on coast geomorphology, habitat type, fauna presence, level of oiling or access. Information on shoreline character and habitat/ fauna distribution for each segment will be recorded using the following techniques:

- Still or video imagery collected with simultaneous GPS acquisition;
- Field notes together with simultaneous GPS acquisition;
- Mud maps outlining key natural features, oil distribution, imagery locations of quantitative data (transects, oil samples);
- Transects (cross-shore, longshore) and vertical sediment profiles; and
- Samples of oil and/or oiled sediments.

The following parameters are to be assessed:

- Physical characteristics: rocky, sandy beach, flat, dune, other wetland;
- Major habitat types: mangrove, salt marsh, saltpan flats, fringing reef, rubble shore, seagrass verge;
- Coastal fauna and key habitats (e.g. nests) including quantification/ distribution of oiled fauna;
- State of erosion and deposition: deposition, erosion, stable;
- Human modified coastline (access tracks, facilities etc); and
- Oil character, if present, including appearance, surface thickness, depth (into sediments), distribution, area and percentage cover.

9.10 Tasks for Deployment of UAVs

UAV (drone) imagery is considered a supplementary source of information that can improve awareness but is not critical to the response. Drones are available from a multitude of suppliers upon request and at cost on an 'as needs' basis. The drones are required to access shorelines that are difficult to access for personnel, and to take photographic images of the shorelines. This is most useful in heavy mangrove areas and where hazards exist such as crocodiles.

Only small drones are required with a maximum flight capability of 1km. These types are available from multiple suppliers without lead times. Imagery will be available subject to the fly-over patterns of the drones.

Once the need for UAV is established, the IMT will notify one or more of the service providers in the Capability table for deployment. Based on the availability of many well-established service providers, a formal contractual arrangement was not deemed to be necessary especially when this is considered as supplementary information.

9.11 Resource Rationale for Operational Monitoring

Aerial surveillance, satellite trajectory buoys and spill fate modelling are the primary operational monitoring tactics used to determine the extent of the spill. They are designed to provide real time observational data for the IMT and to validate response planning modelling. Resources allocated for these tasks are sufficient to provide observations and predictions to the IMT within a reasonable timeframe. Vessel observation, UAVs and fluorometry are secondary tactics which can be used to complement the information gathered through the primary tactics.

Shoreline assessment teams are made up of three members per team and are assumed to be able to cover at least 10 km 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 Dampier Archipelago and Eighty Mile Beach present the greatest resource requirement of 15 assessors (five teams of three members each) as presented in Table 9-2, although the time to contact is shorter for Dampier Archpielago. 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 is assumed that by preparing for this capability, Jadestone will be able to meet lesser shoreline assessment requirements for other locations.

Note: SCAT numbers are not cumulative as this data represents stochastic modelling outputs. A spill would not contact all receptors modelled. Then number required would be based on direction of spill and timeframes to contact.

Table 9-2: Resource Rationale for Shoreline Assessment Personnel

Receptor	Minimum time to shoreline oil at >100g/m² (days)	Accumulated oil on shoreline in worst replicate simulation (m³)	Oiled shoreline at concentrations >100 g/m² in worst replicate simulation (km)	Number of shoreline assessment teams required (1 team per 10km)	Number of shoreline assessors required (3 assessors per team)
Dampier Archipelago	7	2,122	79	5	15
Montebello Islands	8.5	206	29	2	6
Barrow Island	17	317	32	3	9
Lowendal Islands	16	114	29	2	6
Eighty Mile Beach	16.5	1,506	178	5	15

10. CHEMICAL DISPERSION STRATEGY

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 be used to:

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

10.1 Initiation and Termination Criteria

Chemical dispersant tactics are:

- Decision to use chemical dispersant (NEBA);
- Mobilising dispersant;
- Aerial application of dispersant;
- Vessel based application of dispersant; and
- Dispersant efficacy testing.

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

Tactic	Initiation criteria	Termination criteria
Decision to use chemical dispersant	Assessment commences immediately when a Level 2 or 3 spill incident (Stag Crude) is confirmed	When there is no net environmental benefit of continuing dispersant application.
Mobilising dispersant	Immediately when Level 2 or 3 spill incident (Stag Crude) 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
Aerial application of dispersant via FWADC aircraft	Immediately when Level 2 or 3 spill incident (Stag Crude) is confirmed	When there is no net environmental benefit of continuing dispersant application 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 (Stag Crude) is confirmed	When there is no net environmental benefit of continuing dispersant application Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response
Dispersant efficacy testing	Assessment commences immediately when a Level 2 or 3 spill incident (Stag Crude) is confirmed	When dispersant is no longer being applied.

10.2 Chemical Dispersant Action Plan

Table 10-2: Chemical Dispersant Mobilisation and Deployment (6 FWADC and 4 vessels)

CHEMICAL DISPERSANT ACTION PLAN				
Timeframe post incident		**Phase**	**Who to activate**	**Actions**
Day	**Hours**			
1	**0-6**	Resources activated	IMT Leader	Activate FWADC and JSOP with AMOSC and AMSA request 6 x aircraft and associated resources as per JSOP
			Logistics Lead	Mobilise vessels x 4 and associated equipment
			Logistics Lead	Mobilise air attack support (plane and pilot)
			Logistics Lead	Mobilise SAR (plane and pilot)
			Logistics Lead	Mobilise dispersant from WA and east coast stockpiles (AMSA and AMOSC) (refer Appendix A5)
			Operations Lead Planning Lead	Develop Concept of Operation document with AMOSC and AMSA
			Planning Lead	Activate Core Group for aerial observation and vessel dispersant operators
		Resources ready at 6 hours	n/a	AMSA Dampier dispersant stockpile available for marine deployment (20m^3)
	6-18	Resources activated	Operations Lead	Prepare staging areas for aerial and marine deployment
		Resources ready at 18 hours	n/a	AMOSC Exmouth dispersant stock at airport (75m^3)
				3 x FWADC aircraft arrive at Karratha
				2 x aerial observers for dispersant operations available (Core Group)
				Ready to conduct field trials of aerial dispersant application
				Spotter plane and SAR
	18-24	Chemical dispersant applied	Operations Lead	FIELD TRIAL APPLICATION - 3 x FWADC aircraft @ 3m^3 each per sortie x 5 sorties per shift (10hrs daylight per day) x 1 shift = 45m^3 of dispersant applied
				BALANCE OF DISPERSANT STOCK AVAILABLE = 50m^3
2	**24-48**	Resources ready at 24 hours	n/a	100m^3 AMSA stock in 24hrs from Fremantle
				35m^3 AMOSC stock in 24hrs from Fremantle
				4 x vessels and associated equipment
		Chemical dispersant applied from 38 hours	Operations Lead	SECOND APPLICATION - 3 x FWADC aircraft @ 3m^3 each per sortie x 5 sorties per shift (10hrs daylight per day) x 1 shift = 45m^3 of dispersant applied
		Resources ready at 48 hours	n/a	16 AMOSC Core Group Operators for vessels dispersant application

CHEMICAL DISPERSANT ACTION PLAN				
Timeframe post incident		**Phase**	**Who to activate**	**Actions**
Day	**Hours**			
				4 x vessels and associated equipment
				3 x FWADC aircraft @ 1.8m³ each
				3 x FWADC aircraft @ 3m³ each
				2 x aerial observers for dispersant operations available (Core Group)
				Spotter plane and SAR
				137m³ AMOSC stock in 48hrs from Geelong
				20m³ AMSA stock in 48hrs from Adelaide
				20m³ AMSA stock in 48hrs from Darwin
				BALANCE OF DISPERSANT STOCK AVAILABLE = 317m³
3	**48-72**	Chemical dispersant applied from 48 hours	Operations Lead	THIRD APPLICATION - 6 x FWADC aircraft working – 3 @ 3m³ dispersant each per sortie and 3 @ 1.8m³ dispersant each per sortie = 72m³ dispersant delivery per shift (10hrs daylight per day)
				4 x vessels @ 4m³ dispersant each per vessel per day = 16m³ per day
				Aerial observer (Core Group) to follow vessels
				BALANCE OF DISPERSANT STOCK AVAILABLE = 229m³
4	**72-96**	Chemical dispersant applied from 72 hours	Operations Lead	FOURTH APPLICATION - 6 x FWADC aircraft working – 3 @ 3m³ dispersant each per sortie and 3 @ 1.8m³ dispersant each per sortie = 72m³ dispersant delivery per shift (10hrs daylight per day)
				4 x vessels @ 4m³ dispersant each per vessel per day = 16m³ per day
				Aerial observer (Core Group) to follow vessels
				BALANCE OF DISPERSANT STOCK AVAILABLE = 141m³

10.3 Tasks for Deciding to Use Chemical Dispersants

Critical to performance and effectiveness of the chemical dispersant is the weathering state of the oil it is being applied to. Semi-Quantitative Effectiveness Test (SQT) results for Stag crude, referenced to the analysis of the crude in its present state from reservoir (Stag crude is significantly degraded from reservoir), indicate that chemical dispersants would be best applied (Window of Opportunity) within the first 72 hours (three days) of a spill before the crude becomes too weathered for effective application. The SQT method applied to the Stag crude has shown an average 40% effectiveness of the three types of chemical dispersant available through AMSA and AMOSC on the NWS with the maximum effectiveness of 60%.

Given these results, Jadestone has prioritised the use of Dasic Slickgone NS and Corexit 9500. There are sufficient stockpiles of Slickgone NS and Corexit 9500 to sustain dispersant application for the entire duration of dispersant application (Appendix A9).

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.

It is important to activate the Chemical Dispersion Application Plan for 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 evaluated through the NEBA and IAP processes.

Jadestone will apply chemical dispersants to Stag crude as soon as practically possible to maximise the application rate over 72 hours from release to be within the Window of Opportunity. Due to the variability in effectiveness, Jadestone will monitor the effectiveness to assess whether to continue application through the NEBA process.

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 and consider:

- Is it safe to conduct chemical dispersant operations?
- Is the oil dispersible? (existing understanding of Stag Crude)
- Is the environment suitable for chemical dispersant operations? (water depth, weather)
- Does the oil texture allow for chemical dispersant operations? (thickness, appearance)
- Are the resources available for deployment?
- Is the mobilisation time within the Window of Opportunity?
- Has the approval for chemical dispersant spraying been granted by the appropriate authorities?
- The geographic constraints listed in section 10.6.1

10.4 Chemical Dispersant Application Area and Timing

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 (see Section 9).

The controls for the location of chemical dispersant application are defined in the EP (Section 7.8.3).

10.5 Tasks for Mobilising Chemical Dispersants

Access to the National Plan stockpiles is via AMOSC and AMSA. The IMT will request the delivery of chemical dispersant stocks to the Dampier Port (vessel-based application) and Karratha airport (FWADC application) from AMOSC and AMSA stockpiles. AMSA chemical dispersant located in Dampier will begin arriving at Dampier Port for initial loading onto dispersant application vessels within 6 hours of mobilisation activation. AMOSC dispersant stocks located in Exmouth are to be road transported from Exmouth to Dampier Port and Karratha airport within 18 hours.

There are sufficient dispersant stocks in Exmouth and Dampier to last the first 24 hours at the defined application rates, with sufficient stocks available from other locations within the required transport time for ongoing operations of the 4 x vessels and 6 x FWADC aircraft. The Window of Opportunity for chemical dispersants to Stag crude 72 hours is expected to close before stocks will be exhausted. Refer to Table 1 in Appendix A5 for details of the dispersant application budget.

Under the MOU between AMSA and Jadestone, AMSA will provide all resources available through the National Plan in support of a Jadestone Offshore Oil & Gas spill response, which includes all logistical services to transport chemical dispersants from National Plan stockpiles to location at Dampier. All stockpiles are deliverable to any other stockpile location in Australia within 48 hours. The required inventory of dispersant would be transported to Dampier and Karratha within 3 days of the incident.

10.6 Tasks for Aerial Application of Chemical Dispersants

The IMT Leader is to complete the Joint Standard Operating Procedure (Appendix A6) and submit to AMSA to enable activation of the National Plan Fixed Wing Aerial Dispersant Capability (FWADC) aircraft.

Notification and activation of AMSA is to be made through RCC Australia. AMSA will deploy appropriate aircraft to a designated airstrip close to the spill location (e.g. Karratha Airport), and arrange for pilots, Air-Attack Supervisors, observation aircraft (one per two attack planes), trained observers, and the Search and Rescue Department for on-site emergency preparedness (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. Aerial chemical dispersant application will commence within 24 hours (using worst case response time) of initial AMSA notification (daylight and weather condition dependent). Aerotech 1st Response can have three FWADC aircraft at Karratha airport 18 hours after activation and another three aircraft to Karratha within 48 hours after activation.

10.6.1 Chemical Dispersant Application Area and Timing

All chemical dispersant operations will occur during daylight hours only.

At no time, can chemical dispersant be applied:

- In waters shallower than 20 m (LAT);
- Within 10 km of water shallower than 20 m;
- Within exclusion zones for offshore facilities;
- Within a Marine Park boundary or its buffer; and/or
- Within State Waters unless approved by the HMA.

The application of chemical dispersants will occur as soon as possible to ensure that chemical dispersant is applied to freshest oil. The WCS scenario for Stag is an instantaneous spill meaning that there is finite volume of oil to treat and ongoing release of oil is not occurring.

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 20 m 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 Planning Team Lead so that an assessment of movement of dispersed oil into State Waters can be made.

Small breakaway patches of Stag crude 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.

10.7 Tasks for Vessel-Based Application of Chemical Dispersant

Vessel based chemical dispersant application is activated within 6 hours of spill notification as a safeguard, due to the time it takes for the vessel to arrive at the spill location within 24 hours (using worst case response time). The key steps in mobilising this response are:

- Jadestone contracts four suitable vessels through existing contracts to carry vessel-based dispersant equipment;
- Mobilise supply vessels to Dampier Port to receive dispersant, load and ship to the dispersant spray vessels at the spill location (if required); 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 500 L/hr of dispersant meaning that for four vessels spraying for eight 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 4 m^3 of dispersant per day will be required for each vessel (16 m^3/d for all four vessels).

One AMOSC Core Group Responder is 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 Operations Lead via Core Group Responders on-board the vessels with spray equipment. The Operations Lead is responsible for terminating application when chemical dispersants are no longer effective.

10.8 Tasks for Dispersant Effectiveness Monitoring

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.

Photos of chemical dispersant being effective are shown in Figure 10-1, Plate 1 and should show the following signs:

- Coffee colour in underlying water;
- Loss of distinctive edges and replacement with more diffuse edges;
- Changes in colour of the oil;
- Subsurface oil; and
- Increase in slick area (short term 1–2 hours) and subsequent decrease (2–8 hours).

Photos of chemical dispersant being ineffective are shown in Figure 10-1, Plate 2 and should show the following signs:

- Absence of the above;
- Milky white colour in the water. This is dispersant in the water and suggests the dispersant has missed the oil or failed to cut through the oil; and
- Immediate breakup of the slick into thick dark bands due to the dispersant's effect on surface tension. The oil should respread over time.

The effectiveness of the aerial based chemical dispersion strategy is communicated to the Operations Lead via the Air-Attack Supervisors, who are supplied by AMSA through the FWADC. Air-Attack Supervisors will advise the Operations Lead if chemical dispersant application operations are to be terminated. Termination of spraying will be decided once successful dispersion has been achieved and further efforts no longer have an environmental benefit.

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.

Plate 1: A coffee coloured plume indicates the **effective** application of dispersant on an oil slick.

Plate 2: A cloudy white plume indicates that dispersant is **ineffective** or the dose rate is too high.

Figure 10-1: Effective and Ineffective Dispersant Application

10.9 Resource Rationale for Chemical Dispersant Application

An estimation of the resources required for the chemical dispersant strategy was undertaken and an analysis provided in Appendix A5 Spill Response Scenario Planning. Deployment of dispersant application vessels and planes will allow the required dispersant application rate for treating all surface oil to be met at Day 1 until Day 4. The FWADC aircraft are considered the primary platform for dispersant application operations because of the ability to treat large areas of oil with dispersant at the required dosage and droplet size. Vessels are considered a suitable supporting option for dispersant operations given that the spill site is within vessel range/ endurance, and the oil may be patches on the water, favouring the more targeted approach from vessels.

The most recent QET results for Stag crude, referenced to the analysis of the crude in its present state from reservoir (Stag crude is significantly degraded from reservoir), indicate that chemical dispersants (Corexit 9500, Slickgone-NS, Shell VDC and Finasol OSR-51/52) could be effectively applied (Window of Opportunity) within 72 hours (three days) of a spill with Corexit 9500, Shell VDC and Slickgone-NS exhibiting peak effectiveness at 24 hours of weathering.

Supply of these dispersants can be met from national stockpiles accessed through existing contracts/ agreements. To date, the AMSA Oil Spill Control Agent (OSCA) Register contains stocks of Finasol 51 and 52, Dasic Slickgone NS, Dasic Slickgone EW and Ardrox 6120, Dasic Slickgone LTSW and Corexit EC9500A (which are on the transitional list). These stocks are available to Jadestone in a response through the AMSA MOU. The AMOSC dispersant stockpiles consists of Dasic Slickgone NS in Exmouth, Corexit 9500 in Fremantle, Slickgone NS in Fremantle; and Corexit 9500 and Slickgone NS in Geelong, and are available to Jadestone in a response through the AMOSC MSC.

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).

The OSRL stockpile in Singapore contains Dasic Slickgone NS, Finasol OSR-52, Corexit 9527 and Corexit EC9500A. OSRL in Singapore has the Hercules C130 which would arrive at a selected north-west airport (i.e. Karratha) on Day 2. The Hercules is suitable for wide and ongoing oil slicks; however, Jadestone's spill is a defined amount and timeframe. Jadestone can start aerial dispersant spraying within 18 hours using the FWADC. By Day 2, the spill will have split into windrows and aerial application of dispersant is more efficient and targeted by using smaller craft; such as those in the FWADC. There is no environmental benefit to spraying dispersant onto large swathes of sea surface and hitting only strips of oil. Therefore, Jadestone considers that the use of the Hercules C130 will not be an efficient use of resources, and would result in overspraying, increasing the concentrations of oil in the water column unnecessarily, which is not an environmental benefit.

National logistics arrangements for mobilisation of dispersants to deployment locations within the required timeframes have been confirmed. Jadestone considered alternative and additional measures to improve the delivery of chemical dispersant from this Plan and this is discussed in Table 8-13 of the EP.

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.

11.1 Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
Offshore containment and recovery	Immediately when Level 2 or 3 spill incident (Stag Crude) is defined.	When boom encounter rate (BER) is less than $10m^3$ per hour (one third the estimated BER in day 2).
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.

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); 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.

11.3 Containment and Recovery Action Plan

When the containment and recovery strategy is activated, the Planning Lead in consultation with the Logistics Lead will, with the approval of the IMT Leader, begin mobilisation and deployment of resources identified in

Table 11-1.

Table 11-1: Containment and Recovery Mobilisation and Deployment (6 teams, 2 vessels per team)

CONTAINMENT AND RECOVERY ACTION PLAN						
Time from Incident to mobilisation site	**Who to activate**	**Equipment Mobilisation and Owner**		**Personnel**	**Vessels**	**Deployment Location**
24 Hours	Planning and Operations Team Leads	AMOSC (Exmouth) AMSA (Dampier and Fremantle)	2,400m Ocean Sea-Curtain Boom (consisting of 6 x 400m boom per reel) and associated hydraulic systems (6 x power pack, 6 x Ocean Weir Skimmers).	6 x Core group responder team leaders 42 x Team members	6	Vessels based in Dampier will have equipment loaded and personnel will join the vessels in Dampier.
		Waste Contractor (Karratha) Or AMSA	Iso-containers or floating storage barges (AMSA) for 480m^3 of oily waste water per day.			Dampier
72 Hours		Vessel suppliers	6 vessels to make up a total of 6 containment and recovery teams.	As above	6	Dampier

11.4 Tasks for Containment and Recovery

In the initial response, Jadestone will mobilise ocean booms and hydraulic power pack equipment from AMSA Dampier, then from AMOSC in Exmouth. This provides the shortest timeframe for implementation. Requirements for additional resources can 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 and (AMSA) National Plan equipment, and personnel from the AMOSC core group. Deployment is from Dampier to protect the Protection Priorities of Montebello Islands, Dampier Archipelago, Lowendal Islands and Barrow Island.

Each vessel conducting containment and recovery is to be manned with a trained AMOSC Core Group Oil Spill Responder who is the Team Leader 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 Operations Lead. The Operations Lead has the authority to demobilise or stand vessels off in the event of ineffective operations.

Where containment and recovery operations are not successful (due to weather, adverse sea conditions, or nature of oil), or the response does not require ongoing containment and recovery operations (due to a limited volume of release), only part of the deployment plan shall be implemented and then scaled back to suit the incident circumstances.

Where operations are successful, further deployments can be implemented through AMSA National Plan for Maritime Environmental Emergencies equipment stockpiles and National Response Team (NRT) personnel as agreed by AMSA and Jadestone (AMSA-Jadestone MOU, 2016). AMSA will have at least one member within the Jadestone IMT and will be able to authorise immediate mobilisation of resources if required.

11.5 Tasks for Offshore Waste Storage and Collection

Activation of the Jadestone waste management contract will enable waste to be collected, stored and disposed of. Waste management is also discussed in the Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008).

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 Dampier for offloading.

240 m^3 of oily water is estimated to be recovered per day using six containment and recovery teams.

11.6 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).

To minimize the potential for recovered oil being released while the water is decanted, the following practices are recommended (IPIECA/OGP, 2015):

- The temporary storage device should, prior to use, be checked to ensure that it is not contaminated with residues from any products or substances that may previously have been stored in that device, to ensure no unauthorised discharges occur;
- Appropriate settling time should be allowed to enable gravity separation to occur prior to decanting. Settling times will vary depending on the oil type. Studies have shown that settling times for different oil types ranges from 30–60 minutes;
- Where possible, employ the use of internal baffles in the temporary storage device to help speed up the separation and prevent re-mixing of the oil and water;
- Water should be discharged either into a secondary storage container (if available) or within a boomed area with a recovery device (skimmer) so that any residual oil can be recovered;
- Visual monitoring should be undertaken at the discharge point whilst decanting to ensure that only water is released. If possible, the oil/water interface in the storage container should be monitored to ensure that only the water is being drawn; and
- Dependent on the environmental and socio-economic sensitivity of the area affected by the spill, and any other response activities that are taking place, it is advised to identify the area(s) that decanting will be undertaken.

11.7 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 Dampier 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. 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. Stag crude characteristics are well known and are representative of a Group II or III oil for BER planning targets over the first 24hrs. For the purposes of planning, the thickness of Stag crude is assumed to be the same over four days because of emulsification likely to occur. Weathering tests indicate that the oil will tend to form a stable emulsion by the uptake of up to 81%, by volume, of sea water which will further slow the loss of oil components to the atmosphere (refer to Section 4.3.2).

After analysis of the impact of increasing capability, Jadestone is planning on mobilising six containment and recovery teams because of the benefit provided by additional oil recovered. Nine containment and recovery teams is disproportionate to the benefit provided because access to people is the limiting factor for being able to mount nine containment and recovery teams before the predicted shoreline contact of Protection Priorities (refer Appendix A5).

Once shoreline contact occurs, personnel will be directed towards protecting those Protection Priorities. Jadestone is a small company and it is considered disproportional to purchase and maintain equipment to be on standby when we have access to vessels and equipment through contracts and AMOSC. Vessels and people better off doing protection and deflection or shoreline clean-up as determined through the IAP and NEBA (refer Table 8-12 of the EP).

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. Appendix A5 contains the calculations and assumptions used to plan for containment and recovery activities.

12. PROTECTION AND DEFLECTION STRATEGY

Booms can be used to create physical barriers to protect sensitive receptors. This option is often used in nearshore environments in close proximity to the area requiring protection. It can be installed in deeper water further from the protection priority with the intent of taking the oil off its trajectory path to the sensitive receptor.

12.1 Initiation and Termination Criteria

Tactic	Initiation criteria	Termination criteria
Nearshore booming	When OSTM indicates shoreline contact	When shoreline receptors no longer able to be protected by nearshore booming.

12.2 Tactics

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 around areas 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.

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).

In all areas, the primary shoreline protection priorities are mangrove environments and identified turtle nesting beaches during nesting and hatching seasons. The peak turtle nesting and hatching season occurs between October and February for all species, however hawksbill turtles may nest throughout the year.

The effectiveness of this response will depend on sea, current and wind conditions. Deployment is subject to safety concerns of operation in shallow waters and possible grounding issues of small vessels and so must therefore be assessed under a NEBA (see Appendix A (Section 5.4) of the Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008)).

As deflection and protection operations will occur in State Waters, the DoT as 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 protection priorities. All protection and deflection operations are expected to be carried out using Jadestone's plans by DoT as Incident Control.

Following deployment of protection and deflection booms, 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.

12.3 Protection and Deflection Action Plan

Table 12-1: Protection and Deflection Action Plan

PROTECTION AND DEFLECTION ACTION PLAN						
Time from Incident to mobilisation site	**Who to activate**	**Owner (location) and Equipment**		**Personnel**	**Vessels**	**Deployment Location**
48 hours	Planning and Op's Team Leads	AMOSC (Exmouth)	Shoreline protection boom (450 m) Intertidal protection boom (500 m) Shoreline and intertidal boom accessory equipment	4 x AMOSC Core group members 8 x Jadestone labour hire or AMOSC Mutual Aid personnel	2 x Jadestone contract vessels	Wherever dictated by spill trajectory modelling.
		AMSA (Dampier)	Shoreline protection boom (2,400 m) Intertidal protection boom (1,200 m) Shoreline and intertidal boom accessory equipment	8 x AMOSC Core group responders 16 x Jadestone labour hire or AMOSC Mutual Aid personnel	4 x vessels	Wherever dictated by spill trajectory modelling.
72 hours		AMOSC (Fremantle)	Shoreline protection boom (2,400 m) Intertidal protection boom (1,200 m) Solid flotation boom (1,800 m) Shoreline and intertidal boom accessory equipment	8 x AMOSC Core group responders 16 x Jadestone labour hire or AMOSC Mutual Aid personnel	4 x vessels	Wherever dictated by spill trajectory modelling.
Other deployments as required by incident		AMSA	National Plan stockpiles	To be sourced from AMOSC Core Group and Mutual Aid personnel and Jadestone labour hire	Available through Jadestone vessel contracts	Wherever dictated by spill trajectory modelling.

12.4 Tasks for Protection and Deflection

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 protection priority 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 the 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. Smaller hydrocarbon releases will require an appropriately scaled down strategy based on hydrocarbon type, the likely amount of floating oil and the amount of time available before shoreline contact occurs. 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 for each scenario.

Initial deployment of equipment and personnel is to be from the 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 AMSA National Plan shoreline response equipment stockpiles and NRT personnel, as agreed with by AMSA and Jadestone and implemented by the DoT Incident Management Team.

Initial deployment locations will be defined through the spill surveillance and initial spill trajectory modelling once a spill occurs, thereby capturing the most relevant trajectory forecasts in which to guide this spill response activity. These locations are confirmed by DoT in their analysis of the situation and IAP process.

While equipment and personnel mobilisation is occurring, the spill trajectory modelling is being generated and the results are available within two hours of activation. 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 DoT, as the HMA, will advise on protection priorities 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 protection priorities 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, through the Operations Lead. The Operations Lead has the responsibility to extend or terminate the response in consultation with the IMT Leader and the HMA.

12.5 Resource Rationale for Protection and Deflection

OSTM outputs assisted in identifying Protection Priorities. Pre-deployment of resources at locations in which Protection Priorities are identified in modelling would not be practical because of the following:

- 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;
- There are no facilities for storage and maintenance of booms and ancillaries, vessels, waste storage and PPE at all Protection Priorities;
- The time for oil to contact Protection Priorities 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.

Jadestone will access to resources via AMOSC, AMSA and DoT. Jadestone could purchase equipment and store at Dampier, however, this is costly and the limiting factor for response timeframes is accessing the required number of people.

13. SHORELINE CLEAN-UP STRATEGY

In the event of hydrocarbon spills with potential shoreline contact, operational monitoring will identify possible impact areas. The Planning Lead 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 Waters, and the arrangements under the WestPlan-MOP, the HMA (DoT) 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 AMOSPlan are to provide all necessary equipment and resources to enable DoT to undertake shoreline activities.

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). Agreement has been reached with the Jurisdictional Authority relevant to the spill to terminate the response

13.2 Tactics

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

13.3 Shoreline Cleanup Action Plan

Table 13-1: Shoreline Clean-up Action Plan

<table>
<tr><th colspan="5">SHORELINE CLEANUP ACTION PLAN</th></tr>
<tr><th>Time from Incident to mobilisation site</th><th>Who to activate</th><th colspan="2">Owner (location) and Equipment</th><th>Personnel</th></tr>
<tr><td>Deployment Location</td><td rowspan="5">Planning Team Lead</td><td colspan="3">Deployment Location: Resources will be deployed from areas as close as possible to the locations predicted for contact by spill modelling, and updated during the response with spill surveillance and modelling.</td></tr>
<tr><td rowspan="4">36 hours</td><td>Jadestone hired (Exmouth/Karratha)</td><td>2x Front-end dozers or suitable machinery for shoreline access</td><td rowspan="4">132 personnel (22 shoreline clean-up team leaders and 120 labour hire trained onsite) will be required for the worst replicate simulation indicated in OSTM.</td></tr>
<tr><td>Waste provider (Perth / Karratha)</td><td>2x 3 kL Waste skips
22x IBCs</td></tr>
<tr><td>Global Spill Control (previously Perth Petroleum Services) (Perth)</td><td>Forward Operation and Decontamination camp
Beach Clean-up equipment
PPE</td></tr>
<tr><td>AMOSC
(Fremantle/Exmouth)
AMSA (Fremantle)</td><td>Shoreline Clean-up Kits (Decontamination, Beach Wash Down, Initial IAP Support and Beach Clean-up Kits)
Rope Skimmer and Collection Trailer 4 x Fast tanks</td></tr>
</table>

SHORELINE CLEANUP ACTION PLAN				
Time from Incident to mobilisation site	**Who to activate**	**Owner (location) and Equipment**		**Personnel**
			Oil Vacuum Collection system	

13.4 Tasks

Each response activity will be assessed based on NEBA for each location of potential impact based on trajectory of the floating oil. Response strategies 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 strategies and the less intrusive options of natural attenuation and bioremediation will be preferred.

Choice of shoreline clean-up response tactics will be based on NEBA for each location of potential impact. Information on shoreline type 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 (DoT), 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. 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 has a Foreshore Inspection and Sign-off Report 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, taking into account 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.

PPE Kits consist of personal protective equipment, Manual Clean-up Team Kit (6 man) - Plastic Disposal Bags - Collapsible Bunds or HDPE to make temporary bunds (refer to the Jadestone Spill Response Equipment Register for more detail). Waste management guidelines for shoreline clean-up operations are provided in the Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008).

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 in order to clean 1 km of lightly oiled beach in one day.
Low pressure flushing	Low pressure flushing can be used, with care, to remove surface oils from most beach type surfaces. 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.
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.

Method	Description
Monitoring of natural attenuation and bioremedia-tion	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.

13.5 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 protection priority 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.

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 9 personnel in each shoreline clean-up team and assume that each team can recover 10m^3 per day. Actual personnel numbers will vary according to the shoreline clean-up techniques recommended by SCAT teams during their field assessment of affected shorelines and the operational NEBA assessment. However, for planning purposes, Dampier Archipelago presents the greatest requirement for shoreline clean-up teams (22 teams) and the greatest number of responders (220) as presented in Table 13-3. Jadestone will require 22 trained shoreline clean-up team leaders and 198 labour hire personnel to be trained on site for this scenario.

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

Receptor	Minimum time to shoreline oil at or above 100g/m^2 (days)	Accumulated oil on shoreline in worst replicate simulation at or above 100g/m^2 (m^3)	Length of shoreline oiled (km) at concentrations exceeding 100 g/m^2 in the worst replicate simulation	Number of shoreline clean-up teams recommended (1 team per 10m^3/day)	Number of shoreline clean-up responders required (10 per team)	Potential waste generated (worst replicate simulation) bulking factor of 10 (m^3)
Dampier Archipelago	7	2,122	79	22	220	21,220
Montebello Islands	8.5	206	29	10	100	2,060
Barrow Island	17	317	32	10	100	3,170
Lowendal Islands	16	114	29	5	50	1,140
Eighty Mile Beach	16.5	1,506	178	17	170	15,060

The number of shoreline clean-up teams recommended to treat these shorelines is not based on extensive, intrusive and contiguous removal of oil and waste along all shorelines, but rather use of smaller teams and at lower frequency of visits. Where shoreline based manual removal is safe and deemed advantageous by SCAT teams and operational NEBA, this should be conducted via land access (if possible) or via suitable vessels. However, it should be noted that it is generally not feasible to move response equipment into and out of mangroves, tidal flats and delta environments without causing excessive damage. Even foot traffic must be minimised, either by laying down wooden walkways or relying on vessel-based activities as much as possible (API, 2020).

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 DBCA and Industry (AMOSC) Oiled Wildlife Advisors (OWAs) as stipulated in Jadestone's Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008). These roles ensure minimum standards for Oiled Wildlife Response (OWR), as outlined within the WAOWRP, are met and ensure timely mobilisation of appropriate resources (equipment and personnel) through communication with the wildlife logistics team.

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 Appendix A of the Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008)). Under the WAOWRP arrangement, the AMOSC OWA may request further assistance from DBCA 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 (Stag Crude) is defined.	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 Wildlife first response

The most effective means of preventing wildlife from being impacted by the spill is through the spill response actions taken to minimise the impact area (e.g. containment, clean-up and preventing further discharge of hydrocarbons), In addition, the following two options may be considered:

1. Hazing (the scaring of unoiled wildlife way from oiled habitats/areas) and deterrence
2. Pre-emptive capture (involves removing at-risk wildlife from the spill environment, thereby preventing it from being oiled).

There are positive and negative impacts of these prevention methods, which must be considered when preparing an Operational NEBA in consultation with key stakeholders. Only trained and experienced personnel should conduct hazing. Inexperienced personnel can worsen the situation by ineffectively deploying deterrents, inadvertently disturbing animals into oiled areas, or causing debilitated oiled animals to scatter.

Pre-emptive capture carries with it a high degree of risk due to the difficulty of capturing animals safely and maintaining their health in captivity or during relocation. The decision to undertake pre-emptive capture must be determined based on the best possible animal welfare outcome by comparing the risks associated with oiling against the risks of injury, disease or death of the animal associated with pre-emptive capture activities (IPIECA 2017).

Pre-emptive capture maybe considered when hazing/deterrence methods are not appropriate or not effective; when species/ populations are of high conservation value; where there is a high potential of oiling and associated mortality from oiling; and where likelihood of success of pre-emptive capture activities is high.

The following factors should be considered to identify potential wildlife for pre-emptive capture:

- Species/ population conservation value;
- Population health and vulnerability;
- Response to hazing/deterrence;
- There either has to be existing knowledge about how to house the species in captivity, or information on related species that can be potentially extrapolated;
- Availability of appropriate housing, husbandry and personnel for adequate care in captivity; and
- Availability of appropriate relocation habitat.

14.3 Oiled Wildlife Response Levels and Personnel Requirements

The WAOWRP 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. The WA OWR Plan also nominates indicative personnel numbers and role requirements for each OWR Level as shown in **Table 14-3**.

Jadestone Energy is approaching oiled wildlife preparedness in a conservative manner by preparing for a OWR Level 5.. The number of personal 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.

It is expected that for the Stag Field Operations OPEP Jadestone Energy may require 84 skill level 1 personnel. Generally, OWR skill level 1 roles could be filled by wildlife carers known to DBCA and through labour hire agencies that can provide field workers that undergo an induction and basic training. Basic training (over 1 day) for Level 1 OWR personnel can be delivered as just in time training through an arrangement with DBCA.

The remaining personnel at skill levels 2 - 4 and those with specialised skills are expected to be sourced through AMOSC, DBCA, Universities and contractors. At OWR level 5, Jadestone Energy expects to initially establish one staging area and oiled wildlife facility and scale up staging areas as required in response to the location, number of wildlife and different species encountered.

Table 14-2: Oiled Wildlife Response Levels

OWR level	Duration of OWR	Birds general	Birds OWR complex #	Turtles - hatchlings / juveniles / adults	Dolphins / Whales	Pinnipeds	Mammals terristrial	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: 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**

14.4 Sources of Personnel and Equipment

In the event of a spill impacting wildlife, Jadestone Energy will commence arrangements to mobilise personnel and equipment to fill positions and implement strategies within the WAOWRP. An overview of sources of personnel is provided in Appendix A of the Jadestone Jadestone Incident Management Team Response Plan (JS-70-PLN-F-00008).

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 Oiled Wildlife Response Plan.

Table 15-1: Operational Performance Standards and Measurement Criteria

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
Source Control	Shipboard Oil Pollution Emergency Plan (SOPEP)	SOPEP activated within 60 minutes of spill incident	OIM log
	Jadestone's Stag Incident Response Plan (GF-00-PR-F-00041)	Stag Incident Response Plan activated within 60 minutes of spill incident	OIM log
Operational monitoring	Vessel Surveillance	Vessel Surveillance initiated within 90 minutes following request from IMT.	Incident log
		Daily observation reports submitted to IMT until termination criteria is met.	Incident log
	Aerial Surveillance	Aerial Surveillance initiated within 3 hours following request from IMT.	Incident log
		Two passes per day of spill area by observation aircraft provided from Day 1 of response	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 2 hours of request from On-Scene Commander or Operations Lead, subject to vessel availability and weather conditions.	Incident log
		Tracking buoys utilised until termination criteria met.	Incident log
	Oil Spill Modelling	Oil Spill modelling commissioned within 24 hours for a Level 2 or 3 spill notification.	Incident Log

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
		Modelling delivered to IMT within 2 hours of request to service provider.	Incident Log
		Modelling continues until termination criteria are met.	Incident Log
	Operational Oil and Oil in Water Monitoring	Fluorometry surveys mobilised within 2 days of initiation.	Incident Log
		Daily report including fluorometry results provided to IMT within 24 hours of completing daily survey.	Incident Log
Chemical Dispersion	Chemical Dispersion Plan	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
		A pre-deployment operational assessment of dispersant application location, dosage and equipment use is undertaken.	Incident Log
		NEBA undertaken prior to initial field trial dispersant operations 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 • Dispersant efficacy testing • Forecast spill modelling of naturally and chemically dispersed oil • Ecotoxicity data (species protection trigger levels) for dispersed oil (including chemically dispersed oil) (once available) • Operational oil and oil in water monitoring results (once available) • Scientific water sampling results (SMP1) (once available) • Consultation with the DoT (HMA)	Incident Log
		Aerial chemical dispersant application will be available for operation within 18 hours of initial AMSA notification (daylight and weather condition dependent).	Incident Log

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
		Chemical dispersant applied in consultation with relevant statutory agencies and HMA.	Incident Log
		IMT to complete a Concept of Operations Request Form and submit to AMSA within 6 hours of initial activation to enable activation of the FWADC.	Incident Log
			Concept of Operations Request Form (FWADC) notification
		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 a Marine Park boundary or its buffer; • Over responders; and • Within State Waters.	Incident Log
		4 AMOSC Core Group members (1 per vessel) are obtained for dispersant operations.	Incident Log
		Application rates and dilution ratio monitored and adjusted daily based upon operational monitoring reports.	Incident Log
		The effectiveness of the aerial based chemical dispersion strategy is communicated to the Operations Lead via the Air-Attack Supervisors, who are supplied by AMSA through the FWADC	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 Plan	Shoreline boom mobilised from Exmouth and Dampier ready for deployment within 24 hours of spill notification.	Incident Log
		IMT to confirm Protection Priorities for protection in consultation with the HMA (DoT)	Incident Log/ IAP

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
		NEBA undertaken every operational period to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan.	Incident Log/ IAP
Offshore Containment and Recovery (C&R)	Containment and Recovery Plan	Deployment of Containment and Recovery Equipment (based in Exmouth and Dampier) begins within 24 hours of spill notification.	Incident Log
		NEBA undertaken every operational period to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan.	Incident Log/ IAP
Shoreline Clean-up	Shoreline Clean-up Plan	Clean-up strategies will be implemented under the direction of DoT as the HMA.	Incident Log
		At least one member per shoreline clean-up team will have completed IMO Level 1 Operations training course (or equivalent RPL).	Incident Log
		Shoreline Team Lead to assess 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
		Shoreline team leads shall verify clean-up effectiveness and conduct final evaluations.	Incident Log
		The least intrusive shoreline clean-up options for macroalgal and seagrass beds will be prioritised by the IMT	Incident Log
		NEBA undertaken every operational period to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan.	Incident Log/ IAP

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
Shoreline Clean-up	Shoreline Clean-up Plan	The Foreshore Inspection and Sign-off Report will be signed by all signatories before shoreline clean-up for a site is terminated	Incident Log shows all signatories signed the Foreshore Inspection and Sign-off Report
Oiled Wildlife Response (OWR)	WA Oiled Wildlife Response Plan	Request to stand up AMOSC to arrange oiled wildlife response undertaken by IMT immediately following assessment of oiled wildlife event.	Incident Log
		Notification to DBCA Oiled Wildlife Advisor by IMT to occur immediately following assessment of oiled wildlife event.	Incident Log
		All decisions to escalate and de-escalate the equipment and personnel in response to the oiled wildlife incident shall be approved by the Incident Commander.	Incident Log
		Demobilisation of the wildlife response will be guided by parameters established by the Wildlife Coordinator at the beginning of the operations and incorporated into the Incident Action Plan.	IAP/Incident Log
Waste Management	Waste Management Plan	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 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
		The Logistics Lead shall monitor and record the response to demonstrate all waste management legislative requirements are met.	Incident Log
		The DoT 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.	IAP/Incident Log

Response Strategy	Control Measures	Performance Standards	Measurement Criteria
		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)	An Environmental service provider is in place	Contract with Environmental service provider
		A Scientific Monitoring Implementation Plan is in place	
		2Y audit of capability and readiness as described in the Implementation Plan and SMP Framework is conducted by Jadestone. Quarterly status reports from service provider.	Audit Manual (JS-90-PR-G-00003) Quarterly reports.
		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	Audit Manual (JS-90-PR-G-00003)
	Competency and Training Management System [JS-60-PR-Q-00015]	Planning Team Lead has the competency to undertake coordination role with environmental service provider	Skills matrix and annual audit of Competency and Training Management system.
Activation of IMT	Competency and Training Management System [JS-60-PR-Q-00015]	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.
		IMT core members will have completed IMO Level 2 or 3 training and maintain currency	
	Incident Management Team Response Plan [JS-70-PLN-F-00008]	IMT members available for an initial IMT assessment 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

16. REFERENCES

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17. 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
APASA	Asia Pacific Applied Science Associates (Marine and Freshwater Environmental Modelling)
AMOSPLAN	A voluntary oil industry mutual aid plan intended to supplement the National Plan, administered by Australian Institute of Petroleum through AMOSC
APPEA	Australian Petroleum Production and Exploration Association
Approved Dispersant	Means dispersant approved by the National Plan
ATV	All-Terrain Vehicles
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
DPAW	Department of Parks and Wildlife
EP	Environment Plan
FPSO	Floating Production, Storage, and Offtake Vessel
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
JAMBA	Japan and Australia Migratory Bird Agreement
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
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

18. APPENDICES

A1. Observation Logs (vessel, aerial, shoreline)
A2. Bonn Agreement Oil on Water Classification
A3. Diesel Fuel Properties
A4. Stag Crude Assays
A5. Spill Response Planning Scenario Assumptions
A6. FWADC Joint Standard Operating Procedure
A7. Shoreline Assessment Form
A8. Stakeholder Consultation
A9. Global chemical dispersant inventory (July 2020)