Stag Field Operations Oil Pollution Emergency Plan

GF-70-PLN-I-00001

Rev 6

A1. Observer logs

Vessel visual observer log

Survey Details			
Date	Start time	End Time	Observers
Incident			Area of Survey
Vessel type	Call sign		

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

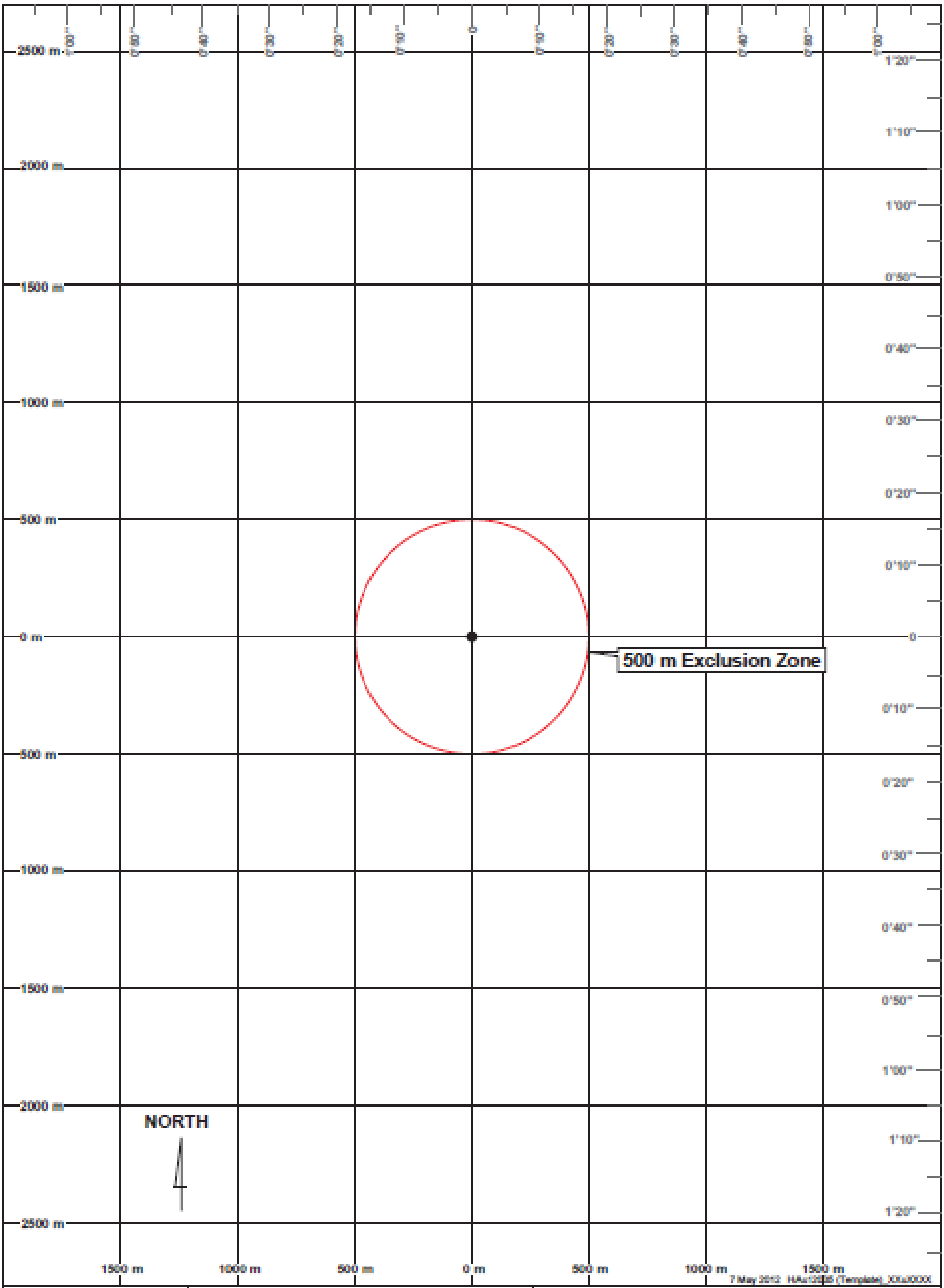
Slick Details						
Slick grid parameters by lat/long		Slick grid parameters (vessel speed)			Slick grid dimensions	
Length Axis	Width Axis	Length Axis		Width Axis	Length	nm
Start Latitude	Start Latitude	Time (seconds)		Time (seconds)	Width	nm
Start Longitude	Start Longitude				Length	nm
End Latitude	End Latitude	essel Speed (knots)		Vessel Speed (knots)	Width	nm
End Longitude	End Longitude				Grid area	km^2

Code	Colour	%age cover observed	Total grid area	Area per oil code	Factor	Oil volume
1	Silver		km^2	km^2	40-300 L/ km^2	L
2	Iridescent (rainbow)		km^2	km^2	300-5,000 L/ km^2	L
3	Discontinuous true oil colour (Brown to black)		km^2	km^2	5,000-50,000L/ km^2	L
4	Continuous true oil colour (Brown to black)		km^2	km^2	50,000 – 200,000 L/ km^2	L
5	Brown / orange		km^2	km^2	>200,000 L/ km^2	L

Aerial visual observer log

<table>
<tr><th colspan="8">Survey Details</th></tr>
<tr><td colspan="2">Date</td><td colspan="2">Start time</td><td>End Time</td><td colspan="3">Observers</td></tr>
<tr><td colspan="5">Incident</td><td colspan="3">Area of Survey</td></tr>
<tr><td colspan="2">Aircraft type</td><td colspan="3">Call sign</td><td colspan="2">Average Altitude</td><td>Remote sensing used</td></tr>
<tr><th colspan="8">Weather Conditions</th></tr>
<tr><td colspan="4">Wind speed (knots)</td><td colspan="4">Wind direction</td></tr>
<tr><td colspan="4">Cloud base (feet)</td><td colspan="4">Visibility</td></tr>
<tr><td colspan="4">Time high water</td><td colspan="4">Current direction</td></tr>
<tr><td colspan="4">Time low water</td><td colspan="4">Current speed (nM)</td></tr>
<tr><th colspan="8">Slick Details</th></tr>
<tr><td colspan="4">Slick grid parameters by lat/long</td><td colspan="2">Slick grid parameters (air speed)</td><td colspan="2">Slick grid dimensions</td></tr>
<tr><td colspan="2">Length Axis</td><td colspan="2">Width Axis</td><td colspan="2">Length Axis</td><td>Width Axis</td><td>Length nm</td></tr>
<tr><td colspan="2">Start Latitude</td><td colspan="2">Start Latitude</td><td>Time (seconds)</td><td></td><td>Time (seconds)</td><td>Width nm</td></tr>
<tr><td colspan="2">Start Longitude</td><td colspan="2">Start Longitude</td><td></td><td></td><td></td><td>Length nm</td></tr>
<tr><td colspan="2">End Latitude</td><td colspan="2">End Latitude</td><td>Air Speed (knots)</td><td></td><td>Air Speed (knots)</td><td>Width nm</td></tr>
<tr><td colspan="2">End Longitude</td><td colspan="2">End Longitude</td><td></td><td></td><td></td><td>Grid area km²</td></tr>
<tr><th>Code</th><th>Colour</th><th>%age cover observed</th><th>Total grid area</th><th colspan="2">Area per oil code</th><th>Factor</th><th>Oil volume</th></tr>
<tr><td>1</td><td>Silver</td><td></td><td>km²</td><td colspan="2">km²</td><td>40-300 L/ km²</td><td>L</td></tr>
<tr><td>2</td><td>Iridescent (rainbow)</td><td></td><td>km²</td><td colspan="2">km²</td><td>300-5,000 L/ km²</td><td>L</td></tr>
<tr><td>3</td><td>Discontinuous true oil colour (Brown to black)</td><td></td><td>km²</td><td colspan="2">km²</td><td>5,000-50,000L/ km²</td><td>L</td></tr>
<tr><td>4</td><td>Continuous true oil colour (Brown to black)</td><td></td><td>km²</td><td colspan="2">km²</td><td>50,000 – 200,000 L/ km²</td><td>L</td></tr>
<tr><td>5</td><td>Brown / orange</td><td></td><td>km²</td><td colspan="2">km²</td><td>>200,000 L/ km²</td><td>L</td></tr>
</table>

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



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

AERIAL SURVIELLANCE MARINE FAUNA SIGHTING RECORD SHEET

<table>
<tr><th>Resource</th><th>Type/species</th><th>Number</th><th>Location</th><th>Behaviour / Comments</th></tr>
<tr><td>Cetaceans</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Turtles</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Dugongs</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sharks</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sea snakes</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Seabirds</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Vessels</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Other Details for each observation location</td></tr>
<tr><td rowspan="5">Ambient conditions at each location</td><td colspan="2">Date</td><td rowspan="3">Photographic record</td><td>Date and Time of each</td></tr>
<tr><td colspan="2">Time</td><td>Photo/video clip number</td></tr>
<tr><td colspan="2">Weather Conditions</td><td>Brief description</td></tr>
<tr><td colspan="2">Visibility (atmospheric)</td><td></td><td></td></tr>
<tr><td colspan="2">Water turbidity</td><td></td><td></td></tr>
</table>

Marine Megafauna Assessment Surveys

Triggers

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

Objectives

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

Data Collection and Management

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

<table>
<tr><th>Resource</th><th>Species</th><th>Numbers observed</th><th>Location</th><th>Behaviour/Comment</th></tr>
<tr><td>Cetaceans</td><td></td><td>Adult______
Juvenile_______
Calf________</td><td>Lat______
Long_____</td><td>Direction of movement
Proximity to oil
Proximity to vessels
Identify marks
Aversion or other behaviour
Carcases</td></tr>
<tr><td>Birds</td><td></td><td></td><td>Lat______
Long_____</td><td>Direction of movement
Proximity to oil
Proximity to vessels
Identify marks
Aversion or other behaviour
Carcases</td></tr>
<tr><th colspan="5">Other Details for each Observation Location</th></tr>
<tr><td rowspan="4">Ambient Conditions at Each Location</td><td colspan="2">Date</td><td rowspan="4">Photographic/Video Record</td><td>Date and time of each</td></tr>
<tr><td colspan="2">Time</td><td>Photo/video clip number</td></tr>
<tr><td colspan="2">Weathering conditions</td><td>Brief description</td></tr>
<tr><td colspan="2">Visibility</td><td>GPS link</td></tr>
</table>

Methodology

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

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

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

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

- State objectives;
- Reflect the level and distribution of observed or anticipated exposure and effects i.e.;

  - Geographic distribution

  - Study duration
- Stipulate replicate sampling, statistical analyses, and scientific rigour;
- Stipulate the expected flight frequency; and
- Indicate comparison to be made between impacted and unimpacted (control) habitats/biota, before and after spill observations.

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

Pre-implementation Actions

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

Resource Requirements Checklist

¨ Aircraft

¨ Species identification manuals

¨ Aerial camera (still and video). Video to be GPS linked

¨ Expert megafauna observers

Supporting Documents

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

Shoreline observation log

Survey Details				
Incident	Date	Start time	End Time	Observers

Area of Survey	
Start GPS: LAT_____________deg.______________LONG___________deg.__________min	End GPS: LAT_____________deg.______________LONG___________deg.__________min

Aircraft type	Call sign	Average Altitude	Remote sensing used (if any)

Weather Conditions		
Sun/Cloud/Rain/Windy	Visibility	Tide Height L/M/H
Time high water	Time low water	Other

Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present					
	Rocky Cliffs		Boulder and cobble beaches		Sheltered tidal flats
	Exposed artificial structures		Riprap		Mixed sand and gravel beaches
	Inter-tidal platforms		Exposed tidal flats		Fine-Medium sand grained beaches
	Mangroves		Sheltered rocky shores		Other
	Wetlands		Sheltered artificial structures		

Operational Features (tick appropriate box)					
	Direct backshore access		Alongshore access		Suitable backshore staging
Other					

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A2. Bonn Agreement Oil Appearance Code

Bonn Agreement Oil Appearance Code

At the thirteenth National Plan Operations Group meeting the Bonn Agreement Oil Appearance Code was adopted as the standard method for assessing the volume of oil on water for the purposes of response and prosecution.

The Bonn Agreement Oil Appearance Code is explained in the following pages, taken from Annex A of the Bonn Agreement Aerial Surveillance Handbook, 2004. The full Handbook can be downloaded from the Bonn Agreement website: http://www.bonnagreement.org/eng/html/welcome.html.

THE BONN AGREEMENT OIL APPEARANCE CODE

1. The Theory of Oil Slick Appearances

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

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

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

2. The Bonn Agreement Oil Appearance Code

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

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

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

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

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

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

Code Description - Appearance Layer Thickness
Interval (µm)
Litres per km2
1 Sheen (silvery/grey) 0.04 to 0.30 40 – 300
2 Rainbow 0.30 to 5.0 300 – 5000
3 Metallic 5.0 to 50 5000 – 50,000
4 Discontinuous True Oil Colour 50 to 200 50,000 – 200,000
5 Continuous True Oil Colour 200 to More than 200 200,000 - More than 200,000

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

3. Description of the Appearances

3.1 Code 1 – Sheen (0.04 µm – 0.3 µm)

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

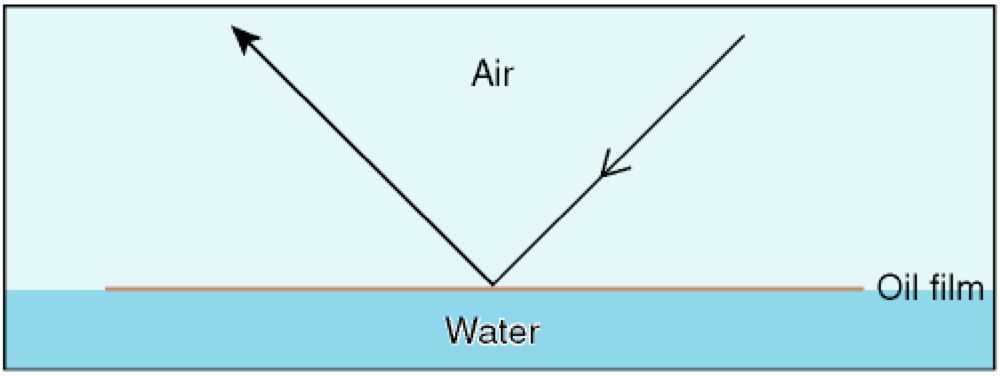

Figure 1. Light Reflecting From Very Thin Oil Films

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

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

3.2 Code 2 – Rainbow (0.3 µm – 5.0 µm)

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

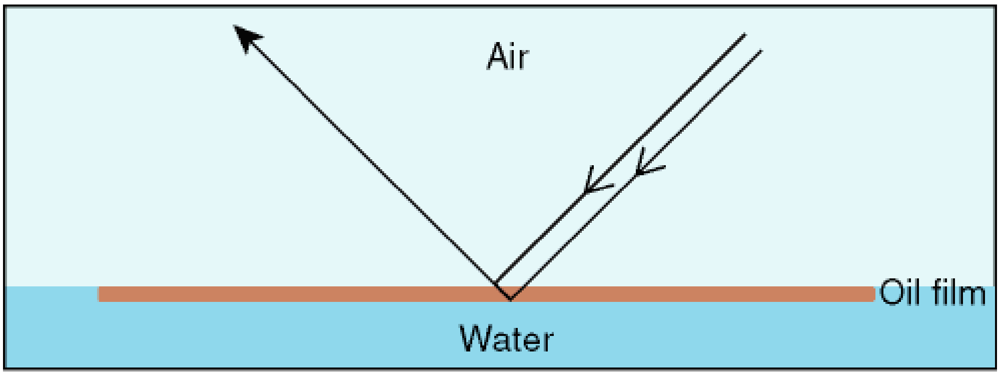

Figure 2. The Rainbow Region

Sheen and Rainbow

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

Figure 3. Constructive Interference

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

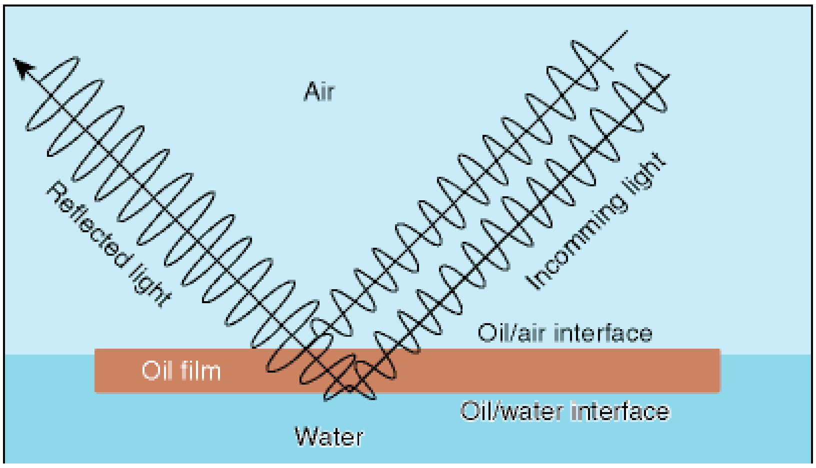

Figure 4. Destructive Interference

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

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

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

3.3 Code 3 – Metallic (5.0µm – 50 µm)

20. The appearance of the oil in this region cannot be described as a general colour. The true colour of the oil will not be present because the oil does not have sufficient optical density to block out all the light. Some of the light will pass through the oil and be reflected off the water surface. The oil will therefore act as a filter to the light (Figure 5).

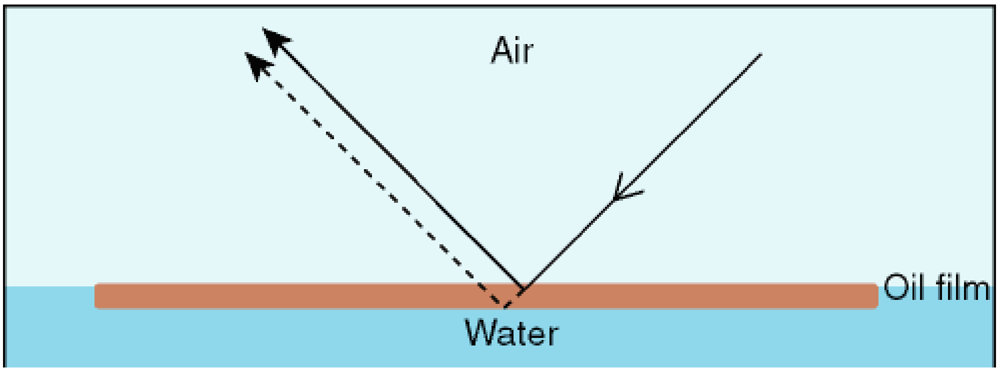

Figure 5. The Metallic Region

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

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

Metallic, with Sheen and Rainbow

3.4 Code 4 – Discontinuous True Colours (50 µm – 200 µm)

23. Code 4 is intermediate between Code 3 and Code 5, and consists of small areas, or patches, of Code 5, Continuous True Oil Colour in a background of Code 3, Metallic. This is an accurate description of the behaviour of the oil layer – it does not spread as an even thickness layer, but consists of thicker patches in a thinner layer.

Observation of Code 4

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

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

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

27. As was demonstrated at the BONNEX 2002 and NOFO 2006 Oil on Water Exercise, observers in small boats, who looked at the spilled oil from a distance of a metre or so, were

able to easily see small patches of Code 5 in a background of Code 3 and reported this as Code 4 -
Discontinuous True Oil Colour.

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

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

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

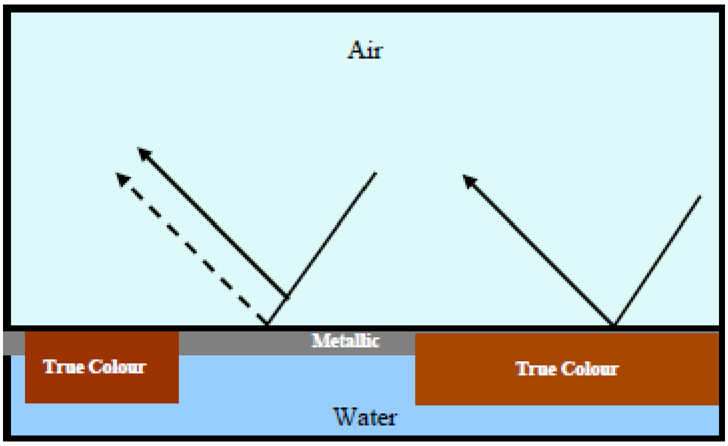

Figure 6a. The Discontinuous True Colour Region Plan (Overhead) View

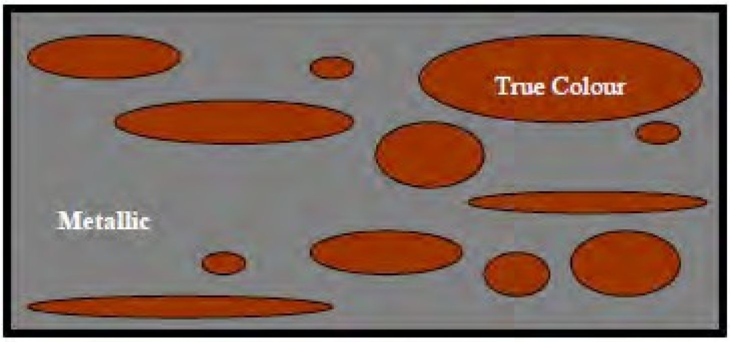

Figure 6b. The Discontinuous True Colour Region

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

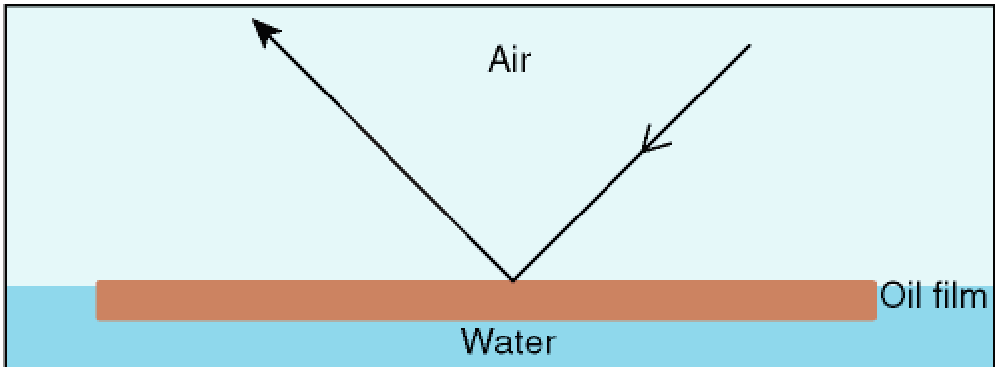

Figure 7. Thick Oil Films

3.5 Code 5 – True Colours (>200 µm)

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

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

True colour

4. Local Variation of Oil Film Thickness at Sea

34. When observing oil in wave conditions on the sea the thickness of a layer of oil on water at a particular location will not remain constant. The sea surface is not static and is often a dynamic environment.

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

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

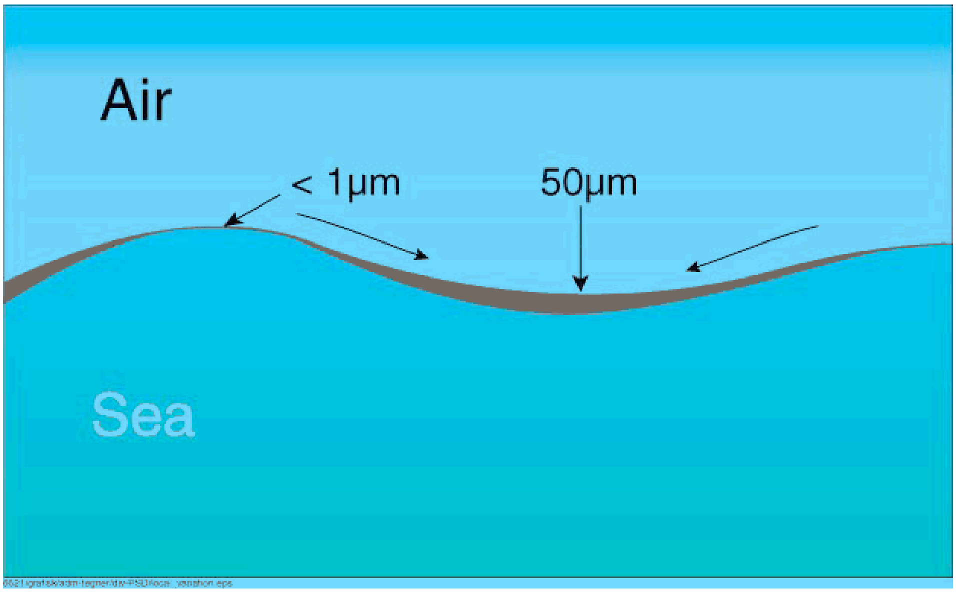

Figure 8 Local Variations of Oil Film Thickness at Sea

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

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

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

5. Emulsion

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

40. Reliable estimates of water content in an 'emulsion' are not possible with out laboratory analysis, but accepting that figures of 50% to 80% are typical, approximate calculations of oil quantity can be made, given that most floating emulsions are 1 mm or more thick.

6. Supplementary Oil Thickness Data

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

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A3. Diesel properties

DIESEL FUEL	Fresh	Weathering		
		1-3 hours	1 day	1 week
Physical Characteristics:				
API gravity (classification)	33.2 (mid distillate)			
Density (g/mL) @ 20° C	0.855	ND	0.856	0.860
Viscosity (cP) @ 20° C	3.62	ND	4.0	5.4
Interfacial Tension (mN/m)	34.5	ND	32.6	31.4
Flash Point (°C)	78.9	ND	91.1	118.3
Pour Point (°C)	6	ND	18	12
Boiling Point (°C)				
Chemical Characteristics:				
Saturates (% by weight)	63.1	ND	64.2	63.6
Aromatics (% by weight)	34.9	ND	33.4	33.7
Resins (% by weight)	1.7	ND	1.7	1.5
Asphaltenes (% by weight)	0.2	ND	0.7	1.2
Waxes (% by weight)	ND	ND	ND	4.2
Weathering:				
% loss after laboratory weathering	-	0	3	23
Persistent in the environment	moderate			
Forms oil in water emulsions	no	no	no	no
Demulsifier effective?	yes	yes	yes	yes
Toxicity (laboratory tested):				
tropical clownfish (*Amphiprion clarkii*)	low	ND	low	low
inland silverside fish (*Menidia beryllina*)	mod.	ND	low-mod.	low-mod.
tropical prawn (*Penaeus vannamei*)	mod.-high	ND	mod.-high	mod.-high
mysid shrimp (*Mysidopsis bahia*)	mod.-high	ND	mod.-high	mod.-high
sea urchin larvae (*Arbacia punctulata*)	low	ND	low	low
sand dollar/sea urchin larvae (*Dendraster excentricus/Strongylocentrotus purpuratus)*	mod.-high	ND	low	low
Amenable to Dispersant:	yes	yes	no	no

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A4. Stag Crude Assay

STAG CPF EXPORT
CRUDE OIL ASSAY

conducted by

Intertek

Petroleum Testing Laboratory
Refinery Road, Lonsdale SA 5160

for

Apache Energy

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SAMPLE DETAILS

SAMPLE:	Stag CPF Export
LABORATORY SAMPLE NO:	2063
ASSAY CONDUCTED FOR:	Apache Energy
LABORATORY REPORT NO:	1292/08
REPORT DATE:	19th September 2008
REPORT BY:	
	Caroline Duke
APPROVED BY:	
	Caroline Duke Distillation Chemist

WORLD RECOGNISED ACCREDITATION

This document shall not be produced, except in full.
This report relates to samples specifically as received

PROPERTIES OF CRUDE

Sample ID	2063
Crude ID	Stag CPF Export
Cut Range	Whole

Test	Method	Unit	Result
Density @15°C	D5002	kg/L	0.9428
Specific Gravity @60/60°F		-	0.9433
API Gravity		°API	18.5
Arsenic	ICP OES	mg/kg	2.3
Ash	D482	%mass	0.0004
Asphaltenes	IP143	%mass	0.14
Carbon Residue - Micro	D4530	%mass	1.05
Characterisation Factor	UOP375	-	11.3
Flash Point	D93	°C	111.0
Heat of Combustion – Gross	D4868	MJ/kg	43.98
Heat of Combustion – Net	D4868	MJ/kg	41.48
Kinematic Viscosity @ 20°C	D445	cSt	122.5
Kinematic Viscosity @ 40°C	D445	cSt	37.26
Mercury	UOP938	wt ppb	<1
Metal - Nickel	D5708	wt ppm	4.0
Metal - Vanadium	D5708	wt ppm	<1.0
Nitrogen - Total	D4629	wt ppm	516
Nitrogen - Basic	UOP 269	wt ppm	299
Pour Point - Upper	D5853	°C	-33
Reid Vapour Pressure	D323	kPa	<1
Reid Vapour Pressure	D323	psi	<0.15
Sediment by Extraction	D473	%wt	<0.01
Sulphur – Total	IP336	%mass	0.14
Total Acid Number	D664	mg KOH/g	0.50
Water Content	D4006	%volume	0.150
Wax Content	UOP 46	%mass	<5

TRUE BOILING POINT DISTILLATION DATA

D2892

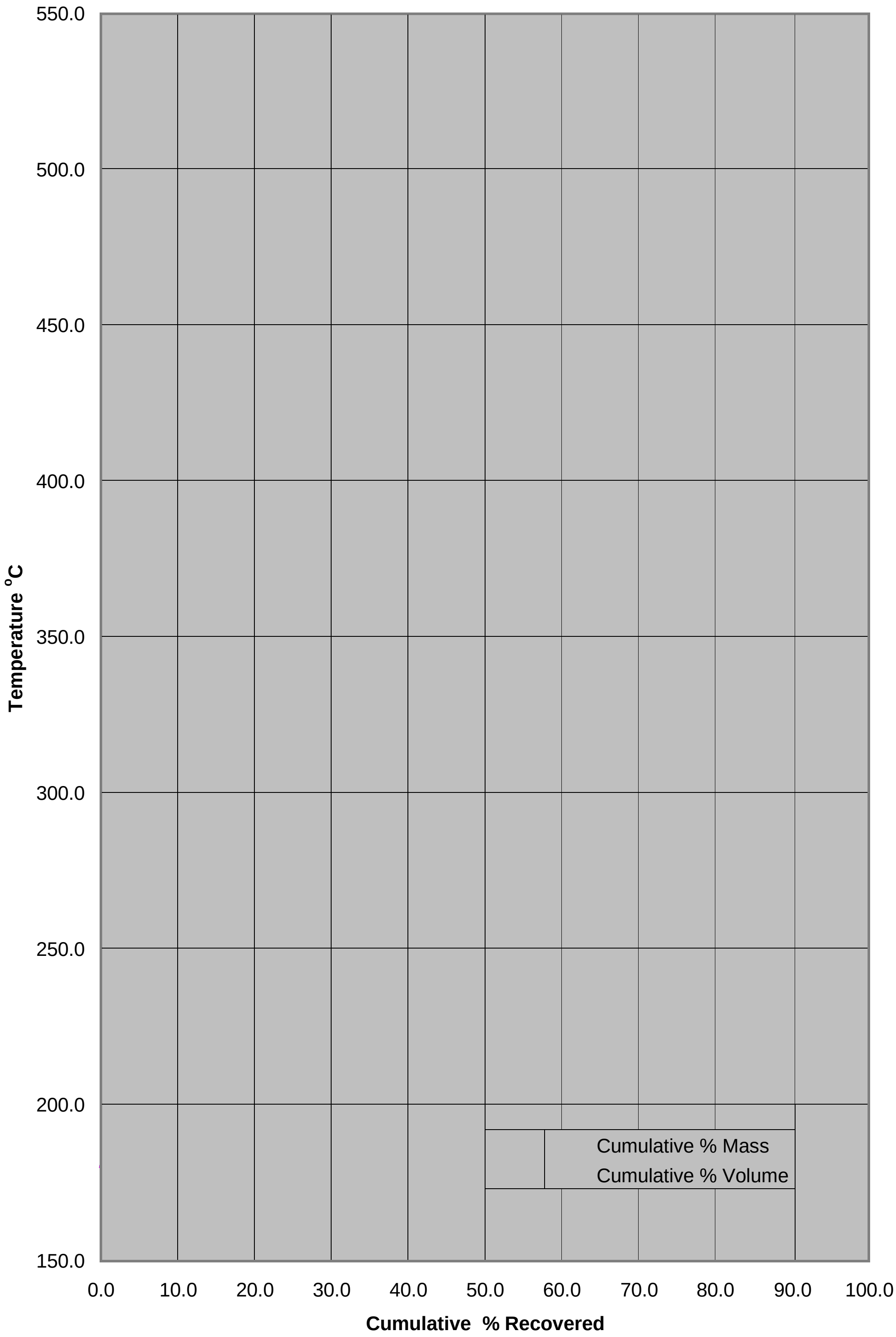
Mass of Dry Sample Charged	13,068g
Charge Volume at 15°C	13,861mL
Mass Recovered After Distillation	13,029g
Mass Loss	0.3% Pass
Volume Recovered After Distillation	13,889mL
Mass of Water Recovered	12.0g

D5236 (360.0°C+)

Mass of Dry Sample Charged	2,420g
Charge Volume at 15°C	2,481mL
Mass Recovered After Distillation	2,434g
Mass Gain	0.6% Pass
Volume Recovered After Distillation	2,503mL

Temperature °C	Temperature °F	Density	SG 60/60F	API Gravity	Cumulative % Mass	Cumulative % Volume
IBP = 179.7	IBP = 355.5	-	-	-	-	-
179.7 - 230.0	335.5 - 446.0	0.8788	0.8793	29.4	4.9	5.2
230.0 - 360.0	446.0 - 680.0	0.9175	0.9180	22.6	53.1	54.6
360.0 - 540.0	680.0 - 1004.0	0.9670	0.9676	14.7	89.5	90.0
540+	1004.0+	0.9937	0.9943	10.8	100.0	100.0

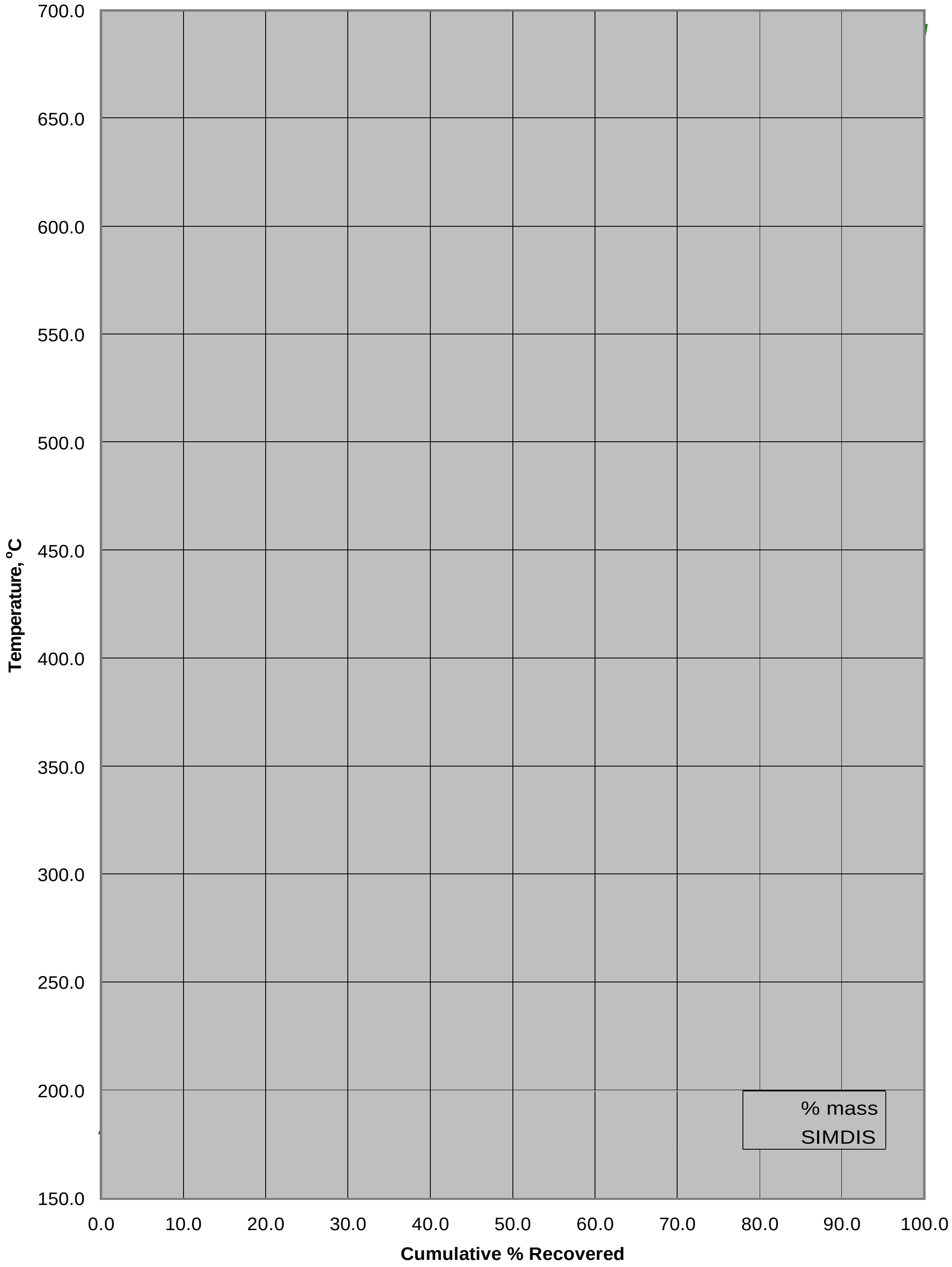
GRAPH OF CUMULATIVE %YIELD AGAINST TEMPERATURE, °C AET



SIMULATED DISTILLATION DATA

Wt%	BP ^oC	Wt%	BP ^oC	Wt%	BP ^oC	Wt%	BP ^oC
0.0	179.5	26.0	286.0	52.0	352.5	78.0	442.0
1.0	188.0	27.0	289.0	53.0	355.5	79.0	446.5
2.0	200.5	28.0	291.5	54.0	358.5	80.0	451.5
3.0	208.0	29.0	294.0	55.0	361.5	81.0	457.0
4.0	214.5	30.0	296.0	56.0	364.5	82.0	463.0
5.0	219.0	31.0	298.5	57.0	367.5	83.0	469.5
6.0	224.0	32.0	301.0	58.0	370.5	84.0	475.5
7.0	228.0	33.0	303.5	59.0	374.0	85.0	482.5
8.0	232.0	34.0	306.0	60.0	377.0	86.0	490.0
9.0	235.5	35.0	308.0	61.0	380.5	87.0	497.5
10.0	239.0	36.0	310.5	62.0	383.5	88.0	505.5
11.0	242.5	37.0	313.0	63.0	387.0	89.0	514.0
12.0	246.0	38.0	315.5	64.0	391.0	90.0	523.5
13.0	249.5	39.0	318.0	65.0	394.5	91.0	534.0
14.0	252.5	40.0	320.5	66.0	398.0	92.0	544.5
15.0	255.5	41.0	323.0	67.0	401.5	93.0	556.5
16.0	258.5	42.0	325.5	68.0	405.0	94.0	568.5
17.0	261.5	43.0	328.0	69.0	408.5	95.0	582.0
18.0	264.0	44.0	330.5	70.0	412.0	96.0	596.0
19.0	267.0	45.0	333.5	71.0	415.5	97.0	613.0
20.0	269.5	46.0	336.0	72.0	419.0	98.0	636.0
21.0	272.5	47.0	339.0	73.0	422.5	99.0	669.5
22.0	275.5	48.0	341.5	74.0	426.0	100.0	694.0
23.0	278.0	49.0	344.5	75.0	430.0		
24.0	281.0	50.0	347.0	76.0	433.5		
25.0	283.5	51.0	350.0	77.0	437.5		

GRAPH OF TRUE BOILING POINT AGAINST SIMULATED DISTILLATION



PROPERTIES OF CUTS

Test	Method	Unit	LPG	IBP - 230C	230 - 360C	360 - 540C	360C+	540C+
Fractional Distillation	D2892	%mass	Ni	4.9	48.2	36.4	47.0	10.6
Volume Yield	D5236	%volume	Ni	5.2	49.4	35.4	45.4	10.0
Density @15°C	D4052	kg/L		0.8788	0.9175	0.9670	0.9754	0.9937
Specific Gravity @60/60°F	D4052	-		0.8793	0.9180	0.9676	0.9760	0.9943
API Gravity	D4052	API		29.4	22.6	14.7	13.5	10.8
Aniline Point	D611	°C		51.9	54.5	62.3	68.8	
Aniline Gravity Product	Calc	-		3685	2940	2119	2103	
Ash	D482	%mass					0.0070	
Asphaltenes	IP143	%mass					0.40	
Carbon Residue - Micro	D4530	%mass					2.48	
Cetane Index - Procedure A	D4737	-			33.2			
Cetane Index - Procedure B	D4737	-			33.0			
Characterization Factor,calc	UOP 375	-					11.5	
Cloud Point	D2500	°C			<-45.0			
Colour ASTM	D1500	-			L0.5			
Copper Corrosion (3hrs @ 50C)	D130	-			1A			
FIA - Aromatic	D1319	%volume		1.8				
Freeze Point	D5972	°C		<-70.0				
Heat of Combustion - Gross,calc	D4868	MJ/kg					43.5	
Heat of Combustion - Nett,calc	D4868	MJ/kg					41.1	
Hydrocarbon - Mono-Aromatics	IP391	%mass			23.4			
Hydrocarbon - Di-Aromatics	IP391	%mass			4.8			
Hydrocarbon - Polycyclic-Aromatics	IP391	%mass			5.0			
Kinematic Viscosity @-20	D445	cSt		11.32				
Kinematic Viscosity @20°C	D445	cSt		3.476				
Kinematic Viscosity @40°C	D445	cSt		2.282	7.342			
Kinematic Viscosity @50°C	D445	cSt				200.2	675.2	
Kinematic Viscosity @100°C	D445	cSt				14.69	33.54	
Metal - Nickel	ICP-OES	wt ppm					7.2	31.4
Metal - Vanadium	ICP-OES	wt ppm					<1	<1
Nitrogen - Basic	UOP269	wt ppm					158	
Nitrogen - Total	D4629	wt ppm				830	1284	3421
PIONA (Benzene)	D6730	%volume		NA				
Pour Point	D5950	°C			<-39.0	-3.0	0.0	48.0
Smoke Point	D1322	mm		16.5				
Sulphur - Total	IP336	%mass		<0.030	0.057	0.20	0.22	0.31
Total Acid Number	D664	mg KOH/g			0.08	0.80	0.9	

D86 ANALYSIS

Boiling Range	**°C**	**230-360**
Mass Yield	% mass	48.2
Volume Yield	% volume	49.4
Density @15°C	kg/L	0.9175
Specific Gravity @60/60°F	-	0.9180
API Gravity	°API	22.6
Initial Boiling Point	°C	260.6
5% Recovered	°C	270.2
10% Recovered	°C	273.7
20% Recovered	°C	278.8
30% Recovered	°C	283.5
40% Recovered	°C	290.2
50% Recovered	°C	297.7
60% Recovered	°C	305.4
70% Recovered	°C	314.5
80% Recovered	°C	323.6
90% Recovered	°C	334.3
95% Recovered	°C	341.4
Final Boiling Point	°C	345.1
Volume recovered	%Vol	98.6
Residue	%Vol	0.3
Loss	%Vol	1.1

Stag Field Operations Oil Pollution Emergency Plan

GF-70-PLN-I-00001

Rev 6

A5. Spill Response Capability Scenario Planning

APPENDIX A5 - SPILL RESPONSE CAPABILITY SCENARIO PLANNING CASE

1. CHEMICAL DISPERSANT OPERATIONS

Chemical dispersant application is a strategy that can be effective in reducing the environmental impact of oil spills. Jadestone has evaluated this strategy for Montara and decided it is suitable for the response toolbox. Capability to support the implementation of this strategy is required. Scenario planning has been used to identify the level of capability that Jadestone will ensure is available as a preparedness measure for oil spill response activities.

1.1 Calculating dispersant volume required

ITOPF Technical Information Paper 4 (TIP 4) Dispersant Use provides a method for determining the volume and application rate of dispersant. There are two parts to the calculation: firstly, determine the volume of oil to be treated, and secondly determine the volume of dispersant required for that volume of oil.

1.1.1 Calculate volume of oil to be treated:

ITOPF suggests that although there are variations in the thickness of oil within a slick, most fresh crude oil spills spread within a few hours so that the average thickness is 0.1mm (also referred to as 10^{-4}m; 100g/m^2) and says "this thickness is often used as the basis upon which to plan operations" Which means that the volume of oil in one hectare is calculated as:

- Thickness of oil x Area = Volume of oil
- 10^{-4}m x $10^{-4}m^2$ = 1m^3 of oil
- For planning purposes, we will use the following volume of oil per hectare as:
- 1m^3/hectare for spills with an average thickness of 100g/m^2 (0.1mm)

1.1.2 Calculate the volume of dispersant required:

The Dispersant to Oil Ratio (DOR) can range from 1:10 through to 1:50 or even less depending on the oil and dispersant types. For planning purposes, a DOR of 1:20 is used because it is an accepted ratio to start with and may be adjusted depending on effectiveness. A DOR of 1:20 is also used in OSTM studies that have been used in this OPEP for evaluating the impact of dispersant use.
ITOPF TIP 4 says the calculation to determine dispersant quantity is using a DOR of 1 part dispersant to 20 parts oil (1:20) is:

- Dispersant quantity = litres of oil divided by 20
- Using the calculation in step 1
- Dispersant quantity per hectare = 1m^3 of oil in 1ha divided by 20 = 50l per ha
- From this we will use the dispersant quantity required per hectare as 50 litres.

1.2 Dispersant planning: calculating volume of dispersant required for Stag WCS

Using the planning assumptions, the following calculations for dispersant volume and the number of daily sorties has been estimated for Stag facility WCS:

- 6,000 m^3 instantaneous spill
- Volume of oil in 1ha at an average thickness of 100g/m2 (0.1mm) = 1m^3
- 1m^3 over 1ha of sea surface
- 6,000m^3 = 6,000ha
- Assuming only 50% of slick is 100g/m^2 = 0.5 x 6,000 = 3,000 ha target area
- **3,000 x 50l dispersant per ha = 150m^3 to treat 50% of the floating oil**

1.3 Planning assumptions

- Modelling was undertaken to estimate the total area of spill with an average thickness of 100g/m2 (0.1mm) each day. To accommodate for the uncertainty in the total area to be treated with dispersant, a figure of 20% of the spill area will be used as the target area to calculate dispersant required as a starting point from which real time planning can be done.
- An application rate of 50 litres of dispersant per hectare (which is a dispersant to oil ratio of 1:20). The volume of oil treated at this application rate is $1m^3$ assuming the average thickness of the slick is $100g/m^2$ over 1 hectare.

1.3.1 Fixed wing aerial dispersant capability assumptions

- Estimating a 2hr turnaround between loading, travel to spray zone, spraying and returning to base for FWADC air tractors between Karratha and Stag.
- FWADC will only operate in daylight hours, assuming 10 hours daylight per day means that there will be approximately 5 sorties per aircraft per day.
- The FWADC aircraft have a flight time of approximately 4 hours before requiring refuelling.
- Aircraft types utilised in the FWADC include the Air tractor AT-504, AT-802 and Ayres S2R34 – T660. These aircraft have:
  - Dispersant load capacities of between 1800 and 3200 litres – for planning purposes a minimum payload of 3000 litres has been confirmed for the three planes to be sourced from Jandakot and 1800 litres is assumed for the planes to be sourced from alternative air bases
  - Operating height of 3 – 5 metres
  - Spraying systems capable of applying accurately measured amounts at the nominated droplet size
  - GPS marking systems.

1.3.2 Vessel based dispersant assumptions

- 2 systems per vessel = 1000l/hr spray rate (dispersant diluted with sea water – 1:50)
- 8hrs spraying = 8000l/vessel (sea water and dispersant)
- $4m^3$ dispersant required per vessel
- 4 vessels = $16m^3$/day of dispersant

1.4 Dispersant budget

The application of $266m^3$ of dispersant could be achieved in the first 4 days by utilising 6 FWADC air tractors working together and 4 vessels (Table 1). Limiting factors would be weather and sea state conditions, dispersant effectiveness and ability to source people, aircraft and vessels. After 48 hours, the oil will have spread and fragmented. Assuming it was at a thickness of $25g/m^2$ a greater area would need to be covered by the air tractors but the volume of dispersant would remain the same if the same DOR was used.

A dispersant budget has been prepared taking into account the daily application rates, daily volume of dispersant arriving in Karratha and Dampier, cumulative totals and balance on hand after each day. See Table 1 for these details and Figure 1 for a graphical representation of the budget. It is clear that dispersant stockpiles (red line) are sufficient and are not the limiting factor for dispersant operations (purple line).

Table 1: Dispersant budget

Dispersant volumes (m^3)	Time from incident (hrs)			
	Day 1 0-24hrs	**Day 2 24-48hrs**	**Day 3 48-72 hrs**	**Day 4 72-96hrs**
Daily chemical dispersant volume required - aerial	45	45	72	72
Daily chemical dispersant volume required - vessel	0	0	16	16
Cumulative chemical dispersant requirement	45	90	178	266
Daily chemical dispersant arrivals	95	312	0	0
Cumulative chemical dispersant available	95	407	407	407
Balance of dispersant on hand after application	50	317	229	141

2. CHEMICAL DISPERSANT APPLICATION CAPABILITY PLANNING

2.1 Methodology

Chemical dispersant operations have been included in the OPEP based on the applicability of the response strategy for a Stag crude oil spill. The case for determining the best capability to support the response strategy was determined using scenario planning and based upon advice from Aerotech (FWADC provider) that the best case is 3 aircraft onsite for deployment by 18 hours. Scenario planning allows for a combination of resources to be assessed and for the most appropriate mix of resources to be chosen.

Aerial application considered the parameters of:

- Number of aircraft;
- Timeframe of aircraft available for application as per advice from Aerotech;
- Dispersant to oil ratio;
- Number of sorties per day;
- Volume of dispersant required per day;
- Volume of oil treated per day;
- Volume of oil dispersed at 40% efficacy;
- Cumulative volumes; and
- Benefit analysis of cumulative volumes.

for four different scenarios:

- 1 FWADC aircraft for 3 days supported by an additional aircraft from Day 4 (scenario 1);
- 2 FWADC aircraft for 3 days supported by an additional 2 aircraft from Day 4 (scenario 2);
- 3 FWADC aircraft for 3 days supported by an additional 3 aircraft from Day 4 (scenario 3); and
- 3 FWADC aircraft for 3 days supported by an additional 5 aircraft from Day 4 (scenario 4).

Vessel application considered the parameters of:

- Number of vessels – from 1 to 6 commencing first operations 3 days after the spill event;

- Cumulative volume of dispersant required – noting that afedo spray systems dilute dispersant with sea water and the Dispersant to Oil ratio used during vessel operations is 1:50;
- Cumulative volume of oil treated; and
- Volume of oil dispersed at 40% dispersant efficacy.

Data for each parameter was based on the dispersant planning described in the OPEP and trajectory modelling.

2.2 Discussion

For both aerial and vessel based scenarios it is important to note the variables and constraints that have not been taken into consideration which means that Jadestone is most likely to have overestimated the capability required for dispersant application.
Variables and constraints that have not been considered are:

- Weathering of the oil –Stag crude is likely to undergo evaporation and emulsification processes which have not been considered in terms of mass balance of oil remaining when estimating volume of oil treated or dispersed;
- Weather conditions or time of day when spill occurs – no allowance has been made for not being able to access the spill site with aircraft or vessels to apply dispersant;
- The relationship between dispersant applied, time of application (in terms of oil weathering processes), efficacy of dispersant type and location conditions is not linear as depicted in the scenario outputs. No discounting has been made to account for this; and
- No allowance has been made for containment and recovery operations or the effectiveness of dispersant operations to determine a mass balance of oil remaining on the surface at the end of each day.

2.2.1 Aerial capability

Analysis of the four scenarios indicates that the best mix of aircraft for the operational requirement in the OPEP is provided by Scenario 3, a total of 6 aircraft applying dispersant in the first 4 days of a response. There is no benefit to be gained from additional aircraft from Day 4, since this is an instantaneous spill and the efficacy of dispersant on Stag crude is shown to diminish after 24 hours (See Section 10.9).

2.2.2 Vessel capability

Jadestone has used the analysis of vessel based application to prepared for a capability of 4 vessels to apply dispersant. The limitations of the scenario planning in terms of variables and constraints means that the benefit provided by vessel based dispersant application is most likely to be overestimated. This is one of the reasons why vessel based application is considered to be a supplementary operation to support aerial application of dispersant over a greater area in a more efficient manner.

3. CONTAINMENT AND RECOVERY

3.1 Introduction

At sea containment and recovery operations is a strategy that can be effective in reducing the environmental impact of oil spills, it involves the use of booms to contain oil and skimmers to recover oil. Jadestone has evaluated this strategy for the Stag facility and has decided it is suitable for the response toolbox. Capability to support the implementation of this strategy is required. Scenario planning has been used to decide on the level of capability that Jadestone will ensure is available as a preparedness measure for oil spill response activities.

3.2 Methodology

3.2.1 Containment of oil

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

$$BER = (LB \times 0.3) \times V \times T$$

Where:

- BER is the boom encounter rate (BER)
- LB is the length of boom deployed
- 0.3 represents the opening of boom array (also called the swathe) and is considered to be 30% of the total boom length
- V is the velocity of the vessel and is assumed for planning purposes to be 1 knot (1852m/hr)
- T is the average thickness of oil (mm) from indicative planning targets table. Assuming only 10% of previous day thickness
- Stag Crude group II or III in BER planning targets table

Recovery calculations have been made using the formula:

$$R = (RC \times 0.3) \times hrs \times units$$

Where:

- R is the volume of oil recovered
- RC is the recovery capacity of the skimmer (m^3/hr)
- Hrs are the hours operating (skimming) at sea
- Units is the number of skimmer units operating

The AMSA guideline recommends that oil thickness be determined through modelling, however the document provides indicative slick thickness and estimate BER as per Table 3. The BER is based on the spreading coefficient and assumes no wind or current; once these are factored into the calculation, the BER will change and it also assumes the spill is instantaneous.

Table 2: Indicative BER (planning targets) AMSA

	Time (hr)	1	2	3	4	6	12	24
Group II or III Oil	Thickness (mm)	0.474	0.283	0.207	0.167	0.123	0.074	0.044
	BER (m3/hr)	79.0	47.2	34.5	27.8	20.5	12.3	7.3

Table 3 indicates that the BER appears to reduce by an order of magnitude over 24 hours, and so is likely to be 10% as effective on day 2 of a response as day 1. At-sea containment and recovery of oil may not be efficient or effective depending on the sea state and how far the slick has spread. These activities will depend on the conditions of the day.

For the purposes of planning, the thickness of Stag crude is assumed to be the same over 4 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.

3.2.2 Recovery of oil

Skimmers collect oil, water and debris. To account for this the potential oil recovery rate is considered to be 50% of the total volume recovered. The recovery calculation allows for the skimmer to not work at its specified pumping rate, by discounting the recovery capacity of the skimmer (m^3/hr rate provided in SoPs) to one third of what is specified.

Large weir skimmers such as the GT185 and the Walosep weir skimmer have recovery capacities up to about 65t/hr[1] (~65m3/hr). Assuming an operational rate of recovery of one-third of that capacity (due to sea-state and oil type), then skimming could potentially yield approx. 20m3/hr.
Using an operational rate of recovery over 4 hours of operation per day, a potential volume of $80m^3$/day could be recovered. At sea recovery is heavily dependent on the viscosity of the oil, wind speed and wave height.

The percentage of oil (from the oil and water mix) that is able to be recovered by large weir skimmers ranges from 50-90%[2]. Assume in these scenarios that the skimmers achieve an efficiency of 50% then for every $10m^3$ of liquid recovered, $5m^3$ would be oil.

3.3 Results

Table 3: Containment calculations (booms)

Time post spill (hrs)	**24**				**48**				**72**				**96**			
Teams	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12
Hours booming oil	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Length boom/team	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Velocity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Thickness	0.047	0.047	0.047	0.047	0.005	0.005	0.005	0.005	0.0005	0.0005	0.0005	0.0005	0.00005	0.00005	0.00005	0.00005
BER (m3/hr)	17.064	34.128	51.192	68.256	1.706	3.413	5.119	6.826	0.171	0.341	0.512	0.683	0.017	0.034	0.051	0.068
Volume contained	**171**	**341**	**512**	**683**	**17**	**34**	**51**	**68**	**2**	**3**	**5**	**7**	**0**	**0**	**1**	**1**

[1] AMSA SoP for GT185 and Walosep weir skimmers (as in the AMSA Oil Spill OHS manual); and also referenced in Fingas (2013).

[2] Fingas (2013).

Figure 1: Comparison between number of containment teams and volume of oil contained.

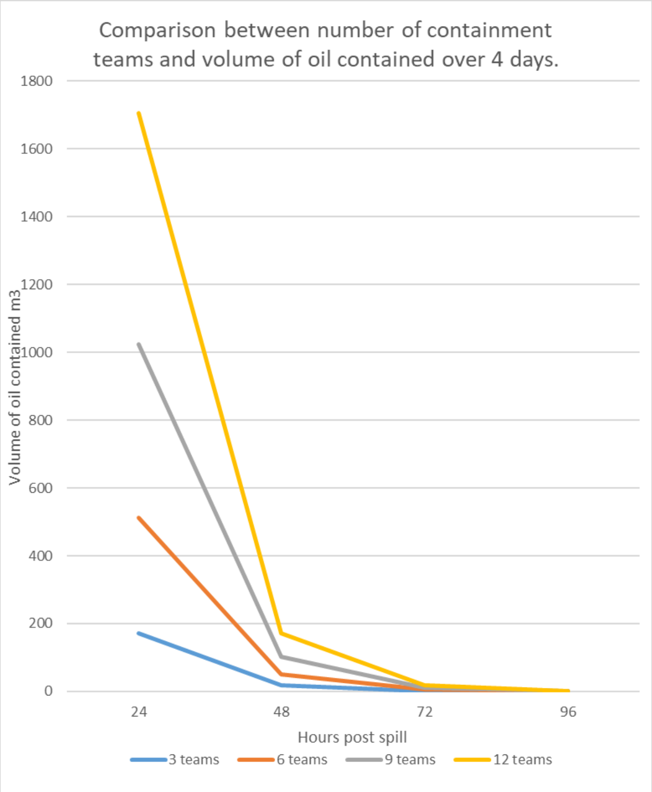


Table 4: Recovery calculations (skimmers)

Time post spill (hrs)	24	48	72	96
Recovery capacity	65	65	65	65
Units	6	6	3	3
Hours skimming	4	4	4	4
Potential recovery m3	468	468	234	234

3.4 Discussion

Jadestone has used the comparison between 3, 6, 9 and 12 teams for containment operations and decided that 6 teams provides the most effective overall response capability option. It is clear from Figure 4 that the volume of oil that can be contained after 24 hours diminishes significantly. It is not a practical or cost effective option to gear up more than 6 teams (i.e. 12 vessels) for a one-day operation. Jadestone believes the most effective option is to utilise 6 teams for containment operations and direct surplus vessel resources to other response strategies such as protection and deflection, shoreline clean-up or monitoring.

Stag Field Operations Oil Pollution Emergency Plan

GF-70-PLN-I-00001

Rev 6

A6. FWADC Joint Standard Operating Procedures

Australian Maritime Safety Authority

And

Australian Marine Oil Spill Centre

and

Aerotech First Response

Fixed Wing Aerial Dispersant Capability

Joint Standard Operating Procedures

Version 1.2.

FEBRUARY 2015

DOCUMENT CONTROL

Document location:

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Version	Author	Description of Change	Date of Authorisation	Authorised by
1.0	A Griffiths	Draft JSOP		
1.2	AG/NQ	Ver 1.2	10/02/2015	AG/NQ
1.3	AG/AO	1.3	20/02/15	AG/AO

GLOSSARY OF TERMS

“**Activation**” means a phase of service delivery, notification of which commences a four (4) hour response time requirement.

“**Aerodrome**” means any aerodrome or aircraft landing area which is operationally suitable for use by Aircraft.

“AFR” Aerotech 1st Response

“**Aircraft**” means an aircraft that may be used by the Contractor to perform the Contract and includes the associated Flight Crew unless otherwise specified.

“**Aircraft Register**” means that document that records the details of Secondary Aircraft that may be utilised by the Contractor.

“AMOSC” Australian Marine Oil Spill Centre

“AMSA” Australian Maritime Safety Authority

“**Available**” means that an Aircraft is able to be airborne with all equipment and Flight crew required by this Contract if given notice of Activation.

“Contract Holder” means AMSA

“**Fixed Wing Aerial Dispersant Capability** (**or FWADC)”** means a system that allows chemical oil pollution dispersant to be delivered over water from fixed wing aircraft.

“**Flight Crew**” means any pilot or other person required by law to crew Aircraft so that it can legally operate.

“**Liaison Officer**” means those Personnel provided to supervise AFR Aircraft operations.

“**Loading Crew**” means those Personnel provided to assist with AFR Aircraft operations.

“**Normal Home Base**” means the usual place at which an Aircraft is located, as advised by the Contractor from time to time.

“**Operating**” means a phase of service delivery during which Aircraft are in flight, commencing from each take-off roll and concluding at the end of roll out from each landing, and including unimpeded dispersant loading operations.

"**Personnel**" means all the Contractor’s employees, sub-contractor’s, sub-contractor’s employees, agents or other staff by whatever means of engagement.

“**Primary Aircraft**” means those Aircraft that the Contractor nominates to be Available 24 hours a day, seven days a week.

“**Secondary** Aircraft” means those Aircraft that are listed in the Aircraft Register and are able to be made Available by the Contractor.

“**Standby**” means a phase of operation during which Primary Aircraft are required to be Available.

PART A – CONTRACT ARRANGMENTS (Day to Day)

1 PREPAREDNESS

1.1 Introduction

The Australian Maritime Safety Authority (AMSA) as Manager of Australia's National Plan for Maritime Environmental Emergencies (the National Plan), in conjunction with the Australian Institute of Petroleum (AIP) through its Australian Marine Oil Spill Centre (AMOSC), developed the Fixed Wing Aerial Dispersant Capability (FWADC) in 1996 for aerial dispersant operations conducted in the marine environment.

The FWADC is designed to complement the existing informal dispersant spraying arrangements using helicopters which are confined to close inshore work. The concept of the FWADC is based on using large fixed wing agricultural spraying aircraft.

1.2 Purpose

The purpose of this Joint standard Operating Procedure (JSOP) is to provide mutual guidance and understanding around key responsibilities and procedures that each of the Parties to the Contract are required to provide.

The JSOP is subordinate to the FWAD Contract (the 'Contract')

1.3 Contract Relationships

AMSA; AMSA is the contract manager (Contract Holder) and is responsible for the contract arrangements over all aspects of the Contract under the National Plan. AMSA represents the Federal and State stakeholders within the Contract. AMSA contributes 50% funding to this Contract (as Contract Holder)

AMOSC; AMOSC is a partner to AMSA in the Contract. AMOSC represents the petroleum companies who are members of AMOSC. The capability provided under the Contract is available for all marine pollution incidents as required by AMOSC (on behalf of AMOSC member companies). AMOSC contributes 50% funding to the Contract

AFR; AFR is the Contractor who provides the service as agreed under the Terms of Contract to AMSA.

As the contract manager AMSA has responsibilities under the Commonwealth Work, Health and Safety Act (2011) in relation to the FWADC which are not transferrable to another Party (Section 14). Under this obligation, AMSA reserves the right to withhold the FWADC if AMSA believes that safety is compromised. AMSA will consult with AMOSC, the Contractor and the relevant Incident Controller prior to the withholding of service to enable any safety issues to be resolved. AMOSC will ensure that its members are fully aware of the operational requirements for the FWAD operations that are covered at **Part B**.

1.4 Contract Term

The term of the Contract is for an initial three (3) year period from 1 August 2014 to 30 June 2017. Additionally there are three extensions available each of a period of two years.

1.5 Contracted Capability

Aircraft Locations	(Adelaide, Scone, Emerald, Batchelor, Jandacot, Ballarat)
Primary Aircraft	5 x Aircraft aircraft (2700 - 3000 ltr capacity) 1 x Aircraft (1850 ltr capacity)
Secondary Aircraft	12 x secondary (non-contracted) aircraft
Availability	24 hours, seven days a week subject to day visual flight rules – wheels up within 4 hours of activation.
Operating Range	Up to 200nm off the coast
Personnel	Flight Crew (per Contractor)
	Liaison Officer (per contractor)
	Loading crew (per contractor)

1.6 Aircraft Categories

Aircraft are classified into two categories:

Type A - Aircraft capable of delivering and applying a dispersant payload, under ISA plus 15*C conditions, of greater than 2500 litres up to 200 NM offshore.

Type B - Aircraft capable of delivering and applying a dispersant payload, under ISA plus 15*C conditions, of greater than 1500 litres and less than or equal to 2500 litres up to 200 NM offshore.

Specific capabilities of Type A and B Aircraft can be found in **Part B** to the JSOP.

Secondary aircraft are those aircraft available held within the company that are not contracted but may be made available if required to replace a contracted aircraft in the event of a breakdown or in the extreme circumstance that additional aircraft are required during an incident.

2 AIRCRAFT AVAILABILITY

2.1 Primary Aircraft

Aerotech 1st Response (AFR) is to nominate a primary aircraft for each zone. Aircraft and flight crew must be available to AMSA twenty-four (24) hours, seven (7) days per week, maintaining a four (4) hour response time. This is to be reported through In NEMO. Information relating to Aircraft Availability can be found at the following link.

https://amsa-forms.nogginoca.com/public/equipment.html?loc=%2Fapi%2Fv1%2Fasset%2F2615901

2.2 Inability to meet the agreed terms

At any given time when AFR primary aircraft ceases to be available or changes its availability status for any reason, AFR must notify AMSA's Rescue Coordination Centre (RCC).

2.3 Action to be taken if unable to meet agreed readiness state

If a primary aircraft is not available AFR must nominate a replacement aircraft that meets the technical requirements specified in the contract.

AFR must monitor and report the availability of these aircraft in the Aircraft Register.

2.4 Aircraft Nominated Home Base

The locations for the six nominated aircraft are as follows. The aircraft must remain within two hours flying time nominated airfield.

3 RESPONSIBILITIES

3.1 Administrative Responsibilities

Day-to-day management of the Fixed Wing Aerial Dispersant Capability is the responsibility of the Contract Holder. As such AMSA will:

- Monitor aircraft location and availability and advise AMOSC of any changes to the Contract provisions of operational capability;
- Reconcile invoices and recommending payment of monthly invoice;
- Prepare information required for invoicing AMOSC for the industry contribution to the cost of the FWADC;
- Ensure contract conditions are being met;
- Coordinate the auditing of Aircraft in consultation with AMOSC. AMSA and AMOSC will each undertake audits on three of the six aircraft
- AMSA will ensure both AMOSC and AFR receive copy of the final audit reports.
- Advise the EP Duty Officer when aircraft availability status' change.

3.2 Operational Responsibilities.

During an incident AMSA/AMOSC will be responsible for:

- Activating the Capability in consultation with relevant parties.
- Identifying a nominated airfield in consultation with AFR
- Coordinating the following equipment and resources.
    - All equipment required to setup the air base (outline in **Part B** to this JSOP.
    - A Dispersant Operation Coordinator
    - In an Offshore industry response AMSA will provide a Liaison officer to deal with contractual issues.
    - An air attack capability
    - A search and rescue platform (vessel of helicopter)
    - Dispersant Monitoring Capability (highly desirable)
- Developing Fixed Wing Dispersant Operations Plan
- Providing an Airbase Manager. This role can be performed by Dispersant Operations Coordinator, however in larger event this may be a standalone position.
- Ensuring AFR are included in the distribution of incident information. This may include:
    - Email distribution groups;
    - Access to Nexus online; and
    - Distribution of Daily Situation Reports;
- Providing a single point of contact in the initial stages of the response. This will generally be undertaken by the AMSA duty officer.

AMSA/AMOSC will appoint a single point of contact to AFR during an incident (Dispersant Operations Coordinator). This person will be responsible for:

- Communicating with AFR Management;
- Receiving and approving the Daily and Weekly Report Forms **(Part B** to the JSOP**)**
- Addressing all contract matters; and
- Establishing effective communication means between both parties.

3.3 AFR Responsibilities

Under the Contract, AFR are responsible for providing the following resources:

- 6 aircraft on standby as outlined in section 2.2 and ready to fly within the required time frames.
- Liaison Officer
- Loading Crew
- Pilots
- Fuel
- All safety equipment as required under the contract.
- Competition of the Daily and Weekly reports

3.4 Response Agency/Company Responsibilities.

The response agency/company is responsible for the incident response and as such will establish incident control.

4 COMPETENCY REQUIREMENTS

The minimum requirements of the specific roles required prior to undertaking aerial dispersant operations are;

Role	Formal Qualification	Qualification Name/number	Non formal Qualification or experience Recognised by AMSA and AMOSC	Comments
AMSA/AMOSC Roles				
Air Base Manager	Optional	XXXX		May be appointed by AMSA/AMOSC of Airport.
AMSA Liaison	No	NA	Knowledge of both the FWADC Contract and H&S requirements.	AMSA Officer only
Air Attack Officer.	Yes	XXX		Must have Australian Qualification Framework recognised qualifications.
Air Observer	Optional	XXX	AMOSC Air Observer Course	May be performed by the Air Attack officer
AFR Roles				
Liaison Officer	No	NA	Knowledge of Fixed Aerial Dispersant Operations.	
Loading Crew	Yes	AAAA accredited		Aerial Agricultural Association of Australia. Required tickets to be available for inspection by Air base manager
Pilot	Yes	Commercial Pilots Licence		

PART B – OPERATIONS

5 OPERATIONAL PHASES

All aircraft as nominated in the contract are currently on stand-by.

Beyond this there are several operational phases both formal and informal associated with the FWADC, these are;

Contractual Requirements	*Phases*	*Description*
Informal	Forward Notice	This is an informal phase to provide the contractor with as long a lead up period as possible in order to facilitate the preparation of the most appropriate aircraft. This stage may be by-passed depending on the nature of the incident.
Formal Activation Decision		
Formal Activation Period	Mobilsation	The contractor, AMSA, AMOSC and supporting parties locating to the nominated airfield to commence the operation as soon as practicable. This can be the first step depending on the nature of the incident.
	Operation	The contractor, AMSA, AMOSC and supporting parties on site preparing for/undertaking the operation for the duration of the incident.
	Demobilisation	Standing down. Returning of aircraft to bases.
Formal De-activation Decision		
Standby	Returned to Base	Aircraft returns to nominated operating base and standby status.

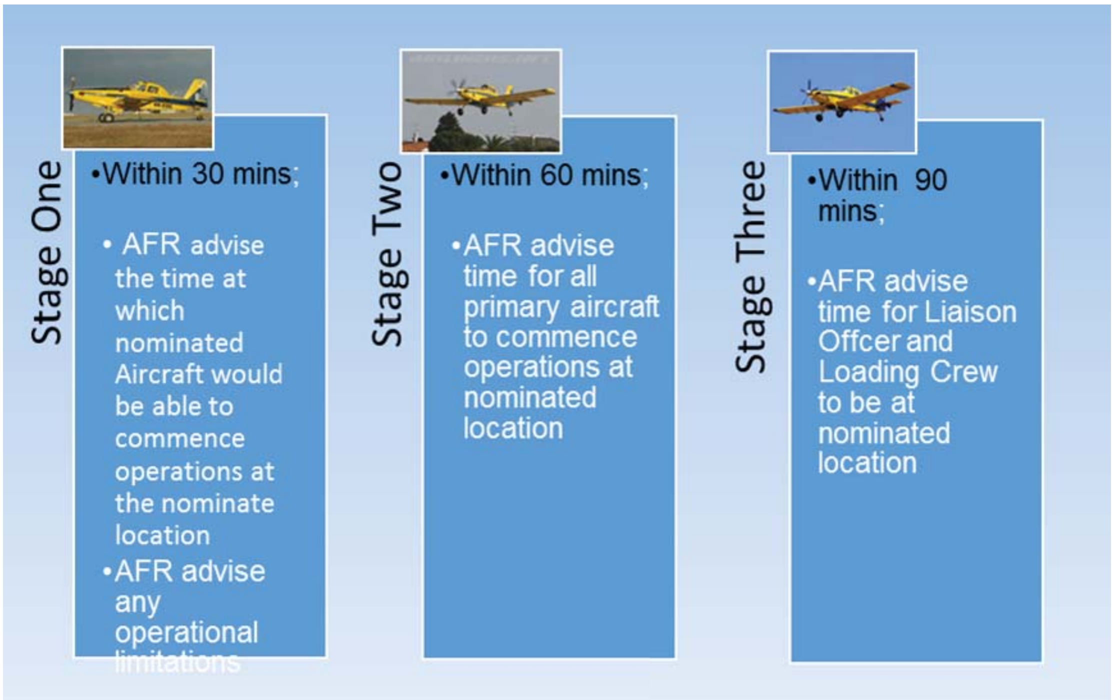
The National Plan Guidance for the activation of the Fixed Wing Aerial Dispersant Capability can be found at **Attachment A**.

5.1 Mobilisation Planning Phase

<u>Aerotech 1st Response</u> is responsible for:

a) The movement of aircraft and pilot to nominated airfield– this includes the initial decontaminating of the aircraft holding tanks.
b) Ensuring the required safety equipment is loaded in the aircraft.
c) The movement of support personnel to the airfield.
d) Assisting with the development of the Fixed Wing Dispersant Operations Plan to cover the operation.
e) Flight planning and airport clearances.
f) Providing flight and response time.

The diagram below describes periods of notice for mobilisation;



AMSA/AMOSC is responsible for:

a) Assisting AFR with any operational requirements.
b) Undertake preliminary planning on possible flight time using **Attachment B**, Aircraft Operational Capabilities.
c) Ensuring all requirements set out in the Fixed Wing Aerial Dispersant Operations Checklist are met (**Attachment C**). This check list includes:
   - Airbase establishment
   - Equipment
   - PPE requirements.
d) The movement of dispersant to the airfield
e) The movement of dispersant transfer capability to the nominated airfield.
f) The creation of the Fixed Wing Dispersant Operations Plan to cover the operation of the aircraft during aerial dispersant operations. This will include the SAR procedures and air attack aircraft.
g) Providing support personnel to effectively undertake the activity including air attack and search and rescue capability.

Response Agency/Company is responsible for:

h) Assisting with meeting the operational requirements of the fixed wing capability.
i) Overall control of the incident, including aerial dispersant operations through the avaiation operations plan.–

5.2 Operational Phase

Aerotech First Response is responsible for:

a) Contractor is responsible for the refuelling and dispersant loading on the ground

b) Contractor is responsible for ensuring the pilot has developed and lodged flight plans
c) Completing Daily Record and Weekly Report form **Attachment D and E**
d) Aviation operations occurring consistent with CASA requirements.
e) Undertaking activities consistent with the Fixed Wing Dispersant Operations Plan.
f) Ensuring that once on site the pilot establishes communications with the Air Attack Supervisor and hands operational control to the AAS

AMSA/AMOSC is responsible for:

a) AMSA/AMOSC are responsible for organising the Air Attack personnel for the over-the-water operation
b) AMSA is responsible for the HSE & contractual aspects of the airbase and overall flight operation
c) Ensuring that activities occur consistent with the Fixed Wing Dispersant Operations Plan
d) Undertaking daily briefings and debriefing.
e) Ensuring relevant reports are forwarded to the IMT

Response Agency/Company is responsible for

f) Overall control of the incident response including the Fixed Wing Aerial Dispersant Operation

5.3 Demobilisation Phase

At this stage, the following should occur;

a) Contractor is responsible for relocation of aircraft and personnel to home base
b) **Attachment F** covers the specific operational detail for demobilisation

6 OPERATIONAL PLANNING

Prior to the commencement of aerial dispersant operations the response agency/industry must ensure the activities of the fixed wing aerial dispersant capability are covered within the general Air Operations Plan. The Air Operations Plan should cover all aspects of all aviation activities that occur during a response. This includes exclusion zones, general flying, aerial surveillance, SAR operations and aerial dispersant operations. The Aerial Dispersant Operations plan needs to be coordinated with surface operations to ensure on-the-ground/sea safety parameters are met for responders/shipping during aerial dispersant operations. This plan remains the responsibility of the Incident Controller.

The Fixed Wing Dispersant Operations plan is a sub-plan to the Air Operations Plan and is generally compiled and coordinated by the AFR and AMSA/AMOSC. The sub-plan will consist;

a) Fixed Wing Dispersant Operations Plan
b) Risk Assessment

Templates for each of the above plans can be found at **Annex A.**

For an offshore industry incident, the Fixed Wing Dispersant Operations Plan can either be articulated in the Titleholder's OPEP or in the Control Agency Incident Action Plan. The Incident Controller is required to approve any operational plan for aerial dispersant operations.

6.1 Operational Airfields

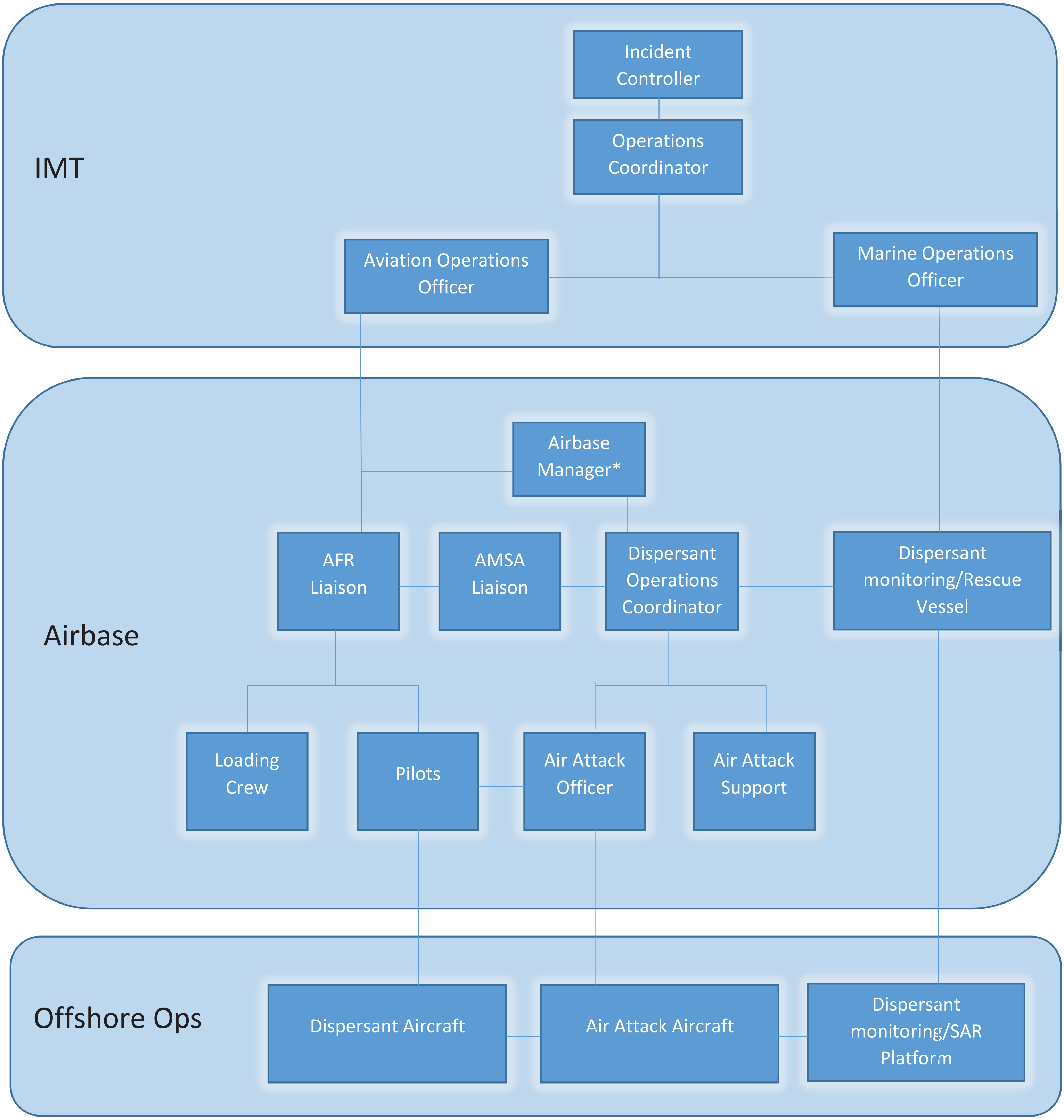
In order to establish an appropriate airfield the Control Agency (through AMSA/AMOSC) must ensure that the requirements as set out in **Attachment C**, Fixed Wing Aerial Dispersant Operations Checklist are followed.

6.2 Operational Control

Operational control of the aerial dispersant operation during a response in which an aircraft is utilised is the responsibility of the Incident Controller.

6.3 FWADC Organisation Chart

The following organogram depicts the dispersant organisation for a 2 x aeroplane operation;



*Airbase manager role may be undertaken by the Dispersant Operations Coordinator depending on the scale of the incident.

7 OPERATIONAL ROLES

During a response each position involved specifically in the FWAD operation has specifics roles and tasks to undertake to ensure the operation is undertaken in a safe manner. The following describe the roles of each of the positions.

7.1 Incident Controller

The Incident Controller is responsible for:

- all operational aspect of the response including the Fixed Wing Aerial Dispersant Capability.
- Approval of the Incident Action Plan part of which will be the Fixed Wing Dispersant Operations Plan. A template for this plan can be found at **Annex A.**
- Final approval for fixed wing dispersant operations to occur. This need to be in writing or email to the contractor before they will fly.

7.2 AMSA Duty Officer

The AMSA Duty Officer is responsible for the initial response to the incident and is required to:

- Activate the Fixed Wing Ariel Dispersant Capability consistent with the activation procedure in **Attachment A**.
- Liaise with AFR to establish a nominated Airfield.
- Act as a single point of contact for AFR until such times and the Dispersant Operations Coordinator can be appointed and is operation.
- Ensure AFR are regularly updated on the current situation.
- Ensure the company or agency requesting the activation is provided with regular updates during the activation process.

7.3 Aviation Operations Cell

The Air Operations Cell within the IMT is responsible for;

- Production of the Air Operations plan within the IAP
- De-confliction of air operations for the airspace through planning
- Air tasking orders for aerial dispersant operations
- Any other air tasking orders i.e. for Shoreline Clean-up Assessment Team, logistical ‘in-theatre’ moves where other aircraft are being utilised
- Management of dispersant logistics into airfield
- Rotation management of Air Ops cell
- Rotation management of air attack sup
- Organisation & tasking of SAR aircraft

7.4 Dispersant Operations Coordinator (DOC)

In an AMSA/State response AMSA will be responsible for providing appointing the DOC.

For an industry response the relevant company will be responsible for appointing the DOC.

The DOC is responsible establishing the airbase in accordance with the Fixed Wind Dispersant Operations Checklist provided in **Attachment C** to the JSOP**.**

They are responsible for developing the systems and procedures for the effective day to day management of the Fixed Wing Dispersant Operation.. This will include:

- Source equipment required to set up the airbase See **Attachment C** of the JSOP
- Single point of contact for the AFR Liaison officer and the Aviation Section of the IMT
- Arranging dispersant (transportation to the nominated airfield);
- Arranging a dispersant transfer capability (loading aircraft)
- Meeting all safety requirements.
- Conducting daily briefings for airbase personnel;
- Communicating with the Incident Management Team;
- Approving the Daily Report Form;
- Managing and coordinating National Plan equipment and resources; and
- Managing the welfare of Dispersant personnel.
- Developing the concept of operation for dispersant operations in conjunction with the AFR Liaison Officer.
- Undertake daily briefing and debriefing consistent with Atta**chment XXXXX**

7.5 AMSA Liaison Officer

In an AMSA or State led response this role can be filled by the Dispersant Operations Coordinator. In and Industry led response this position must be appointed and assist the DOC with:

- FWADC contractual matters
- All safety matters in liaison with AFR and Incident control.
- Liaison with industry and the AFR
- Ensuring all resources and PPE to undertake are on site. I list of resources can be found **Attachment C.**

7.6 AFR Liaison Officer

The AFR Liaison Officer is responsible for supervising AFR personnel and resources. The Liaison Officer has the authority to make decisions on behalf of AFR.

Liaison Officer duties include:

- Providing specialists advise in regards to aircraft and loading operations;
- Onsite monitoring ensuring compliance(s) with contract requirements;
- Coordinating and gathering information for aircraft operations including Flight Plans and post flight reporting;
- Completing the daily and weekly report forms provided in **Attachments D and E** respectively**.**
- Managing AFR aircraft and personnel.
- Liaising with the DOC and AMSA liaison officer.

- Assist with the development of the Fixed Wind Dispersant Operations Plan in conjunction with the Dispersant Operations Coordinator.

7.7 Air Attack/Air Observer

AMSA/AMOSC will be responsible for providing air attack capability of appropriately qualified personnel. The Air Attack Officer will be responsible for coordinating dispersant operations at the incident site. They along with the pilots are also responsible for developing flight plan in for each dispersant sortie. A flight plan template can be found at **Attachment G.**

7.8 Loading Crew

AFR is required to provide a Loading Crew of 2 people on site within 24 hours. AFR must ensure that Loading Crew maintain accurate records of activities, including but not limited to:

- Hours worked;
- Duties performed;
- Dispersant type loaded; and
- Aircraft loaded.

7.9 Pilots

All operational decisions will be made in consultation with the AFR Liaison Officer, the AFR pilots and AMSA. The final decision as to whether an aircraft will undertake a given task lies with the pilot.

The pilot is responsible for:

- Developing flight plans
- Application of dispersant consistent with the concept of operations and at the direction of the Air Attack Officer.
- Post flight reporting.

ATTACHMENT A – NATIONAL PLAN GUIDANCE FOR THE ACTIVATION OF THE FIXED WING AERIAL DISPERSAND CAPABILITY

NATIONAL PLAN GUIDANCE	ACTIVATION OF THE FIXED WING AERIAL DISPERSANT CAPABILITY
Reference	*Fixed Wing Aerial Dispersant Capability Joint SOP Version 2.0 dated 13 Aug 2013* *AMSA Contract 13AMSA115. (Note: New JSOPs are currently being developed for the new Contract and this proceeding may change to reflect these SOPs at a later date)*
Purpose:	*This Guidance should be observed by the AMSA Duty Officer responsible for either **placing on standby or activating** the FWADC as part of a pollution response.*
STEP 1	**RECEIVE Request**
How Requests are Received	**All requests are to be put through the RCC on 1800 641 792.** **RCC advises MEPR Duty Officer** • MEPR Duty Officer assesses need for AMSA response **State or Territory Agency** • Request by phone call, with follow up in writing via email (as soon as practicable), to AMSA Duty Officer, from the Incident Controller **AMOSC (on behalf of the offshore industry)** • Request by phone call, and in writing via email (as soon as practicable), to AMSA **AMSA confirms** the request, through AMSA Duty Officer, in consultation with either: • Manager, Marine Environment Pollution Response, • General Manager, Marine Environment Division
STEP 2	**ASSESS the request**
CONFIRM Key Information	**Confirm** key information: • Requests from State/Territory or AMOSC to be taken at face value for action, but seek to confirm information in order to inform AMSA decision-makers and FWADC contractors - refer to existing POLREP • Confirm location and timing of spill, pollutant type, and quantity spilled, • If possible, seek information on where the incident controller is in the process to approve dispersant use. Note: activation should still occur as a pre-emptive measure without use-approval confirmation. • *if additional information is required, contact the requesting agency.* **Record** all details in NEMO.
CONFIRM Aircraft availability	**Confirm** availability of FWADC aircraft (NOTE: This is not a **Stand-by** or **Activation** action) • **Liaise** with FWADC Contractor Duty Officer to confirm availability of Primary Aircraft (*This will serve as a warning of a potential task*). • **Outline** incident details as currently known to the FWADC Contractor Duty Officer – confirm in email as soon as possible.

In consultation with the FWADC Contractor Duty Officer,

- **Determine** what zone should respond
- **Review** likely operating airfields
- **Review** aircraft register for available aircraft

Record all details in NEMO.

STEP 3 NOTIFY Stakeholders

AMSA Authority

AMSA Officers authorised to place the Contractor on Standby or to Activate are:

- Manager, Marine Environment Pollution Response,
- General Manager, Marine Environment Division,
- AMSA Deputy CEO, or
- MEPR Duty Officers (as directed by one of the above AMSA Officers, or when consultation with these officers from Step 1. can't be completed within required timeframes).

MEPR Duty Officer

- Is responsible to communicate the Standby and Activation request

Heads Up and ACTIVATION

Phone call to **FWADC Contractor Duty Officer**, followed by email (as soon as practicable) with details:

- Incident location and on-site agency/incident controller contact details
- Number of aircraft to be on standby/activated for initial response
- Oil & dispersant type(s), including properties
- In consultation with FWADC Contractor Duty Officer determine appropriate airfield/s

Record actions in NEMO.

CONSIDER notifying

Internal (AMSA)

- GM Marine Environment Division
- AMSA Public Relations
- AMSA Legal
- Other MEPR Personnel – for assistance
- AMSA Airbase Manager (when appointed)

External

- Affected jurisdictions
- Other jurisdictions
- GBRMPA – *if within boundary or adjacent*
- AMOSC – *if offshore area*
- NOPSEMA

Call Out Lists and Email contacts (available in NEMO)

- FWADC contractor Duty Officer and Supervisor
- State & Territory call out list
- National Plan Call out list

STEP 4 AMSA Duty Officer ACTIONS

Forward Notice Phase

- **Receive**, assess and confirm the request
- **Determine** the spill location, size, time & properties of oil
- **Liaise** with the requesting agency, and seek status of dispersant use approval process
- **Contact** the FWADC Duty officer and notify them of the incident and that their services may be required. When doing so, ensure that they understand that the notification is for information only and not a formal activation
- **Record** all details in NEMO.

ACTIVATION Phase

Direct FWADC Contractor to ACTIVATE the FWADC

- **Liaise** with FWADC Contractor Duty Officer to determine the location of a suitable aerodrome, closest aircraft, suitable stockpile of dispersants and pumps
- **Obtain** AMSA Authority as is Step 3 above
- **Confirm** Activation by email to FWADC Contractor – to include update on known information, including AMSA single point of contact

Receive Operational Updates from FWADC Contractor (AMSA Duty Officer to follow up with courtesy call if contractual time limits below are exceeded)

- **Stage 1** : within 30 min - FWADC Contractor to advise when nominated aircraft can commence and any limitations
- **Stage 2**: within 60 min – FWADC Contractor to advise time other primary aircraft would be able to commence operations at nominated location
- **Stage 3**: within 90 min – FWADC Contractor to advise the time that the FWADC Contractor **Liaison Officer** and FWADC Contractor **Loading Crews** would be at nominated aerodrome and ready to commence operations

Inform stakeholders on relevant updates/changes

- **Record** actions in NEMO
- **Duty Officer provides all details of Activation to the AMSA FWADC Contract Liaison Officer, once appointed, for inclusion in the incident plans and Concept of Operations**

ATTACHMENT B – AIRCRAFT OPERATIONAL CAPABILITIES

Zone	NOB	Endurance (minutes)	Capacity (litres)	Air Speed (knots)	Range (nm)	Operating Range (nm)	Max Capacity at 200nm (litres)	Closest Operating NOB	Flight Time (approx.)	Furthest Operating NOB	Flight Time (approx.)
Southern Zone (SA) AT-802	Parafield	240 min	3000 lts	160 kn	640 nm	280 nm	3000 lts	Parafield	0	Ceduna	112 min
SE Zone (VIC) AT-50	Ballarat	210 min	1900 lts	130 kn	455 nm	200 nm	1500 lts	Avalon	17 min	Hobart (TAS)	135 min
Eastern Zone (NSW) AT-802	Scone	240 min	3000 lts	160 kn	640 nm	280 nm	3000 lts	Taree	32 min	Byron Bay Merimbula	90 min 110 min
NE Zone (QLD) S2RT-660	Emerald	190 min	2700 lts	160 kn	500 nm	215 nm	2700 lts	Rockhampton	48 min	Horn Is	350 min Incl 1 fuel stop
Northern Zone (NT) AT-802	Batchelor	240 min	3000 lts	160 kn	640 nm	280 nm	3000 lts	Darwin	15 min	Gove Exmouth (WA)	130 min 460 min
SW Zone (WA) AT-802	Jandakot	240 min	3000 lts	160 kn	640 nm	280 nm	3000 lts	Perth	0	Carnarvon Exmouth	165 min 270 min

ATTACHMENT C - FIXED WING AERIAL DISPERSANT OPERATIONS CHECKLIST

[Completed by AMSA/AMOSC]

Stage 1 – Airfield Establishment – AMSA

Task	✔	✘	Comments
Identify Aircraft to be utilised			
Consult with Contractor to identify specific aircraft requirements			
Identify acceptable airfields within vicinity of incident considering: • Geographical & Climatic limitations • Airfield or landing area availability • Approach and departure paths • Apron capacity & number of aircraft & type of aircraft • Maintenance support • Fuel availablity			
Liaise with Airport Operations Manager to arrange access to airfield			

Assess airfield facilities – • Operations/coordination room • Office facilities – internet, fax, telephone • Catering facilities / Amenities – toilets, kitchen, eating room • Access arrangements – 24/7 • Security arrangements – equipment, operations room, airfield • Availability of bulk water • Vehicle access – truck, 4wd, car, bus • Storage for equipment			
Refuelling facilities and arrangements – bulk, drums, truck Identify fuel requirements of aircraft – Turbine / Piston Identify availability and transfer arrangements for refuelling			
Emergency Service arrangements – fire, ambulance, rescue, hospital			
Transport arrangements for airbase personnel – distance from town			

Stage 2 – Staging Area Establishment - AMSA

Task	✓	✗	
Establish Operations Room			

Identify staging area – loading area, parking of aircraft, equipment zones			
Develop aviation traffic plan – transiting of aircraft, loading aircraft			
Develop traffic plan – entry/exit point to airfield, parking, travel directions			
Points of Contact • Aviation providers • Pilot's • Aircrew • Airport Operations • Ground Crew • Emergency Services • Fuel Provider • Taxi and local services/business			
Communication Equipment – Mobile Phone Marine radio Aviation radio Satellite telephone Internet Landline			
Communication Plan – Develop protocol for communication			
Local Maps – including street maps of nearest town, business directory			
Dispersant - availability, transport, storage, bunding			

Loading Area Considerations – • Heavy vehicle access • Safety of Airbase personnel • Does not interfere with airport operations • Sufficient parking for vehicles & equipment • Security – media, members of the public, equipment storage			
Equipment fault report procedure			
Develop contingency plans for secondary equipment if required			
Identify local suppliers of equipment - establish contact			
Evaluate need for signage – restricted area, designated walkway, parking			
Evaluate need for external lighting – loading area			
Obtain MSDS for dispersant			
Reporting structure for Airbase personnel			
Crew rosters / shift arrangements			

Stage 3 – Airfield Operations - AMSA

Task	✓	✗	
Sign in book for Airbase personnel			

Develop site safety / induction briefing (airbase manager)			
Recording of aircraft flight details and crew			
Identify local flight schedules			
Recording of dispersant usage – quantities, aircraft, time, date			

AMSA Equipment to be collected from Canberra

Equipment	Location	✓	✗	Comments
4 x Aviation manually inflating Svitlik life vests	Basement			
4 x Personal Locating Beacon (PLB)	Basement			
1 x Aviation Radio & charger	Basement			
1 x Marine Radio & charger	Basement			
2 x Ear Muffs	Basement			
4 x Chemical Masks and filters	Basement			
1 x Satellite Telephone	Basement			
ASIC and MISC Identification	Personal Issue			

AMSA Equipment considerations on arrival at Airbase – currently not supplied

Equipment	Comment	✓	✗	Comments
Secondary Water Pump	As backup should primary pump fail			

10lt bucket	Hand washing, fresh water storage			
5lt jug	Priming of dispersant pump			
20lt Jerry Can	Fuel for dispersant pump			
1000lt Fresh water	For washing, 1st Aid and priming pump			
Fire Extinguisher	9kg Dry Chemical Powder			
First Aid Kit	Ensure contains eye wash solution			
Spill kit	Dispersant/fuel spill equipment			
Sunscreen				
Hand Wash				
Additional PPE Equip.	Replacement filters, overalls, gloves, masks etc			
Stationary	Clip board, paper, highlights, sticky pad, stapler White board markers, calculator, manila folder			

AMSA Personal Protective Equipment (PPE) required by Airbase personnel AFR personnel supply their own PPE

Equipment for Airbase/Dispersant Loaders	✓	✗	**Comments**
Hi visibility safety clothing/vest			
Cotton Overalls – Loading Crew specific			
Eye Protection – Loading Crew specific			
Industrial Work Boots			

Sun Protection – cap must be secured by ear muffs			
PVC Gloves – Loading Crew specific			
Hearing Protection			
Towel – Loading Crew specific			

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A7. Shoreline Assessment Form

Shoreline Assessment Form

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

Purpose

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

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

Purpose

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

Priorities

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

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

Complete

- Take Five and
- Job Safety Analysis (JSA)

Prior to and as part of your operations

What is a shoreline assessment?

A shoreline assessment:

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

What information needs to be gathered?

Purpose

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

Additional information that may be required:

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

Dividing the shoreline

Sectors

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

Segments

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

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

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

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

Shoreline descriptors:

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

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

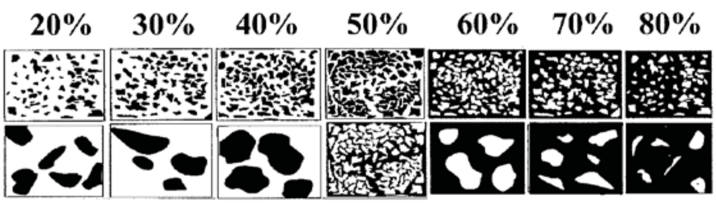
Biological character

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

Oil description/character

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

Percentage oil cover

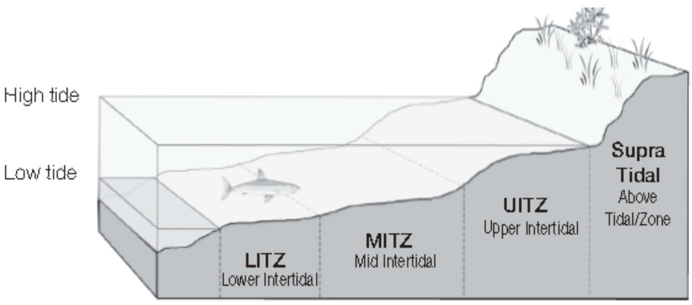


Oil thickness

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

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

Shoreline tidal zones



Incident		Ref No.	

REPORTING DETAILS			
Assessment Team Leader		**Position/ Organisation**	
Team Members (name/org)			
Date Completed		**Time Completed**	
Reporting to		**Position/ Organisation**	
Date Received		**Time Received**	

LOCATION DETAILS			
Sector		**Segment**	
Name of Beach/Location		**Description (e.g. slope)**	
Topography/ Other Map		**Map Reference**	
Access Via	☐ Foot Only ☐ Road ☐ 4WD ☐ Boat ☐ Helicopter ☐ Gator/OUV		
Hazards			

TIMING			
First Assessment	☐ Yes ☐ No	**Last Assessment**	☐ Yes ☐ No
Timing	☐ Pre Impact ☐ Post Impact Before Clean-Up ☐ Post Impact After Clean-Up		
Time Since	Impact (days/hrs.):	Last Clean-up (days/hrs.):	

ASSESSMENT

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

Sketch Map

Please include North point and scale

Notes

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A8. Stakeholder Consultation

Refer to Document ID: JADESTONE-1389807935-53404

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A9. Global Dispersant Stockpiles July 2020

APPENDIX A9: GLOBAL CHEMICAL DISPERSANT INVENTORY (JULY 2020)

Owner	Stockpile Locations	Dispersant Volume (m^3)	Dispersant Type	Total Volume (m^3)
AMSA	Adelaide	10	Slick Gone EW	355
		10	Slick Gone NS	
	Brisbane	10	Slick Gone NS	
		10	Slick Gone EW	
	Townsville	10	Slick Gone EW	
		15	Slick Gone NS	
	Karratha	10	Slick Gone EW	
		10	Slick Gone NS	
	Darwin	10	Slick Gone EW	
		10	Slick Gone NS	
	Devonport	10	Slick Gone NS	
		10	Slick Gone EW	
	Fremantle	48	Slick Gone NS	
		52	Slick Gone EW	
	Horn Island	10	Slick Gone NS	
	Melbourne	10	Slick Gone EW	
		10	Slick Gone NS	
	Sydney	45	Slick Gone NS	
		55	Slick Gone EW	
AMOSC	Exmouth	75	Slick Gone NS	747

Owner	Stockpile Locations	Dispersant Volume (m^3)	Dispersant Type	Total Volume (m^3)
	Fremantle	8	Slick Gone NS	
		27	Corexit 9500	
		500 (SFRT stockpile)	Slick Gone NS	
	Geelong	75	Slick Gone NS	
		62	Corexit 9500	
OSRL (Access up to 50% of SLA stocks)	Various: Singapore Southampton (UK) Bahrain Fort Lauderdale (USA)	694 (50% = 347)	Slick Gone NS Slick Gone EW Slickgone LTSW Finasol OSR 52 Corexit 9500 Corexit 9527	347
TOTAL (access agreements in place)				**1,094**
OSRL Global Dispersant Stockpile (GDS) (Access to GDS at the time of an event)	Various: Singapore Southampton (UK) Vatry (France) Cape Town (South Africa) Fort Lauderdale (USA) Rio de Janeiro (Brazil)	5,000	Slick Gone NS Finasol OSR 52 Corexit 9500	5,000
TOTAL (including additional ORSL 50% SLA and GDS stocks)				**6,094**