Gump-1 Exploration Drilling

Environment Plan Summary

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CONTENTS

LIST OF ACRONYMS

Abbreviation	Description
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMBA	Area that May Be Affected
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Marine Safety Authority
Apache	Apache Northwest Pty Ltd
APPEA	Australian Petroleum Production and Exploration Association
AQIS	Australian Quarantine and Inspection Service
ARPA	Automatic Radar Plotting Aid
BOP	Blow-Out Preventer
CFA	Commonwealth Fisheries Association
CHARM	Chemical Hazard and Risk Management
CMR	Commonwealth Marine Reserves
DAH	Dissolved Aromatic Hydrocarbons
DEC	Department of Environment and Conservation
DEWHA	Department of the Environment, Water, Heritage and the Arts
DMP	Department of Mines and Petroleum
DoE	Department of the Environment
DoF	Department of Fisheries
DoT	Department of Transport
DPaW	Department of Parks and Wildlife
EMBA	Environment that May Be Affected
ENVID	Environment hazard identification
EP	Environment Plan

Abbreviation	Description
EPA	Environmental Protection Agency
EPBC	Environmental Protection and Biodiversity Conservation
GDA	Geocentric Datum of Australia
HSE	Health Safety Environment
ICT	Incident Command Team
IMO	International Maritime Organization
IMS	Introduced Marine Species
IOPP	International Oil Pollution Prevention
KEF	Key Ecological Feature
KPI	Key Performance Indicators
MARPOL	International Convention for the Prevention of Pollution from Ships
MASP	Maximum Allowable Surface Pressure
MMA	Marine Management Areas
MODU	Mobile Offshore Drilling Unit
MOU	Memorandum of understanding
MP	State Marine Parks
MSDS	Material Safety Data Sheet
NEBA	Net Environmental Benefit Analysis
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NWS	North West Shelf
OCNS	Offshore Chemical Notification Scheme
ODS	Ozone Depleting Substances
OIM	Offshore Installation Manager
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPEP	Oil Pollution Emergency Plan
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OWR	Oiled Wildlife Response

Abbreviation	Description
ROV	Remotely Operated Vehicle
PMS	Planned Maintenance System
POB	Persons on Board
RCC	Rescue Coordination Centre
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	International Convention of the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
TD	Total Depth
TVDSS	True Vertical Depth Sub-Sea
VRASS	Bio fouling Vessel Risk Assessment
VSP	Vertical Seismic Profiling
WA	Western Australia
WAF	Water Accommodated/Available Fraction
WAFIC	Western Australian Fishing Industry Council
WOMP	Well Operations Management Plan
WBM	Water Based Muds

1. INTRODUCTION

Apache Northwest Pty Ltd ('Apache') proposes to drill the Gump-1 hydrocarbon exploration well (the 'Activity'), located in Commonwealth waters approximately 250 km north of Karratha, Western Australia (WA), within permit area WA-482-P. Apache is the titleholder for petroleum activities covered under this environment plan (EP) within the permit area WA-192-P.

The Gump-1 Exploration Drilling Environment Plan (EA-00-RI-10016/1) ('the EP') has been prepared in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS (E) Regulations) for approval by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

1.1 Compliance

The overall purpose of the EP is to comply with statutory requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E) Regulations) and to ensure that the Activity is planned and conducted in accordance with Apache environmental policies and standards, including the Corporate Environmental Policy. The EP was assessed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 28th of January 2015. This EP summary has been prepared in accordance with the requirements of regulation 11(3) and 11(4) of the OPGGS (E) Regulations.

1.2 Schedule

The Activity is expected to take approximately 15-22 days to complete.

The timing of the drilling operation is dependent on rig availability and weather conditions; therefore the EP covers drilling Gump-1 well in any season. Currently, the drilling of the exploration well is scheduled to commence in Q2 of 2016.

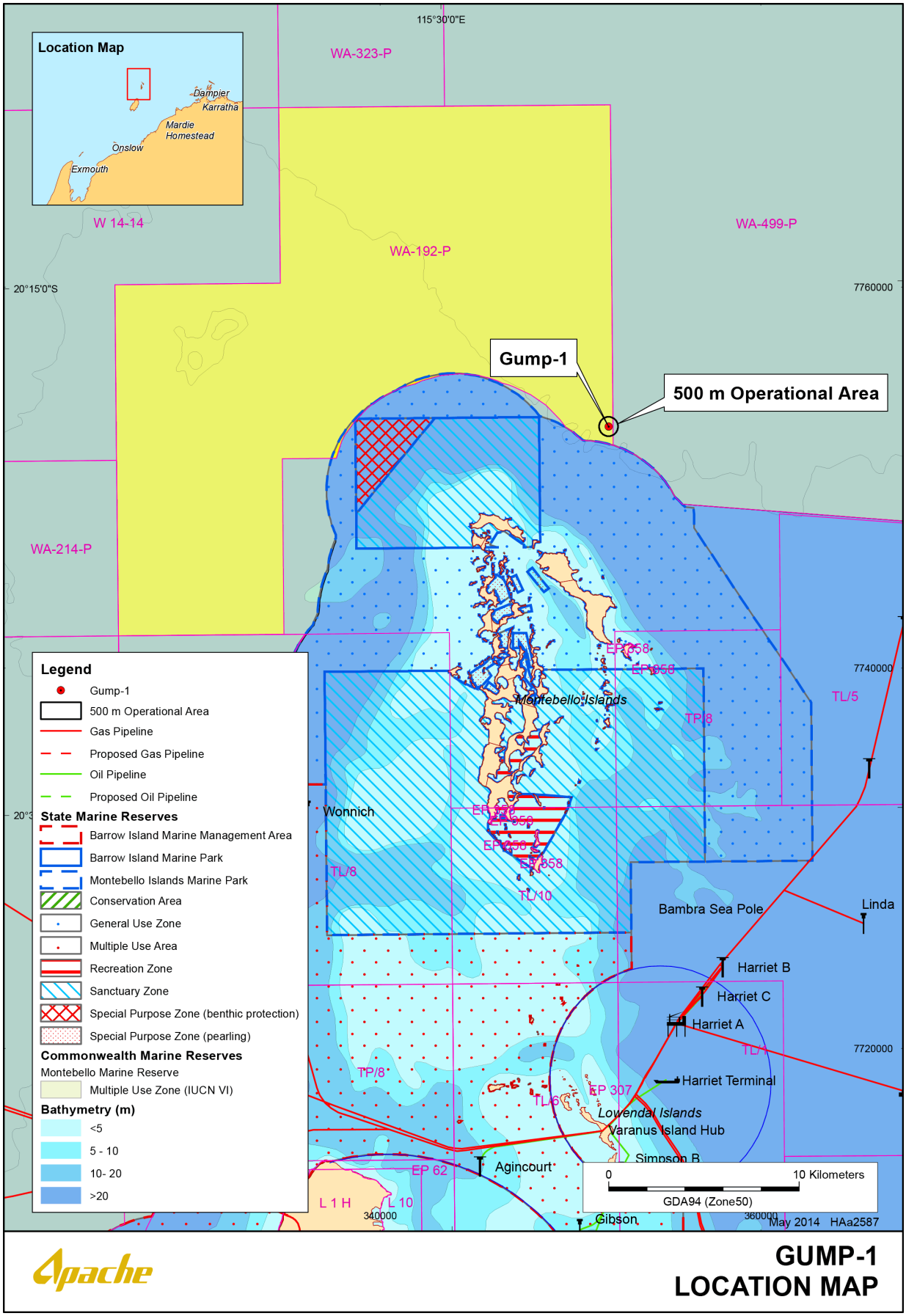

Figure 1-1: Location of the Gump-1 drilling activity

2. ACTIVITY LOCATION

The proposed coordinates of the well are provided in **Table 2-1** and the location is displayed in **Figure 1-1.**

The proposed well is located in a water depth of approximately 50 m, lies approximately 7.5 km from Trimouille Island (Montebello Group), 85 km from the closest mainland coast and 123 km from Dampier (closest population centre).

Table 2-1: Indicative location of the Levitt-1 exploration well

Parameter	Coordinates (Datum/Projection: GDA 94 Zone 50S)			
	Latitude	Longitude	Easting	Northing
Gump-1 well centre	20°19'04.86"S	115°34'53.62"E	351,999.70	7,752,690.60

2.1.1 Operational Area

The Operational Area defines the geographical boundary of the Activity and extends 500 m radially from the surface-hole location of the well and covers 0.78 km^2. Since the location of the well is less than 500 m away from the WA-192-P and WA-499-P boundary, some of the Operational Area falls within permit area WA-499-P. Apache is also the titleholder for WA-499-P, so there are no additional relevant persons identified associated with the Operational Area in this respect.

3. DESCRIPTION OF THE ACTIVITY

Apache proposes to drill the Gump-1 exploration well to test the depth and reservoir quality of the Havarti Sandstone formation using a using a jack up rig - mobile offshore drilling unit (MODU). The expected hydrocarbon is a light crude oil.

Jack-up rigs are towed into position to the drilling location by one to three support vessels. Once at the desired location and with the rig stationary, the legs are lowered to be fully in contact with the seabed and the rig raises itself approximately 15m above the sea surface, supported by legs contacting the sea floor. There are typically three spudcans that will penetrate the seabed with a diameter of approximately 18m. The estimated surface area at the bottom of each leg and associated spud can is 260 m^2.

The well will be drilled in three sections: surface, intermediate, and production[1]. The top surface hole will be drilled using sweeps of seawater and bentonite and will be returned to the seabed in this uncased section. The intermediate and production sections will be drilled with inhibited polymer water based muds (WBM). The extracted cuttings and recoverable fluids (WBM) from the intermediate and production intervals will be brought to the MODU through the riser and treated by solids control equipment to separate the drilling fluid from the cuttings. Separated drilling fluids are recycled downhole or stored for future use; cuttings (containing some residual drilling fluids) are discharged to the marine environment.

The drilling activity will also include installation of a blow-out preventer (BOP), wireline logging and vertical seismic profiling of the well.

The support vessels for the Activity will supply food, bulk drilling materials and transport equipment to the MODU once it is in position. There will be no support vessel anchoring within the nearby Montebello Islands (State) Marine Park or the Operational Area (**Section 2.1.1**). At least one support vessel will remain on location for the duration of the Activity to monitor the Operational Area around the MODU.

Vessel activities outside the 500 m diameter Operational Area are not regulated under this EP.

Crew changes for personnel on board the MODU will involve transfer by helicopter between the MODU and the nearest airport (most likely Onslow or Dampier). These flights will occur at least four times a week dependent on the progress of the Activity and logistical constraints. On approach to the MODU, the helicopters will descend to the helideck from a typical cruising height of between approximately 1,000 to 1,400 m.

Remotely operated vehicle (ROV) surveys are likely to occur periodically to determine the condition of subsea infrastructure, monitor drilling operations, manipulate subsea equipment, and confirm site adequacy (site survey).

3.1 Area that may be affected from planned events

Planned events of the activity will have environmental impacts. These will largely be confined to within the Operational Area. The area that may be affected (AMBA) by each planned event (hazard) associated with the activity is described below:

- **Seabed disturbance** is restricted to mooring of the MODU whilst operating within the Operational Area**;**
- **Discharge of cement** is predicted to only affect an area within the Operational Area, with mixed cement expected to settle rapidly following discharge from the seabed and surface;
- **Planned discharges** of waste streams will occur, and disperse/dilute;

[1] N.B. The naming convention used for the third drilling section (i.e. 'production') refers to the section at which the Havarti Sandstone reservoir will be encountered and not to the purpose of the section or the Activity. This is not a production well.

- **Atmospheric emissions** associated with the burning of fossil fuels are predicted to dissipate to concentrations that pose limited potential impact to receptors within the Operational Area; and
- **Interference with other users of the sea** is restricted to the activities undertaken in the Operational Area.
- The AMBA by **artificial light** has been based on the most sensitive receptor identified in the receiving environment, which in this case is considered to be marine turtles. The WA EPA conservatively estimates the area of influence on marine turtles from a light source is around 1.5 km (EPA, 2010), therefore this distance in a radial arc around the MODU is considered the AMBA by artificial light.
- The most sensitive receptors associated with **noise** are considered to be cetaceans that use noise for navigation and communication. The activity generating the highest level of potentially harmful noise is the VSP proposed to be undertaken as part of the Activity. The area of potential impact from VSP is considered to be 3 km;
- The AMBA by the **discharge of drill cuttings** has been identified as a 1 km radial arc around the MODU for seabed disturbance although any environmentally significant effect is expected to be restricted to within 50 m of the well;
- The AMBA by the **discharge of drill cuttings** on water quality has been identified as a 2.5 km radial arc around the MODU albeit during a relatively short period of time.

3.2 Area that may be affected from unplanned events

Unplanned events (i.e. accidents) may lead to environmental impacts. The following hazards arising from unplanned events have been assessed as having an AMBA confined to the Operational Area:

- Although the **Introduction of marine pests** could result in impacts to the marine ecosystem on a much larger spatial scale than that of the Operational Area, the estimate of an AMBA is not feasible owing to the large number of variables associated with this hazard (e.g. species type, habitat suitability) and hence the AMBA has been restricted to the Operational Area where the potential translocation could occur;
- Most non-buoyant **solid wastes** lost to the marine environment as a result of the Activity are expected to remain within the Operational Area; however buoyant waste streams may travel outside of the area. The dispersion of buoyant waste is highly unpredictable and hence the AMBA has been restricted to the Operational Area in the absence of dispersion data;
- **Dropped objects** (defined here as objects with sufficient weight to sink to the seafloor) will remain within the Operational Area;
- The potential for **marine fauna collisions** associated with the Activity are restricted to the Operational Area; and
- The potential for environmental impacts from small volume (<160 L) **spills of hydrocarbons, environmentally hazardous chemicals or liquid-wastes** is expected be restricted to receptors within the Operational Area owing to the rapid dilution or evaporation of volumes of this quantity and nature.

Unplanned events with the worst potential environmental impact and largest AMBA are all accidental oil spills, namely: diesel spills associated with vessel collisions or refuelling incidents; or a loss of well control (well blowout) resulting in the uncontrolled release of a large volume of formation hydrocarbon to the environment.

The AMBA by a diesel refuelling incident or a ruptured fuel tank, as determined by spill modelling, is illustrated in **Figure 3-1**.

The AMBA from a loss of well control is shown in **Figure 3-2** and **Figure 3-3**; the figures show some of the key sensitivities that occur within the AMBA for each hydrocarbon component for reference. Worst-case extents, based on a number of simulation outputs from stochastic oil spill dispersion modelling undertaken for the Activity (GHD 2014), have been used to determine the extent of three key physical and/or chemical phases of the hydrocarbon that pose differing environmental risks: surface oil, total oil in water and dissolved aromatic hydrocarbons (DAH). Threshold concentrations for each of these phases were developed and applied to the modelling outputs to define the AMBA for each phase.

The AMBAs shown in **Figure 3-1** to **Figure 3-3** do not represent the area that would be impacted following a single worst case credible oil spill. Rather they represent a cumulative area within which all potential oil spill impacts would be contained within. In the event of an oil spill accident the spill would move in the direction of the prevailing wind and currents, this area would be a smaller proportion of the area shown in these figures.

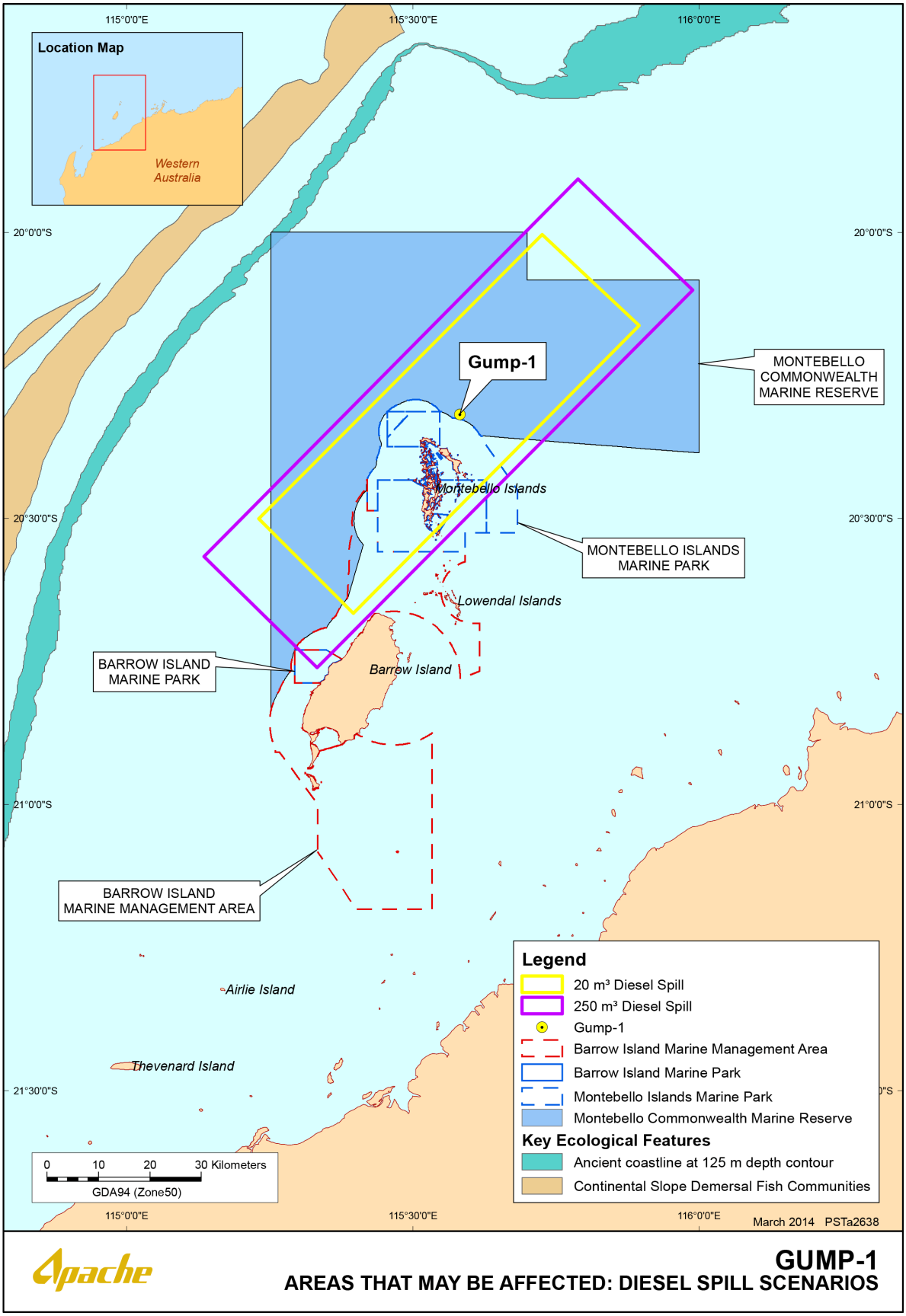

Figure 3-1: AMBA by spilt diesel showing marine protected areas and key ecological features

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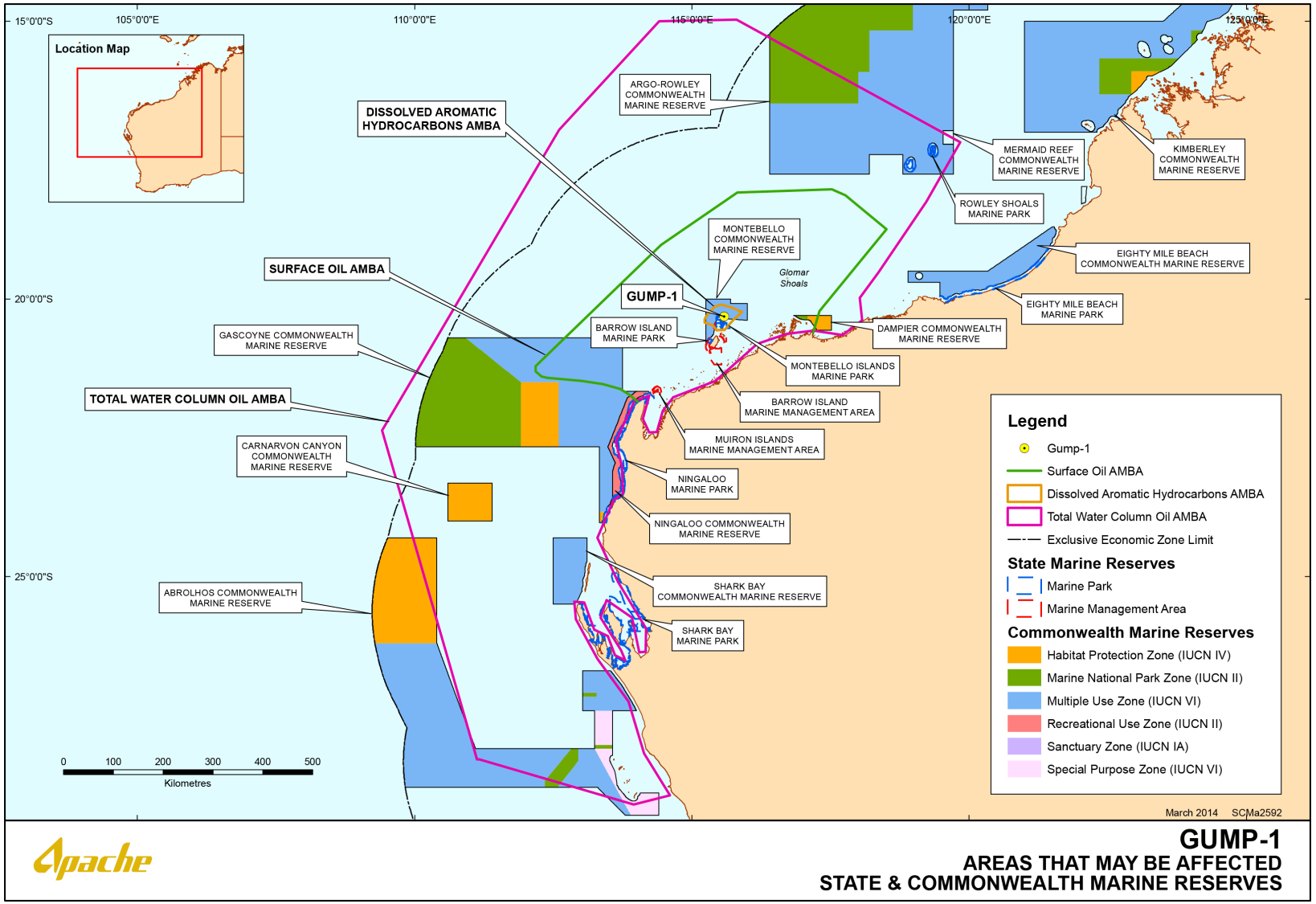

Figure 3-2: AMBAs for loss of well control showing marine protected areas

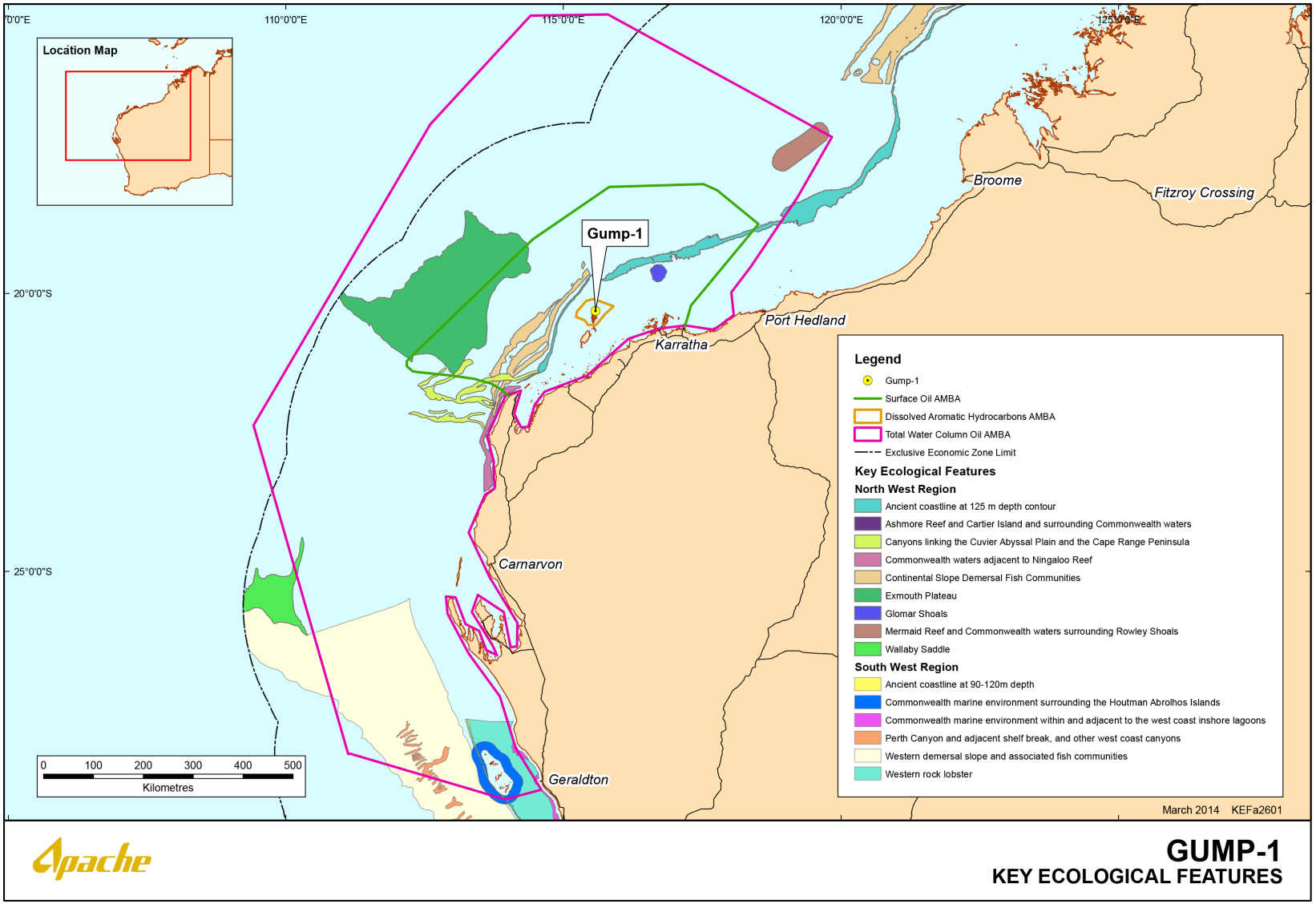

Figure 3-3: AMBAs for loss of well control showing key ecological features

4. RECEIVING ENVIRONMENT

The environment that may be affected (EMBA) by the activity is defined as the environment that could be affected by unplanned events (accidents) as well as planned events. The worst-case extent that may be affected by this Activity corresponds to the AMBA from a loss of well control scenario (refer **Figure 3-2** and **Figure 3-3**).

4.1 Physical environment

North West Shelf (NWS) waters are usually thermally stratified with a marked change in water density at approximately 20 m (SSE, 1993). Surface temperatures vary annually, being warmest in March (32˚C) and coolest in August (19˚C). During summer (October–March), the prevailing non-storm winds are from the southwest, west and northwest at an average speed of less than 10 knots, peak average speeds of 15–25 knots, and maximum speeds of 30 knots. Non-storm winds prevail from the north-east through to south-east at average speeds of 5–6 knots, peak average speeds of 10–15 knots, and maximum speeds of 20 knots. The wave climate is generally composed of locally generated wind waves (seas) and swells that are propagated from distant area (WNI, 1995; 1996). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway and Nye, 1985).

Tidal and wind-forcing are the dominant contributions to local sea surface currents. The tides of the NWS have a strong semi-diurnal signal with four tide changes per day (Holloway and Nye, 1985) and a spring tidal range of 1.9 m and a highest astronomical tide of 2.9 m (Chevron Australia, 2010). The dominant sea surface offshore current (typically seaward of the 200 m isobath) is the Leeuwin Current, which carries warm tropical water south along the edge of WA's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer. The current is described as a sea surface current, extending in depth to 150 m (BHPB, 2005; Woodside, 2005). Closer to the coast, the Ningaloo Current flows in a northerly direction, in the opposite direction to the Leeuwin Current, along the outside of the Ningaloo Reef and across the inner shelf from September to mid-April (BHPB, 2005; Woodside, 2005). The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer NWS (Woodside, 2005). This current brings warm and relatively fresh water to the region from the western Pacific via the Indonesian Archipelago.

Offshore drift currents are represented as a series of interconnected eddies and connecting flows that can generate relatively fast (1–2 knots) and complex water movement. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals) and thus will have greater influence upon the trajectory of slicks over time scales exceeding a few hours (APASA, 2014).

4.2 Habitats

The habitat within the Operational Area and at similar depths in the region is comprised of predominantly soft sediment. Given the depth of the Operational Area, and reduced light availability at the seabed, habitats such as seagrass meadows, algae beds and hard corals (often referred to as benthic primary producers) are not present. The soft sediment habitat of the Operational Area and adjacent seabed will be impacted by some planned events (**Table 7-1**) and could potentially be impacted by unplanned events (**Table 7-3**).

Habitats which could potentially be impacted by unplanned events (e.g. oil spills, refer **Table 7-3**) and the regional/geographical feature association of these habitats is presented in **Table 4-1.**

Table 4-1 Predominant habitats associated within the geographical features and regions within the EMBA

Geographical Feature	Predominant Subtidal/Intertidal Habitats				Predominant Shoreline Habitats			
	Soft Sediments	Coral Reefs	Macroalgal Beds	Seagrass Beds	Hard Substrates	Rocky Shorelines	Sandy Beaches	Mangroves
Northwest islands and reefs								
Muiron Islands	✓	✓	✓	✓	✓	✓	✓	
Thevenard Island	✓	✓	✓	✓			✓	
Barrow Island	✓	✓	✓	✓	✓	✓	✓	✓
Lowendal Islands	✓	✓	✓	✓		✓	✓	
Montebello Islands	✓	✓	✓	✓	✓	✓	✓	✓
Imperieuse Reef	✓	✓		✓	✓		✓	
Clerke Reef	✓	✓		✓				
Mermaid Reef	✓	✓		✓				
Northwest mainland regions								
Exmouth Region	✓	✓	✓	✓	✓	✓	✓	✓
Onslow Region	✓	✓	✓	✓	✓	✓	✓	✓
Dampier Region	✓	✓	✓	✓	✓	✓	✓	✓
Hedland Region	✓	✓	✓	✓	✓	✓	✓	✓
Mid-west islands and reefs								
Abrolhos Islands	✓	✓	✓	✓	✓		✓	
Mid-west mainland regions								
Coral Bay Region	✓	✓	✓	✓	✓	✓	✓	✓
Lake Macleod Region	✓	✓	✓	✓	✓	✓	✓	✓
Shark Bay Region	✓	✓	✓	✓	✓	✓	✓	
Kalbarri Region	✓	✓	✓	✓	✓	✓	✓	
Geraldton Region	✓	✓	✓	✓	✓	✓	✓	

4.3 Protected Areas

The World Heritage Areas that occur within the EMBA are listed in **Table 4-2**. The Operational Area does not overlap any World Heritage Areas and no planned or unplanned events will contact a World Heritage Area with the exception of a loss of well control event that may contact the Shark Bay and Ningaloo Coast World Heritage Areas **Table 4-2**.

Three National Heritage Properties occur in the EMBA as listed in **Table 4-2**. The Operational Area does not overlap any National Heritage Properties and no planned or unplanned events will contact a National Heritage Properties with the exception of diesel spills which may contact the Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves and a loss of well control event that may contact the Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves and the Shark Bay and Ningaloo Coast World Heritage Areas **Table 4-2**.

The marine protected areas (Commonwealth Marine Reserves and State Marine reserves) that occur within the EMBA are listed in **Table 4-2** and displayed in **Figure 3-2**. The Operational Area is located within the Montebello Commonwealth Marine Reserve (CMR) and is adjacent to the Montebello Islands Marine Park (refer **Figure 1-1** and **Figure 3-1).** Other marine protected areas that overlap the AMBAs for unplanned events (unplanned diesel spills and loss of well control) are presented in **Table 4-2**.

The key ecological values of the Montebello/Barrow Islands Marine Conservation Reserves (which includes the Montebello Islands Marine Park) are listed below. Some of these have been identified as Key Performance Indicators (KPI) for the marine park.

- Geomorphology
- Sediment quality
- Water quality (KPI)
- Coral Reef communities (KPI)
- Mangrove communities (KPI)
- Macro algal and seagrass communities (KPI)
- Rocky shore/intertidal communities
- Intertidal sand/mudflat communities
- Subtidal soft bottom communities
- Marine mammals
- Turtles (KPI)
- Seabirds
- Finfish (KPI)
- Invertebrates

Additional information on State Marine Reserves is available at the following link:

http://www.dpaw.wa.gov.au/management/marine/marine-parks-and-reserves

Additional information on Commonwealth Marine Reserves is available at the following link:

http://www.environment.gov.au/topics/marine/marine-reserves/north-west

Additional information on World Heritage Areas is available at the following link:

http://www.environment.gov.au/heritage/places/world-heritage-list

Additional information on National Heritage Properties is available at the following link:

http://www.environment.gov.au/topics/heritage/heritage-places/national-heritage-list

Table 4-2: Protected areas overlapping the Operational Area and hydrocarbon spill AMBAs

Marine protected area	Operational Area	Diesel Spills AMBA (Refuelling)	Diesel Spill AMBA (Collision)	Loss of well control AMBA
World Heritage Areas				
Ningaloo Coast World Heritage Area				✓
Shark Bay World Heritage Area				✓
National Heritage Places				
Ningaloo Coast National Heritage Place				✓
Shark Bay National Heritage Place				✓
Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves		✓	✓	✓
Commonwealth Marine Reserves				
Montebello Commonwealth Marine Reserve (CMR)*	✓	✓		✓
Dampier CMR*				✓
Ningaloo CMR				✓
Gascoyne CMR*				✓
Shark Bay CMR*				✓
Argo Rowley CMR*				✓
Mermaid Reef CMR				✓
Carnarvon Canyon CMR*				✓
Abrolhos CMR*				✓
State Marine Parks (MP) and Marine Management Areas (MMA)				
Rowley Shoals MP				✓
Barrow Island MP			✓	✓
Barrow Island MMA		✓	✓	✓
Montebello Islands MP		✓	✓	✓
Ningaloo Marine Park				✓
Muiron Islands MMA				✓

*Declared as a Commonwealth Marine Reserve in November 2012 and subject to Transitional Arrangements until July 2014 when new Marine Park Management Plans come into force.

4.4 Key Ecological Features

Key ecological features (KEFs) are elements of the Commonwealth marine environment that are considered to be of regional importance for either the region's biodiversity or ecosystem function and integrity.

The Key Ecological Features (KEFs) of the EMBA are listed in **Table 4-3**. None of these features overlap the Operational Area. The only event resulting from the activity with the potential to impact a KEF is an unplanned loss of well control. The AMBA for an unplanned loss of well control overlaps the spatial boundaries of the KEFs listed in **Table 4-3.**

Further information on the listed KEFs is available at:

http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north-west

Table 4-3: Key Ecological Features of the EMBA

Key Ecological Feature	Operational Area	Diesel Spills AMBA (Refuelling)	Diesel Spill AMBA (Collision)	Loss of well control AMBA
Ancient coastline at 125 m depth contour				✓
Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula				✓
Commonwealth waters surrounding Ningaloo Reef				✓
Continental Slope Demersal Fish Communities				✓
Exmouth Plateau				✓
Glomar Shoals				✓
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals				✓
Wallaby Saddle				✓
Ancient coastline at 90-120 m depth				✓
Commonwealth marine environment surrounding the Houtman Abrolhos Islands				✓
Commonwealth marine environment within and adjacent to the west coast inshore lagoons				✓
Perth Canyon and adjacent shelf break, and other west coast canyons				✓
Western demersal slope and associated fish				✓
Western rock lobster				✓

4.5 Marine fauna

Species likely to be resident within the Operational Area are infaunal and epifaunal invertebrates and demersal fish species. A search of the EPBC Act Protected Matters Database was conducted to provide a list of threatened and/or migratory species protected under the EPBC Act within the EMBA, as displayed in **Table 4-4** and **Table 4-5**. These species are considered to be of greatest sensitivity to planned and unplanned events arising from the activity, however none of these species are considered resident within the Operational Area. Some may pass through the Operational Area while the majority occur outside the Operational Area but within the areas that may be affected (AMBAs) by accidental diesel spills or a loss of well control event.

Table 4-4: EPBC Act listed threatened species in the EMBA

Species		EPBC Act Status				Operational Area	Diesel spills AMBA	Loss of well control AMBA
Common Name	Scientific Name	Critically Endangered	Endangered	Vulnerable	Migratory			
Fish								
Whale shark	*Rhincodon typus*			✓	✓	✓	✓	✓
Grey nurse shark (west coast population)	*Carcharias taurus*			✓				✓
Great white shark	*Carcharodon carcharias*			✓	✓			✓
Dwarf sawfish	*Pristis clavata*			✓			✓	✓
Blind gudgeon	*Milyeringa veritas*			✓				✓
Marine mammals								
Sei whale	*Balaenoptera borealis*			✓	✓			✓
Blue whale	*Balaenoptera musculus*		✓		✓	✓	✓	✓
Fin whale	*Balaenoptera physalus*			✓	✓			✓
Southern right whale	*Eubalaena australis*		✓		✓			✓
Humpback whale	*Megaptera novaeangliae*			✓	✓	✓	✓	✓
Australian sea lion	*Neophoca cinerea*			✓	✓			✓
Marine turtles								
Loggerhead turtle	*Caretta caretta*		✓		✓	✓	✓	✓
Green turtle	*Chelonia mydas*			✓	✓	✓	✓	✓

Species		EPBC Act Status				Operational Area	Diesel spills AMBA	Loss of well control AMBA
Common Name	Scientific Name	Critically Endangered	Endangered	Vulnerable	Migratory			
Leatherback turtle	*Dermochelys coriacea*		✓		✓	✓	✓	✓
Hawksbill turtle	*Eretmochelys imbricata*			✓	✓	✓	✓	✓
Flatback turtle	*Natator depressus*			✓	✓	✓	✓	✓
Short-nosed sea snake	*Aipysurus apraefrontalis*	✓				✓	✓	✓
Birds								
Australian lesser noddy	*Anous tenuirostris melanops*			✓				
Southern royal albatross	*Diomedea epomophora epomophora*			✓	✓			
Northern royal albatross	*Diomedea epomophora sanfordi*		✓		✓			✓
Amsterdam albatross	*Diomedea exulans amsterdamensis*		✓		✓			✓
Tristan albatross	*Diomedea exulans exulans* (*D. dabbenena*)		✓		✓			✓
Wandering albatross	*Diomedea exulans (sensu lato)*			✓	✓			✓
Southern giant-petrel	*Macronectes giganteus*		✓		✓	✓	✓	✓
Northern giant-petrel	*Macronectes halli*			✓	✓			✓
Soft-plumaged petrel	*Pterodroma mollis*			✓				✓
Australian Painted Snipe	*Rostratula australis*		✓		✓			✓
Australian fairy tern	*Sternula nereis nereis*			✓				✓
Indian yellow-nosed	*Thalassarche carteri*			✓	✓			✓

Species		EPBC Act Status				Operational Area	Diesel spills AMBA	Loss of well control AMBA
Common Name	Scientific Name	Critically Endangered	Endangered	Vulnerable	Migratory			
albatross								
Shy albatross	*Thalassarche cauta cauta*			✓	✓			✓
White-capped albatross	*Thalassarche cauta steadi*			✓	✓			✓
Black-browed albatross	*Thalassarche melanophris*			✓	✓			✓
Campbell albatross	*Thalassarche melanophris impavida*			✓	✓			✓

Table 4-5: Additional EPBC Act listed migratory species in the EMBA

Species		Operational Area	Diesel spills AMBA	Loss of well control AMBA
Common Name	**Scientific Name**			
Fish				
Shortfin mako	*Isurus oxyrinchus*		✓	✓
Longfin mako	*Isurus paucus*		✓	✓
Mackerel shark	*Lamna nasus*			✓
Giant Manta Ray	*Manta birostris*		✓	✓
Marine mammals				
Bryde's whale	*Balaenoptera edeni*	✓	✓	✓
Killer whale	*Orcinus orca*	✓	✓	✓
Indo-pacific humpback dolphin	*Sousa chinensis*	✓	✓	✓
Spotted bottlenose dolphin (Arafura/Timor Sea populations)	*Tursiops aduncus*	✓	✓	✓
Antarctic minke whale	*Balaenoptera bonaerensis*			✓
Sperm whale	*Physeter macrocephalus*			
Dusky dolphin	*Lagenorhynchus obscurus*			
Dugong	*Dugong dugon*		✓	
Birds				
Roseate tern	*Sterna dougallii*	✓	✓	✓
Common noddy	*Anous stolidus*			✓
Fork-tailed swift	*Apus pacificus*		✓	✓
Lesser frigatebird	*Fregata ariel*		✓	✓
White-tailed tropicbird	*Phaethon lepturus*			✓
Flesh-footed shearwater	*Puffinus carneipes*			✓
Wedge-tailed shearwater	*Puffinus pacificus*		✓	✓
Little tern	*Sterna albifrons*			✓
Bridled tern	*Sterna anaethetus*		✓	✓
Lesser crested tern	*Sterna bengalensis*		✓	✓

Species		Operational Area	Diesel spills AMBA	Loss of well control AMBA
Common Name	**Scientific Name**			
Caspian tern	*Sterna caspia*		✓	✓
White-bellied sea-eagle	*Haliaeetus leucogaster*		✓	✓
Barn swallow	*Hirundo rustica*		✓	✓
Rainbow Bee-eater	*Merops ornatus*			✓
Common sandpiper	*Actitis hypoleucos*			✓
Great egret	*Ardea alba*		✓	✓
Cattle Egret	*Ardea ibis*			✓
Ruddy turnstone	*Arenaria interpres*			✓
Sanderling	*Calidris alba*			✓
Red knot	*Calidris canutus*			✓
Curlew sandpiper	*Calidris ferruginea*			✓
Red-necked Stint	*Calidris ruficollis*			✓
Great knot	*Calidris tenuirostris*			✓
Greater sand plover	*Charadrius leschenaultii*			✓
Oriental plover	*Charadrius veredus*		✓	✓
Oriental pratincole	*Glareola maldivarum*		✓	✓
Grey-tailed tattler	*Heteroscelus brevipes*			✓
Bar-tailed godwit	*Limosa lapponica*			✓
Black-tailed godwit	*Limosa limosa*			✓
Eastern curlew	*Numenius madagascariensis*			✓
Whimbrel	*Numenius phaeopus*			✓
Grey plover	*Pluvialis squatarola*			✓
Wood Sandpiper	*Tringa glareola*			✓
Terek sandpiper	*Xenus cinereus*			✓

4.6 Socio-economic environment

The State and Commonwealth managed fisheries that occur within the EMBA are shown in **Table 4-6**.

Table 4-6: State and Commonwealth Fisheries zones within the EMBA

Value/Sensitivity	Operational Area	Diesel Spills AMBA	Loss of well control AMBA
Commonwealth Managed Fisheries			
North West Slope Trawl Demersal trawl fishery for scampi (primarily) and finfish. Extends from 114° E to approximately 125° E off the WA coast between the 200 m isobath and the outer limit of the Australian Fishing Zone (AFZ).			✓
Western Skipjack Tuna Fishery Primarily purse seine fishery but with no current effort in NW Australia	✓ But no current effort in NW Australia	✓ But no current effort in NW Australia	✓ But no current effort in NW Australia
Southern Bluefin Tuna Purse seine or pelagic longline fishery but with no current effort in NW Australia.	✓ But no current effort in NW Australia	✓ But no current effort in NW Australia	✓ But no current effort in NW Australia
Western Deepwater Trawl Fishery Trawl fishery for demersal finfish west and south of North West Cape and operating offshore the 200 m isobath to the edge of the Australian Fishing Zone			✓
Western Tuna and Billfish Fishery Primarily pelagic longline fishery. Extends westward from Cape York Peninsula (142°30' E) off Queensland to 34° S off the WA west coast. It also extends eastward from 34° S off the west coast of WA across the Great Australian Bight to 141° E at the South Australian–Victorian border. No current effort near Operational Area	✓ But no recent effort in this location	✓ But no recent effort in this location	✓
State Managed Fisheries (Whole of State)			
Marine Aquarium Fish Fishery Hand harvest of finfish, coral, live rock, seagrass, algae and invertebrates by diving or wading throughout WA waters.	✓ But no effort in Operational Area as restricted to dive-able depths.	✓	✓
Specimen Shell Managed Fishery Hand harvest of shells by diving or wading throughout WA waters.	✓ But no effort in Operational	✓	✓

Value/Sensitivity	Operational Area	Diesel Spills AMBA	Loss of well control AMBA
	Area as restricted to dive-able depths.		
Beche-de-mer Fishery Hand harvest of sandfish (*Holothuria scabra*), deepwater redfish (*Actinopyga echinites*) by diving (primarily) and wading.	✓ But no effort in Operational Area as restricted to dive-able depths.	✓	✓
Mackerel Managed Fishery (Area 2 and 3) Trolling or handlining for spanish and grey mackerel in all waters to the 200 nautical mile AFZ between 114º E to 121º. Restricted to coastal and shallower waters.	✓	✓	✓
Octopus Baited or unbaited traps for common octopus (*Octopus tetricus*), white-striped octopus (*Octopus ornatus*), Maori octopus(*Octopus maorum*) from just south of Coral Bay to the WA – South Australia State border.			✓
State Managed Fisheries (North Coast Bioregion)			
Pilbara Trap Managed Fishery Trap fishery for demersal finfish This fishery lies north of latitude 21°44'S and between longitudes 114°9.6'E and 120°00'E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 30 m isobath	✓	✓	✓
Pilbara Fish Trawl Interim Managed Fishery Trawl fishery for demersal finfish. It occupies the waters north of latitude 21°35'S and between longitudes 114°9'36"E and 120°E. The Fishery is seaward of the 50 m isobath and landward of the 200 m isobath	✓	✓	✓
Pilbara Line Fishery Line fishery for demersal finfish Operates in 'Pilbara waters' meaning all waters bounded by a line commencing at the intersection of 21°56'S latitude and the high water mark on the western side of the North West Cape on the mainland of Western Australia; thence west along the parallel to the intersection of 21°56'S latitude and the boundary of the Australian Fishing Zone and north to longitude 120°E	✓	✓	✓
Pearl Oyster Managed Fishery (Zone 1, Zone 2, Zone 3) It is a quota-based, dive fishery, harvesting Indo-Pacific, silver-lipped pearl oyster (*Pinctada maxima*) in shallow coastal waters along the North-West Shelf. The fishery is separated into 4 zones: Pearl Oyster Zone 1: NW Cape (including Exmouth Gulf) to longitude 119°30´ E. This zone has not been fished since 2008.	✓ Zone 1 but currently not fished	✓ Zone 1 but currently not fished	✓

Value/Sensitivity	Operational Area	Diesel Spills AMBA	Loss of well control AMBA
Pearl Oyster Zone 2: East of Cape Thouin (118°20´ E) and south of latitude 18°14´ S. This zone is mainstay of fishery. Pearl Oyster Zone 3: West of longitude 125°20´ E and north of latitude 18°14´ S.			
Onslow Prawn Managed Fishery Trawl fishery targeting western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*) and endeavour prawns (*Metapenaeus* spp.). Operates along the western part of the North-West Shelf with most prawning activities concentrated in the shallower water off the main land. The boundaries of the OPMF are 'all the Western Australian waters between the Exmouth Prawn Fishery and the Nickol Bay prawn fishery east of 114º39.9' on the landward side of the 200 m depth isobath'.	✓	✓	✓
Nickol Bay Prawn Managed Fishery Trawl fishery targeting banana prawns (*Penaeus merguiensis*). Operates along the western part of the North-West Shelf in coastal shallow waters The boundaries of the NBPMF are 'all the waters of the Indian Ocean and Nickol Bay between 116°45' east longitude and 120° east longitude on the landward side of the 200 m isobath'. The NBPMF incorporates the Nickol Bay, Extended Nickol Bay, Depuch and De Grey SMFGs			✓
Pilbara Developing Crab Fishery Trap fishery for blue swimmer crab (*Portunus armatus*) centred largely on the inshore waters from Onslow through to Port Hedland			✓
Aquaculture Pearling Sites Production of pearls from the species *Pinctada maxima*. Major hatcheries operating at Broome and the Dampier Peninsular. Pearl farm sites are located mainly along the Kimberley coast, particularly in the Buccaneer Archipelago, in Roebuck Bay and at the Montebello Islands.		✓	✓
State Managed Fisheries (Gascoyne Bioregion)			
Shark Bay Crab Interim Managed Fishery Trap fishery for blue swimmer crab (*Portunus armatus*) in waters of Shark Bay north of Cape Inscription, to Bernier and Dorre Islands and Quobba Point (with some fishing south of Cape Inscription permitted).			✓
Shark Bay Prawn Limited Entry Fishery Trawl fishery for western king prawn (*Penaeus latisulcatus*) and brown tiger prawn (*Penaeus esculentus*) in and near the waters of Shark Bay.			✓
Shark Bay Scallop Limited Entry Fishery Trawl fishery for saucer scallop (*Amusium balloti*) in and near the waters of Shark Bay.			✓
Shark Bay Beach Seine and Mesh Net Managed Fishery			✓

Value/Sensitivity	Operational Area	Diesel Spills AMBA	Loss of well control AMBA
Net (seine and mesh) fishery for whiting (*Sillago schomburgkii* and *S. analis*), sea mullet (*Mugil cephalus*), tailor (*Pomatomus saltatrix*) and yellowfin bream (*Acanthopagrus latus*) in waters in and around Shark Bay.			
Gascoyne Demersal Scalefish Fishery Line fishery for various finfish in waters of the Indian Ocean and Shark Bay between latitudes 23°07'30"S and 26°30'S.			✓
Exmouth Gulf Prawn Fishery Trawl fishery for brown tiger prawn (*Penaeus esculentus),* western king prawn (*P. latisulcatus*), endeavour prawn (*Metapenaeus spp.)*, banana prawn (*P. merguiensis*) in the waters of Exmouth no farther than the Muiron Islands, Serrurier Island and Locker Island.			✓
West Coast Deep Sea Crustacean Managed Fishery Trap fishery for crystal (Snow) crabs (*Chaceon albus*), giant (king) crabs (*Pseudocarcinus gigas*) and champagne (spiny) crabs (*Hypothalassia acerba*) in the waters lying north of latitude 34° 24' S (Cape Leeuwin) and west of the Northern Territory border on the seaward side of the 150 m isobath out to the extent of the Australian Fishing Zone.	✓ But no effort due to water depth	✓	✓
State Managed Fisheries (West Coast Bioregion)			
West Coast Rock Lobster Fishery Trap fishery for Western rock lobster (*Panulirus cygnus*) from Albany to North West Cape			✓
Roe's Abalone Fishery Dive fishery for Roe's Abalone (*Haliotis roei*) in WA waters but commercial fishery closed above Moore River.	✓ But no effort due to water depth and closed fishery	✓ But no effort due to closed fishery	✓ But no effort due to closed fishery
Abrolhos Islands and Mid-West Trawl Trawl fishery for saucer scallops (*Amusium balloti*) and western king prawn (*Penaeus latisulcatus*) in the waters of the Indian Ocean adjacent to Western Australia between 27°51´ south latitude and 29°03´ south latitude on the landward side of the 200 m isobaths.			✓
West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery Gillnet and longline fishery for dusky whaler shark (*Carcharhinus obscurus*), whiskery shark (*Furgaleus macki*) and gummy shark (*Mustelus antarcticus*) in waters north from latitude 33° S to a line drawn north of North West Cape (114°06' E). However, the use of shark fishing gear has been prohibited north of 26° 30' S (Steep Point) since 1993.			✓
West Coast Demersal Scalefish (Interim) Managed Fishery Handline and dropline fishery for demersal finfish operating in waters just south of Shark Bay to just east of Augusta and seaward to the 200 nautical mile boundary of the Australian Fishing Zone			✓

Value/Sensitivity	Operational Area	Diesel Spills AMBA	Loss of well control AMBA
South West Coast Salmon Managed Fishery South-West Coast Salmon Managed Fishery includes all WA waters north of Cape Beaufort except Geographe Bay. However fishing occurs only around Perth metropolitan beaches (given species distribution along south and south-west coasts)	✓ But no fishing effort. Outside distribution of target species.	✓ But no fishing effort. Outside distribution of target species.	✓ But no fishing effort. Outside distribution of target species.

Aquatic recreational activities such as boating, diving and fishing occur near the coast and islands off of the Pilbara and Ningaloo coasts. Nature-based tourism has become more popular in the north-west coastal region, with seasonal attractions including humpback whale watching, whale shark encounters and tours of turtle hatchings. The majority of these tours occur around Ningaloo Reef and Cape Range National Park. Popular land based activities include bushwalking, camping, bird watching and four-wheel driving. These activities are concentrated in the vicinity of the population centres such as Exmouth, Dampier, Onslow, Carnarvon, Shark Bay (Monkey Mia), Point Samson and Port Hedland.

The EMBA supports a large petroleum industry, with production/drilling infrastructure common throughout the area; the closest onshore facility to the Gump-1 well centre is located on Varanus Island.

There are many recognised shipping fairways off the north-west coast of Australia; this network was established by AMSA and any alerts to changes or hazards within these fairways are managed by a Notice to Mariners.

5. ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

Environmental impact and risk identification involves identifying the hazards and events that could result in an environmental impact from the activity. The identification of hazards and events is based on a detailed understanding and experience of the activities to be carried out (Apache's engineers and project co-ordinators) and knowledge and experience of likely impacts from these activities on the environment (Apache's environmental scientists). The hazard identification workshop is the forum used to capture this expertise and was used to identify hazards and events associated with operational and non-routine activities as well as unplanned events. Following on from the workshop the risk assessment is further detailed through smaller working groups/ meetings as required, during the preparation of the environment plan and detailed engineering of the project design to mitigate the environmental risks identified to as low as reasonably practicable (ALARP) and acceptable levels.

As Low As Reasonably Practical (ALARP) impacts and risks

For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that control measures adopted reduce the impact or risk to ALARP. This process relies on demonstrating that further potential control measures would require a disproportionate level of cost/effort for the level of impact or risk reduction they would provide. If this cannot be demonstrated then further controls are implemented. The level of detail included within the ALARP assessment is based upon the nature and scale of the potential impact and risks.

Acceptable levels of impacts and risks

Apache considers that environmental impacts of planned events are within an 'acceptable level' (i.e. tolerable) when the severity of the impact (consequence) is rated 'minor' or 'negligible', as defined in **Table 5-1**.

Table 5-1: Definition of consequence

Consequence	
Critical	Large-scale detrimental effect. Long-term recovery over decades.
Major	Significant effect on local ecosystem factors. Recovery measured in years.
Moderate	Detectable impact on local ecosystem factors. Recovery measured in months.
Minor	Insignificant changes to overall ecological function. Recovery measured in weeks to months.
Negligible	Short-term, localised and insignificant impacts. Rapid recovery measured in days to weeks.

While the consequence of an impact from an unplanned event (i.e. an accident) may be higher than 'minor' (**Table 5-1**), the likelihood could be so remote that the risk posed to the environment is considered 'tolerable' (i.e. acceptable) according to Apache's definition of risk and management response **Table 5-2**.

Table 5-2: Definition of risk and management response

Category	**Description and response**
Unacceptable	Work cannot proceed as currently planned. The work needs to be redefined and enhanced mitigation strategies need to be implemented and reassessed before the work can proceed.
ALARP	Risk reduction measures need to be implemented – ALARP principle applies.
Tolerable	Risks are sufficiently low to be acceptable – ALARP principle also applies.

The key steps Apache used in the assessment of environmental impacts from planned activities and risk from unplanned events are identified below.

5.1 Environmental impact assessment of planned events

1. Environmental hazard identification (**Section 5.3**): a process used to define and describe the hazard associated with the activity.
2. Impact analysis (**Section 5.4**): assessment of potential environmental impacts to the values and sensitivities in the environment that may be affected (EMBA).
3. Pre-treatment consequence ranking (**Section 5.5**): ranks the level of 'inherent' environmental consequence of each planned event without control measures in place based on the available information and the experience of marine scientists/engineers assessing the hazard.
4. Control measures (**Section 5.6**): describes the proposed control measures, and associated measures of environmental performance, used to reduce the level of impact to ALARP and acceptable.
5. Post-treatment consequence ranking (**Section 5.7**): ranks the post treatment ('residual') environmental consequence based on the available information (including known effectiveness of proposed control measures) and the experience of marine scientists/engineers assessing the hazard with control measures in place.
6. Acceptability and ALARP demonstration (**Section 5.8**): presents the available information to demonstrate that post treatment impact is at an ALARP and acceptable level.

5.2 Environmental risk assessment of unplanned events

1. Environmental hazard identification (**Section 5.3**): a process used to define and describe the hazard associated with the activity.
2. Impact Analysis (**Section 5.4**): assessment of potential environmental impacts to the values and and sensitivities in the EMBA.
3. Pre-treatment risk ranking (**Section 5.5**): ranks the inherent risk level combining the likelihood of the event occurring and the potential consequence rating without control measures in place. The risk ranking is determined at risk workshops attended by experienced marine scientists and engineers.
4. Control measures (**Section 5.6**): describes the proposed control measures, and associated measures of environmental performance, used to reduce the level of risk to ALARP and acceptable.
5. Post-treatment risk ranking (**Section 5.7**): ranks the risk level combining the likelihood of the event occurring and the potential consequence rating with control measures in place. The risk ranking is determined at risk workshops attended by experienced marine scientists and engineers and subsequent meetings as required.
6. Acceptability and ALARP demonstration (**Section 5.8**): presents the available information to demonstrate that post treatment risk is at an ALARP and acceptable level.

5.3 Environmental hazard identification

The environment hazard identification (ENVID) process is used to identify all of the environmental hazards that could credibly be associated with an activity either from planned (i.e. actual impacts) or unplanned events (i.e. potential risks). The basis of the ENVID process is industry experience and professional judgment together with available incident databases.

5.4 Impact analysis

Impact analysis for each identified hazard is conducted in a systematic manner following the general process of:

- Identifying the key concerns;

- Consideration of sensitive environmental features potentially affected either directly or indirectly by the activities;
- Where practicable, quantification of the magnitude of the stressor, the concentration of contaminant and/or level of disturbance;
- Consideration of timing, duration and other factors affecting the impact and risk (water depth, temperature, tides etc.); and
- Consideration of cumulative impacts.

The impact analysis is undertaken for values and sensitivities of the EMBA by planned and unplanned events.

The environmental consequence of each impact is assessed in workshops attended by marine scientists. Given the complexity of ecosystems (in terms of ecosystem components and their interactions), consequence can be difficult to quantify but can be expressed qualitatively based on the scale of the impact, the expected level of change to ecosystem/population function and the time it may take for recovery of the ecosystem/population. It is considered that within the natural environment, some aspects have a higher value than others. The following aspects, or sensitive receptors, have been specifically considered when determining the overall environmental consequence of an impact:

Habitat

- Benthic primary producer habitats;
- Habitats that are rare or unique;
- Habitat that represents a Key Ecological Feature; and
- Habitats within protected areas.

Species and ecological communities

- EPBC listed threatened fauna;
- EPBC Act migratory fauna; and
- EPBC listed threatened ecological communities.

Protected Areas

- World Heritage Areas;
- Ramsar Wetlands;
- Commonwealth/National Heritage Areas; and
- Marine Conservation Reserves

In addition to an assessment of natural sensitive receptors, the consequence levels for impacts to socio-economic factors are also assessed. For this Activity relevant socio-economic receptors are fishing (commercial and recreational) and aquaculture, tourism, oil and gas exploration and production and commercial shipping.

5.5 Pre-treatment ranking

The severity of impacts for all planned and unplanned events is assessed according to **Table 5-1**.

For unplanned events, the likelihood of the event occurring is also determined on a scale of Rare to Expected (**Table 5-3**). Unplanned events are then risk ranked using the qualitative risk matrix shown in **Table 5-4**. The environmental risk ranking is determined by combining the expected severity of the impact (consequence) with the likelihood of the unplanned event occurring.

Table 5-3: Definition of likelihood

Likelihood	
Expected	Is expected to occur in most circumstances at the location during the lifecycle phase or phases being assessed.
Probable	Will probably occur in most circumstances at the location during the lifecycle phase or phases being assessed.
Likely	Could occur in most circumstances at the location during the lifecycle phase or phases being assessed.
Unlikely	Unlikely but possible to occur at the location during the lifecycle phase or phases being assessed.
Rare	The possibility of an incident is highly unlikely but may occur under exceptional circumstances during the lifecycle phase or phases being assessed.

Table 5-4: Apache qualitative risk matrix

		Consequence				
		Negligible	Minor	Moderate	Major	Critical
Likelihood	Expected to Occur	*Tolerable*	*ALARP*	*Unacceptable*	*Unacceptable*	*Unacceptable*
	Probably will occur	*Tolerable*	*ALARP*	*ALARP*	*Unacceptable*	*Unacceptable*
	Likely to Occur	*Tolerable*	*ALARP*	*ALARP*	*Unacceptable*	*Unacceptable*
	Unlikely to Occur	*Tolerable*	*Tolerable*	*ALARP*	*ALARP*	*ALARP*
	Rare	*Tolerable*	*Tolerable*	*Tolerable*	*ALARP*	*ALARP*

5.6 Control measures

Control measures are measures that reduce the likelihood of the event occurring (unplanned events), or reduce the consequence of the impact of the event (both planned and unplanned events). Defining control measures takes into account the relevant options defined during the impact and risk assessment workshop and subsequent meetings, legal requirements, relevant guidelines, Apache policy and after consideration of the requirements of relevant stakeholders. Control measures must also reduce the impact or risk to an acceptable level and to ALARP.

Adopted control measures are given appropriate environmental performance outcomes, performance standards and measurement criteria for determining whether the outcomes and standards have been met during the activity.

An environmental performance outcome is a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.

The approach adopted in this EP is that all events that are being managed to reduce the impact or risk have an associated environmental performance outcome.

Noting, for events which have impacts that are considered of low environmental consequence (i.e. environmental consequence rating of ‘minor’ or ‘negligible’) or where there is a clear linkage between

cause and effect relationship, the environmental outcome may be focused on the processes and procedures necessary to ensure adequate controls are applied for reducing the impact or risk to ALARP.

An environmental performance standard means a statement of the performance required of a control measure. All control measures have at least one environmental performance standard.

5.7 Post-treatment ranking

Post-treatment ranking follows the same process of the pre-treatment ranking but with consideration of the adopted control measures. This process takes into consideration the effectiveness of the control measures which can be determined from industry experience, statistics and an assessment of the number and type of control measures employed.

5.8 Acceptability and ALARP demonstration

The OPGGS (E) Regulations require the EP to demonstrate that the environmental impacts and risks of the activity will be acceptable and that they will be reduced to ALARP.

If the residual (i.e. after application of control measures) environmental impact or risk of the planned or unplanned event has been ranked within an 'unacceptable zone' (i.e. a consequence of Moderate to Critical for planned events or a risk ranking of High for unplanned events) then the activity cannot be carried out without a further application of control measures to reduce the ranking to an acceptable level.

Further, there must be an ALARP demonstration for each hazard that the cost/effort of additional control measures are grossly disproportionate to the level of impact or risk reduction that they would provide. This process considers the proportionality of impacts and risks during the ALARP evaluation. That is, the level of demonstration for a particular hazard is proportionate to inherent impact or risk of that hazard.

In addition to assessing an acceptable level of impact to the natural and socio-economic environment based on a consequence level/risk ranking and ALARP demonstration, acceptability is also based on whether the impact, or control measures used to reduce the level of impact, are consistent with the Apache Environmental Policy, applicable legislation and have considered any relevant stakeholder feedback.

6. STAKEHOLDER CONSULTATION

As stated in Apache's Environmental Management Policy, our company is committed to maintaining open community and government consultation regarding its activities and environmental performance.

Apache's operating presence off the North West Shelf (e.g. gas processing facilities at Devil Creek and Varanus Island) ensures that communication is regular with relevant stakeholders, including those potentially affected by this activity. The identified stakeholders are commercial fishers in the region, fishing bodies, federal departments and regulators. Relevant stakeholders identified for the Activity based on the defined Operational Area are summarised in **Table 6-1**.

Table 6-1: Summary of stakeholders consulted

Group	Stakeholder
Commercial fisheries	• Australian Fisheries Management Authority (AFMA) • Department of Fisheries (DoF) • Western Australian Fishing Industry Council (WAFIC) • Commonwealth Fisheries Association (CFA) • A Raptis and Sons. • Austral Fisheries • WestMore Seafoods • Shark Bay Seafoods • MG Kailis • Pearl Producers Association • State commercial fishing licence holders
Recreational fisheries	• Recfishwest • Marine Tourism WA
Marine conservation	• Commonwealth Department of the Environment (DoE) • Department of Parks and Wildlife (DPaW) • Marine Parks and Reserves Authority (MPRA)
Tourism	• Marine Tourism WA (formerly Charter Boat Association)
Shipping safety and security	• Australian Maritime Safety Authority (AMSA) • Department of Defence
Hydrocarbon spill response	• Australian Marine Oil Spill Centre (AMOSC) • Department of Transport (DoT)
Adjacent Regulator	• Department of Mines and Petroleum (DMP)

Apache consults with stakeholders regularly in the course of its NWS operations, and will notify or consult with stakeholders should there be any changes to the Activity, either through the regular consultation process, or through a specific notification, whichever is deemed more appropriate. Apache is confident that stakeholders are adequately informed, and is able to feed back or request further information if required.

No major concerns were raised by stakeholders prior to the submission of this EP Summary. The most extensive consultation included the provision of oil spill modelling to DMP at request, and consultation with DPaW which included the provision of oil spill modelling and additional consultation with the Marine Parks and Reserves Authority. These interactions were all closed out and not further consultation is required at this stage.

Prior to preparing the Gump-1 Drilling EP, a consultation package was distributed to stakeholders on February 20, 2014, outlining the drilling activity.

Apache has extended its consultation program to include provision of Quarterly Updates to all individual commercial fishing licensees operating off the North West Shelf – now some 600 individual contacts.

The Apache Energy Quarterly Project Update has been developed in consultation with informed stakeholders and includes a summary of Apache's activities for the next six to nine months (in both

Commonwealth and State waters). The quarterly updates (which include this survey) are intended to trigger feedback, comments and requests for additional information or consultation opportunities for the future activities, and provide updates of the activities that are underway, or have previously been consulted on. Stakeholders are urged to contact Apache should they require more information or have concerns with any activities showcased.

Apache believes that consultation undertaken for the Activity has consulted with stakeholders and matters raised during consultation have been suitably addressed, and the ongoing Apache consultation program allows for future updates to be provided to stakeholders.

Oil Pollution Emergency Plan (OPEP) consultation

The Gump-1 EP contains a detailed OPEP to respond to accidental oil spills from the Activity. Appropriate and adequate consultation involves the consideration of stakeholders that could be impacted by the spill itself and its response, such that the impacts are reduced to ALARP.

Stakeholders for all Apache OPEPs including the Gump-1 Drilling OPEP (EA-00-RI-10016/2) are identified through evaluation of the Activity and spill potential.

Consultation has been undertaken with the following agencies and organisations throughout the development of Apache oil spill response strategies and tactics so that roles and responsibilities are understood and accepted:

- Australian Marine Oil Spill Centre;
- Australian Marine Safety Authority;
- APC Logistics;
- Department of Environmental Regulation (Waste Management Branch);
- Department of Foreign Affairs and Trade;
- Department of Industry;
- Department of Parks and Wildlife;
- Department of Transport;
- Oceaneering;
- Oil Spill Response Limited;
- ToxFree; and
- Wild Wells Control.

All listed parties have had input into the development of the responses defined within this OPEP. Results of consultation are evidenced in the Gump-1 Drilling OPEP (EA-00-RI-10016/2).

The OPEP will be revised and updated should a stakeholder's position change after acceptance of the Gump-1 OPEP, which will be identified through the ongoing engagement by the Apache Emergency/Oil Spill Coordinator with all companies and agencies identified, and through the periodic testing of the response arrangements as defined in Apache Oil Spill Response Arrangements Procedure (AE-91-IO-10097).

7. ENVIRONMENTAL HAZARDS AND CONTROLS

The following tables (refer to **Table 7-1** and **Table 7-3** below) provide a summary of environmental hazards and control measures for routine and contingency activities. The tables list the control measures that will be adopted to either prevent or mitigate impacts such that impact and risks are reduced to ALARP and are at acceptable levels. **Table 7-2** provides supporting information for the control of bulk drilling product discharges detailed in **Table 7-1.**

Table 7-1: Summary of planned events, impacts and control measures for routine and contingency activities

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
Seabed disturbance from physical presence	Disturbance of the seabed as a result of routine activities (e.g. MODU anchoring), leading to disturbance of benthic habitat.	The 'cans' of the legs of the jack-up MODU that will anchor the rig to seafloor are estimated conservatively to have a surface area of 260 m^2 per leg, equating to a maximum footprint of the MODU of 780 m^2. Impact will occur throughout the Activity.	Negligible	• No support vessel anchoring within the nearby Montebello Islands (State) Marine Park or the Operational Area (500 m exclusion zone) • 1 km^2 pre-spud seabed survey, centred around the proposed surface location of Gump-1 well, used to identify presence of significant raised seabed features and if present in a cluster, surface location of well to be repositioned to maximise the distance from the raised seabed features, within the technically feasible margin • MODU positioned at the location defined in the positioning procedures
Artificial light emissions	Limited behavioural impacts to fish and seabirds.	Depending on weather conditions, MODU lighting (particularly at night-time) will be visible at distances of tens of kilometres, with intensity attenuating with distance. Artificial lighting will be required on a 24-hour basis for the duration of the Activity (15-22 days).	Negligible	• Deck spot lights not required for safety purposes will be turned off or directed inboard.
Noise	Impacts to fauna are expected to be limited to temporary behavioural impacts to migrating cetaceans.	Localised around the drilling location for general noise, extending up to 3 km from the well location for VSP. Duration of the Activity for general noise and approximately 18 hours for VSP.	Negligible	• MODU and support vessel machinery maintained in accordance with the PMS. • Vessel crew to attend environmental induction containing basic information on procedures to manage interactions between support vessels and marine fauna. • Compliance with Part 8 of EPBC Regulations for interacting with cetaceans (vessels). • Unless taking off or landing, helicopters will operate in accordance with Part 8 of EPBC Regulations for interacting with cetaceans (Aircraft). • VSP or check-shot survey activities will implement mitigation

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
				measures outlined in Apache's Environmental Checklist for MODU Seismic Operations, which are consistent with EPBC Act Policy Statement 2.1 Part A (DEWHA, 2008b) for cetaceans and whale sharks: ○ Training and awareness of MODU crew ○ Visual observation by MODU crew ○ Soft start, operations and stop work procedures ○ Daylight, low visibility and night procedures ○ After action review, reporting and record keeping
Discharge of water based mud (WBM), drill cuttings and fluids	Benthic habitats have the potential to be impacted through smothering (sediment deposition and toxicological effects) and through reduction to water quality (turbidity and toxicological effects).	The seabed area affected by drill cuttings is expected to extend up to 1 km from the source, although any environmentally significant effect is expected to be restricted to within 50 m of the well. Turbidity from drilling discharges (either during the riserless section or during discharge overboard) is expected to affect the environment within a distance of up to 2.5 km, albeit during a relatively short period of time. Recovery of benthic habitats from disturbances due to drilling discharges is expected within weeks to months of the discharges having occurred. Recovery of water quality conditions is expected within hours after the cessation of drilling.	Negligible	• Apache's drilling fluid selection process is utilised to ensure the mud selected for the Activity presents the lowest environmental impact given the formation properties and the required drilling performance to successfully complete the hole. • In accordance with Apache's Drilling Fluid and Chemical Selection in Drilling Activities (EA-91-II-007) document, drilling fluids registered under the Offshore Chemical Notification Scheme (OCNS) will have a Chemical Hazard and Risk Management (CHARM) ranking of Gold or Silver or Non-CHARM ranking of D or E, being chemicals with the lowest potential for causing environmental harm. • Drilling fluids not registered under the OCNS will be risk assessed in accordance with Apache's Drilling Fluid and Chemical Risk Assessment Procedure (EA-91-II-008) and only chemicals with an acceptably low potential for causing environmental harm based on ecotoxicity, bioaccumulation and biodegradation data will be selected. • WBM cuttings returned to the MODU are treated through shale shakers to reduce the volume of WBM fluid on cuttings prior to discharge. • Selected shaker screens are inspected daily during drilling operations to ensure they are operating as intended. • The decision list provided in **Table 7-2** will be followed to dispose of bulk powders, brines and WBM.

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
				• Preventative maintenance conducted on the cuttings management system (e.g. shale shakers, centrifuges) • To ensure correct volumes are recorded, mud pit sensor calibration is checked every 2 weeks, with re-calibration only required if calibration is out • When operational, daily inspections to ensure the centrifuge system is operating as planned to remove solids from the mud.
Discharge of cement	Presence of cement in the water column may lead to reduced water quality (e.g. increased turbidity) and the smothering of benthic habitat.	Cement will be discharged at the sea surface during drilling with a riser and at the seabed when undertaking riserless drilling. The thickness and spread of piles or slabs on the seabed will be dependent on the volume of cement discharged and the currents experienced in the vicinity of the well location. The majority of the cement waste discharged at the surface during cement pipe cleaning and drilling of plugs will settle within a footprint similar to that identified for riserless drilling; smaller particles will travel further during surface discharge but would be unlikely to result in significant build ups downstream. In the unlikely event bulk cement and / or cement additives have to be disposed of overboard as wet slurry, the area that may be affected is estimated to be <50 m around the surface well location.	Negligible	• During bulk loading of silos, a crew member will be posted at the vent and will remain in contact with the supply vessel to prevent overfilling. • In accordance with Apache's Drilling Fluid and Chemical Selection in Drilling Activities (EA-91-II-007) document, cement chemicals registered under the Offshore Chemical Notification Scheme (OCNS) will have a Chemical Hazard and Risk Management (CHARM) ranking of Gold or Silver or Non-CHARM ranking of D or E, being chemicals with the lowest potential for causing environmental harm. • While cementing prior to riser installation, a remotely operated vehicle (ROV) will monitor the top of the well, to ensure excessive volumes of cement are not pumped. • 1 km^2 pre-spud seabed survey, centred around the proposed surface location of Gump-1 well, used to identify presence of significant raised seabed features and if present in a cluster, surface location of well to be repositioned to maximise the distance from the raised seabed features, within the technically feasible margin • Liquid or semi liquid cement that returns to surface will be diverted overboard to avoid blocking the shale shakers. • Hard cement which returns to surface is diverted to the shale shakers and then overboard. • The decision list provided in **Table 7-2** will be followed to dispose of bulk cement. • PMS is up to date and includes shale shakers.

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
Planned operational discharges	Operational discharges (treated sewage, water maker brine, cooling water, deck drainage, ballast, bilge water) will be small and continuous and dependent on rainfall, the number of persons onboard and the machinery activity. Operational discharges have the potential to impact on environmental receptors through nutrient enrichment, toxicity, turbidity, increased temperature/ salinity and potential for introduced marine species	The small volumes of non-hazardous discharges may cause nutrient enrichment, organic and particulate loading, thermal impacts and increased salinity primarily in surface (<5 m) waters. Altered water quality conditions are predicted up to 100 m from the drilling location. Planned discharges will occur for the duration of the Activity (15-22 days).	Negligible	• Sewage discharged in compliance with Regulation 11 of MARPOL Annex IV. • Sewage system compliant with Regulation 9 of MARPOL Annex IV. • Sewage system maintained in accordance with PMS. • Persons on board (POB) do not exceed the maximum carrying capacity of the MODU or support vessel's sewage system. • MODU and support vessel waste managed in accordance with: • Garbage Management Plan as required under Regulation 9 of MARPOL; and/or • Shipboard Waste Management Plan as required under AMSA Marine Order 95: Marine Pollution Prevention Garbage. • In accordance with MARPOL Annex V regulation 9.1, placards will be displayed on support vessels and MODU to provide guidance on garbage disposal requirements. • Pursuant to MARPOL Annex V Regulation 4, no waste will be discharged within the Operational Area as it is within 12 nm of the nearest land. • Deck drainage control measures, such as scupper plugs or spill kits, available where chemicals and hydrocarbons are stored and frequently handled. • Only non-hazardous, biodegradable detergents used for deck washing. • Hydrocarbon and chemical spills and leaks to deck immediately cleaned up • Oily water discharged in accordance with MARPOL Annex I Regulations, otherwise shipped onshore to reception facility or to a carrier licensed to receive the waste.
Air emissions	Air emissions through the release of ozone depleting substances (ODS), and combustion of fuel may result in a temporary, localised	Gaseous emissions will under normal circumstances, quickly dissipate into the surrounding atmosphere. Air emissions will occur for the	Negligible	• No incineration will take place on board the MODU and support vessels within the 500 m Operational Area. • Sulphur content of fuel oil complies with Regulation 14 of MARPOL Annex VI.

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
	reduction of air quality in the environment immediately surrounding the discharge point.	duration of the Activity (15-22 days).		• MODU and support vessel engines meet NOx emission levels as required by Regulation 13 of MARPOL Annex VI. • Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL Annex VI. • Engines maintained in accordance the PMS.
Interference with other users of the sea	Interference of other users of the sea through undertaking the Activity. The presence of the MODU, support vessels and the Operational Area could potentially inhibit commercial shipping and fishing activities and the presence of vessels and infrastructure could pose a collision risk to these operations.	Impact will be limited to the Operational Area during the Activity.	Negligible	• Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of the drilling activity via a rig move notice. • NOPSEMA and DMP notified that the Activity is to commence at least 10 days before the Activity commences. • NOPSEMA and DMP notified that the Activity is completed within 10 days after the completion. • AMSA RCC notified of the drilling activity via a rig move notice. • Navigation equipment and vessel procedures compliant with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012 (or equivalent). • Support vessels equipped with an automatic identification system (AIS) and an ARPA system. • MODU has a RACON (radar transponder) or Automatic Identification System (AIS) to aid in its detection at sea. • Bridge-watch on all support vessels 24 hours per day. • At least one support vessel monitoring the MODU 500 m exclusion zone at all times to aid in the detection of other vessels and to provide additional communication with other vessels.
Spill response operations	While response strategies are intended to reduce the environmental consequences of a hydrocarbon spill, poorly planned and coordinated response activities can result in a lack of, or inadequate,	Spill response operations will be focused within the EMBA area dependent upon the volume of oil spilled and the direction/ area of an oil spill. Duration of response activities is variable and may continue for years in the	Minor	In the event of a hydrocarbon spill, oil spill response strategies will be implemented where possible to minimise environmental impacts. The selection of strategies will be undertaken through the Net Environmental Benefit Analysis (NEBA) process. **Chemical Dispersion Plan**

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures

	information being available upon which poor decisions can be made, exacerbating or causing further environmental harm. An inadequate level of training and guidance during the implementation of spill response strategies can also result in environmental harm over and above that already caused by the spill.	case of remediation and monitoring of shorelines.		• Chemical dispersants listed as approved in the National Plan (OSCA) are to be prioritised for use and chemical dispersant used only if evaluated to be an acceptable level of risk as determined by the Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001).
				• NEBA undertaken every operational period to determine if response strategy is having a net environmental benefit.
				• Aerial chemical dispersant application will be available for operation within 24 hours of initial AMSA notification (daylight and weather condition dependent).
				• Vessel-based dispersant systems will have trained and competent crew.
				• Chemical dispersant applied in consultation with relevant statutory agencies and HMA.
				• Complete a Concept of Operations Request Form and submit to AMSA to enable activation of the FWADC within 2 hours of initial activation.
				• Up to two Apache vessel-based dispersant spray system sets are to be maintained ready for deployment at Dampier.
				• Dispersant efficacy will be undertaken
				• All chemical dispersant operations will occur during daylight hours only. At no time can chemical dispersant be applied:
				  ○ In waters shallower than 20 m;
				  ○ Within exclusion zones for offshore facilities;
				  ○ Within a Marine Park boundary or its buffer;
				  ○ Over responders; and
				  ○ Within State Waters.
				• Application rates and dilution ratio monitored and adjusted daily based upon operational monitoring reports.
				• Dispersant not to be applied when modelling indicates contact with Marine Park within 24 hours.

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
				• Response to continue until termination criteria reached. **Shoreline Protection Plan** • ICT to identify protection priorities in consultation with the HMA (DoT). • Daily inspections and maintenance of deployed booms is to be undertaken to ensure achievement of objectives. • Response to continue until termination criteria reached. **Shoreline Clean-up Plan** • Clean-up strategies will be implemented in accordance with the DoT OSCP (2010). • Shoreline Clean-up Plan methodologies followed. • Equipment selected to undertake clean-up activities targeted to avoid secondary contamination. • At least one member per shoreline clean-up team will have completed IMO Level 1 Operations training course. • OSRT specialists shall verify clean-up effectiveness and conduct final evaluations. • Early mobilisation of the OSRT to provide the ICT with initial assessment of shorelines. • Clean-up teams and equipment will be deployed and positioned as per observations by the OSRT in consultation with the DoT. • NEBA undertaken every operational period to determine if response strategy is having a net environmental benefit. • Shoreline clean-up response ceased when termination criteria are met, as outlined within the Shoreline Clean-up Plan. **Oiled Wildlife Response** • Oil wildlife response strategies will be implemented in accordance with the OWR Plans. • Apache maintains Master Service Agreements for Oiled Wildlife Response contractors. • NEBA undertaken every operational period to determine if

Planned event	Impact	Severity, extent, or duration	Post treatment consequence	Control measures
				response strategy is having a net environmental benefit. • Oiled wildlife response ceased when termination criteria are met. **Waste Management Plan** • Apache maintains service contracts with Toxfree • Apache maintains Waste Management Plan • Mobilise Toxfree within 6 hours of spill • An application for discharge of the water phase to sea will be lodged to AMSA / DoT • All temporary storage of liquids can be performed within bunded areas and as per regulatory requirements • Oily waters are treated on shore • If waste inputs exceed the Toxfree processing and storage capacity, Apache will apply to DER for a temporary waste storage license for the evaporation ponds on the Apache Devil Creek facility • Oily sands will be collected along the affected coastlines. Skip bins will be distributed by telehandlers and readily accessible by clean-up crews. Wastes will then be either collected by operating mobile plant such as excavators, or through manual waste removal (bagged waste), and deposited into these bins. • In areas that are inaccessible by vehicles, barges may be used for the initial transfer operations, and transported to the marine operational base for pick-up by Toxfree. • Oil-contaminated sands and soils recovered during the operations will be deemed requiring Class III or Class IV landfills for disposal. In the event that oils are collected in such a form as to be too contaminated for landfill disposal, yet not liquid enough to be incorporated into the waste oil stream, then these solids will be segregated and despatched for incineration at ToxFree's Port Hedland incinerator. • ToxFree will transport the waste to a commercial composter for consolidation.

Table 7-2: Decision list for disposal of bulk powders[2], brines, and water based drilling fluids remaining on the MODU at the end of the well

Trigger	Fate of stock	Reasoning
Well is not the last well in the rig schedule and ongoing use of the product is anticipated	**Retain stock** Bulk powders stock will be retained on board for use in the next well, or may be sent for temporary storage on a supply vessel. Brines and drilling fluids will be retained on board for use in the next well or may be sent for temporary storage on a supply vessel where space permits. This disposal option eliminates overboard disposal.	These products are expensive. Apache's preferred option is to use all stock in subsequent wells in the rig schedule to minimise campaign costs and reduce discharges.
Well is the last or only well in the rig schedule and the next Operator is willing to buy the stock	**Sell stock** Stock will be retained on board for use by next Operator. This disposal option eliminates overboard disposal.	It may be possible for Apache and the next Operator using the rig to transfer ownership of the unmixed stock. The implementation of this option is dependent on commercial agreements.
Well is the last or only well in the rig schedule and selling the stock to the next Operator is not an option.	**Minimise stock** Apache will have measures in place to reduce the stock requiring disposal at the end of the campaign. This disposal option requires some overboard disposal.	Stock minimisation measures will be put in place without compromising the minimum bulk stock required for well control or dealing with lost circulation.
Well is the last or only well in the rig schedule, selling the stock to the next Operator is not an option but another Apache operated rig is in proximity and can take on stock.	**Transfer stock to alternate rig** This disposal option eliminates overboard disposal.	It is possible that multiple rigs will be operated by Apache at the time of this Activity. Bulk cement stock can be transported to an alternate rig dependent on: - Apache have another rig operating in region; - Travel distance and cost associated with transporting the bulk stock to the other alternate rig are not prohibiting; - Alternate rig has the capacity to take on additional stock.

[2] Bulk powders include any of the following: Barite, bentonite, calcium carbonate and cement

Trigger	Fate of stock	Reasoning
Retain stock, sell stock, and transfer of stock to alternate rig disposal are not viable options, then vessel-to-shore transfer is considered.	**Onshore transfer of bulk material using vacuum transfers only**	Due to safety issues related to the pneumatic transfer of bulk powders from supply vessels to onshore (bulk trucks or containers), pneumatic transfer will not be allowed. Vacuum transfers are subject to vessel pressurised tanks being suitable to carry out the Activity and will be undertaken if safety conditions are not compromised.
All other disposal options have been exhausted.	**Overboard disposal only under the following conditions:** 1. in waters greater than 70 m depth; 2. not within 5 km of a marine park; and 3. bulk powders will be discharged as wet slurry.	Disposal volumes will be minimal due to stock minimisation. Under normal circumstances where the well is the last well in the program and the well drills to plan, the stock cement usually does not exceed 50 tonnes. Barite and bentonite stocks are unlikely to exceed 500 bbls each.

Table 7-3: Summary of unplanned events, impacts and control measures for the Activity

Unplanned event	Potential impact	Severity, extent and duration	Post treatment risk	Control measures
Introduction of marine pest species	Vessels carrying Invasive Marine Species (IMS) on external biological fouling, internal systems (sea chests, seawater systems etc.), on marine equipment (ROVs, anchors etc.), or through ballast water exchange can affect local populations of flora and fauna.	Localised (seabed and water column near the MODU) to widespread impact if successfully trans located to new areas via ocean currents or vessel transit. Impact may be temporary (duration of the Activity) to long-term (in the event of successful translocation), depending on successful trans location of species.	Tolerable	• Vessel anti-fouling systems are maintained in compliance with International Convention on the Control of Harmful Anti-fouling Systems on Ships. • MODU has AQIS clearance to be in Australian waters. • An international or domestic (interstate) plying MODU or support vessel will complete a biofouling Vessel Risk Assessment Score Sheet (VRASS) before entering an Apache petroleum permit. • Vessels shall exchange 'high-risk' ballast water, as defined in Australian Ballast Water Management Requirements (AQIS, 2011), outside Australian territorial seas and in waters at least 200 m deep.
Release of solid waste (hazardous and non-hazardous)	Non-hydrocarbon solids such as bulk materials may be lost during the Activity through accidental events leading to a reduction in water quality and potential for marine fauna entanglement	The hazard originates within the operational area and all non-buoyant waste material is expected to remain within the operational area. Buoyant waste material would potentially move beyond the operational area. An unplanned release of waste may occur throughout the Activity and impacts may occur until the waste degrades.	Tolerable	• Non-hazardous and hazardous wastes collected, stored, processed and disposed of in accordance with the MODU and support vessel's Garbage Management Plan, as required under Regulation 9 of MARPOL Annex V. • Solid hazardous wastes separated, labelled and stored on board in a manner that provides secondary containment • Non-hazardous waste produced on the MODU will be segregated for recycling. • Solid non-biodegradable and hazardous waste will be disposed of onshore at a suitable waste facility or to a carrier licensed to receive the waste if required by legislation. • Accidental release of waste to the marine environment is reported and investigated and corrective actions are implemented.
Dropped objects	An object dropped overboard from the MODU or support vessels (i.e. container, support vessel anchor drop/drag) has the potential to damage benthic habitats and associated biota that lie	Direct impacts due to a dropped object would be restricted to within the Operational Area. The hazard will exist throughout the timeframe of the Activity. Potential impacts may continue to occur until dropped objects	Tolerable	• No support vessel anchoring within the nearby Montebello Islands (State) Marine Park or the Operational Area (500 m exclusion zone) • Lifting equipment certified. • All lifts to be completed in accordance with the MODU safety case. • Detailed records of any equipment lost overboard completed.

Unplanned event	Potential impact	Severity, extent and duration	Post treatment risk	Control measures
	directly within the footprint of the dropped object.	degrade or become stable (stationary) in the environment.		• MODU deck fastening procedures enacted prior to MODU moving or adverse weather • Dropped objects will be recovered if safe to do so
Marine fauna collision	There is the potential for vessels involved in the Activity to collide with marine fauna including cetaceans, fish, marine reptiles and seabirds. In addition to boats, helicopters involved in the Activity also pose a risk of seabird collision. The main collision risk associated with the Activity is through support vessel collision with large, slow moving cetaceans or whale sharks; potentially resulting in severe injury or mortality.	Restricted to immediate area around the support vessels and aircraft whilst underway within the Operational Area.	Tolerable	• Support vessels to operate in accordance with Part 8 of EPBC Regulations (Vessels) to avoid injury to cetaceans.
Spill of (small volumes of) hydrocarbons, environmentally hazardous chemicals or liquid-waste to the marine environment	Fuel and other hazardous liquids including biocides, corrosion inhibitors and hydraulic oil as well as a variety of miscellaneous chemicals and waste streams (pipe dope, lubricating oils, cleaning and cooling agents, oily water, cement, recovered solvents, stored or spent chemicals, leftover paint materials, used cooking oil and used lubricating oils) are used or stored on board the MODU and support vessels	The maximum volume of hydrocarbon that could be released during routine operations is likely to be small and realistically limited to the volume of individual containers (e.g. fuel drums etc.) stored on-deck. The most credible worst-case spill scenario on board the MODU is considered to be loss of a 160 L container of hydraulic fluid during transfer from a support vessel. In the event that the spill is not contained on deck, there would be a release to the marine environment, which	Tolerable	• Dangerous goods managed in accordance with International Maritime Dangerous Goods Code (IMDG Code). • Chemicals (environmentally hazardous) and hydrocarbons stored in bunded areas. • Chemicals and hydrocarbons stored in accordance with relevant MSDS. • Chemical and hydrocarbon storage areas inspected weekly. • All shipboard chemical spills and hydrocarbon spills managed in accordance with SOPEP/SMPEP. • Spill clean-up equipment located where chemicals and hydrocarbons are stored and frequently handled. • Secondary containment shall be available for all MODU machinery or equipment storage tanks containing hydrocarbons or environmentally harmful chemicals.

Unplanned event	Potential impact	Severity, extent and duration	Post treatment risk	Control measures
	during the Activity. If accidentally released into the marine environment, chemicals and other liquids may result in a reduction of water quality and potential toxicity impacts to local marine fauna.	would be likely to rapidly disperse and evaporate. Risk will be managed through the Activity.		• MODU machinery and equipment hoses containing hydrocarbons or environmentally harmful chemicals with the potential to leak directly to the marine environment shall be inspected and replaced at the frequency listed on a hose register. • Following rainfall events, bunded areas on open decks of the vessels will be cleared of rainwater. • Maintenance records on the MODU and support vessels indicate that all machinery and equipment containing hydrocarbons have maintenance scheduled on their respective PMS. • Transfer of fuel to and from the MODU in compliance with the MODU's fuel transfer procedure.
Hydrocarbon spills from vessel activities	Accidental loss of fuel during refuelling or from a ruptured fuel tank into the marine environment resulting in a reduction of water quality and potential impacts to local marine fauna.	The surface life for an instantaneous diesel spill of 20 m^3 from a worst-case refuelling accident is estimated at 18 hours. In this time, surface diesel may travel up to 75 km alongshore and 25 km cross-shore. This places environment receptors within the Montebello and Lowendal Islands at risk of contact; The surface life for a five hour diesel spill of 250 m^3 from a ruptured fuel tank in a vessel collision scenario is 24 hours. In this time, surface diesel may travel up to 110 km alongshore and 35 km cross-shore relative to the mainland (**Figure 3-1**). This places environment receptors within the Montebello Islands, Lowendal Islands and Barrow	Tolerable	• Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of the drilling activity via a rig move notice • AMSA RCC notified of operational area, Activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning. • Navigation equipment and vessel procedures compliant with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012 (or equivalent). • Support vessels equipped with an automatic identification system (AIS) and an ARPA system • Support vessels equipped with an automatic identification system (AIS) and an ARPA system • Bridge-watch on all support vessels 24 hours per day. • At least one support vessel monitoring the MODU 500 m exclusion zone at all times to aid in the detection of other vessels and to provide additional communication with other vessels. • Fuel bulk transfer outlet and inlet connections on MOUD are bunded to contain minor spills and leaks. • Diesel transfer hose certified, pressure tested prior to use and replaced at least every 12 months.

Unplanned event	Potential impact	Severity, extent and duration	Post treatment risk	Control measures
		Island areas at risk of contact.		• In line with MARPOL Annex I, all vessels involved in the Activity over 400 gross tonnage will have a current SOPEP in place and a valid IOPP certificate. • Oil spill response executed in accordance with Gump-1 OPEP (EA-00-RI-10016.2). • Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL. • Oil spill exercises conducted as stipulated in OPEP and SOPEP.
Hydrocarbon spill from a loss of well control	During drilling, a loss of well control may result in release of light crude oil to the marine environment, with the release points at either the MODU floor or seabed. The environmental consequences of a loss of well control are highly variable, dependant on the characteristics of the hydrocarbon released, the dynamics of the receiving environment and the proximity of the release point to sensitive environmental receptors. Physical (coating) and chemical (toxicological) impacts could occur to habitats and marine fauna. Disruption and financial impacts could occur to socio-economic sensitivities from disruption to activities or flow on effects from impacts to habitats and marine fauna.	Potential extent is depicted in **Figure 3-2** and **Figure 3-3** (note the figures do not represent the area that would be impacted following a single worst case credible oil spill, rather they show a cumulative area within which all potential oil spill impacts would be contained within). Dependent upon the scale of a spill and the types of receptors impacted, impact and recovery may persist on a scale of years.	ALARP	• WOMP details specific well control standards for this Activity and will be approved prior to commencement of the Activity. • An NOPSEMA-accepted MODU safety case contains control measures that are shown to reduce well blowout risk to ALARP. • After BOP's are installed, the well will have two barriers maintained during drilling, suspension and abandonment activities in accordance with the Apache's Drilling and Completions Technical Standards (AE-91-ID-004, Rev 9, Section 11), unless contingency casing slip installation is required. • If contingency casing slip installation is required, the well will be verified static and an overbalanced column of fluid will be utilised prior to reducing barriers to one. • Well drilled in accordance with Apache's Gump Drilling Program. • Well control equipment (e.g. BOP) included on PMS. • Well control equipment, casings and wellhead equipment tested to MASP as a minimum. • Oil spill response executed in accordance with Apache Gump-1 OPEP (EA-00-RI-10016.2). • Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL. • Oil spill exercise conducted as per the OPEP and SOPEP.

8. MANAGEMENT APPROACH

The Gump-1 drilling activity will be managed in compliance with all measures and controls detailed within the EP accepted by NOPSEMA under the OPGGS (E) Regulations, other environmental legislation and Apache's Management System (e.g. Apache Environmental Management Policy).

The objective of the EP is to ensure that potential adverse environmental impacts associated with planned and unplanned events associated with the Activity, are identified, assessed and managed such that impacts and risks are reduced to ALARP and acceptable levels.

The EP details specific environmental performance outcomes and environmental performance standards for the control measures used to manage the Activity. The control measures for the Activity are summarised in **Section 7**. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance outcomes.

In order to meet the environmental performance outcomes and standards the EP outlines an implementation strategy which includes the following:

1. Details on the systems, practices and procedures to be implemented.
2. Key roles and responsibilities.
3. Training, competencies and ongoing awareness.
4. Monitoring, auditing, management of non-conformance and review.
5. Incident investigation, reporting and follow up.
6. Records Management.
7. Incident response including an OPEP, and
8. Reporting.

During the period that activities described in the EP are undertaken, Apache will ensure environmental performance is managed through an inspection and monitoring regime undertaken by Apache representatives Apache representatives based on the MODU (or vessel masters). This will include daily and weekly monitoring and is recorded via a number of checklist and inspection documents that are sent to the Apache HSE Manager or delegate. Feedback from the ongoing monitoring also informs the environment plans developed for other Apache oil and gas activities, through the risk assessment stage, and the internal review of these documents prior to submission, providing opportunity for continuous improvement.

Changes to the EP and OPEP will be made in accordance with Apache's Environmental Management of Change Procedure (EA-91-IQ-10001). MOC documents and associated non-significant addendums will be tracked on a register, and available on Apache's intranet.

Non-conformances identified through audits and ongoing operational activities will be closed out using Apache's incident management systems (i.e. Enablon), unless they can be addressed immediately using the MODU or vessel hazard management system. Audit findings will be shared between Apache-contract MODUs and support vessels as a continuous improvement initiative.

Feedback from the ongoing monitoring also informs the development of future EPs developed for oil and gas activities, through the risk assessment stage and the internal review of these documents prior to submission; this provides the opportunity for continuous improvement.

All personnel are informed of the need to report HSE incident and hazards through inductions and regular operations meetings. HSE incidents and hazards will be documented in Apache's incident management system (Enablon) and significant incidents will be investigated through a roots cause analysis. Incident notification and reporting to NOPSEMA and other regulators will be conducted as per the OPGGS (E)

Regulations, as detailed within the EP. Reported HSE incidents and hazards will be communicated to personnel during daily operational meetings

9. HYDROCARBON SPILL RESPONSE ARRANGEMENTS

Credible hydrocarbon spill scenarios identified for the Activity are:

- Small spill of stored hydrocarbons (<160 L various lubricants, hydraulic fluids, fuels)
- Hydrocarbon spill during refuelling (20 m^3 marine diesel)
- Hydrocarbon spill from ruptured fuel tank (250 m^3 marine diesel)
- Loss of well control (134, 000 m^3 light crude)

In the event of a spill, initial actions will be undertaken by the Rig OIM/Vessel Master in line with the MODU/ vessel Shipboard Oil Pollution Emergency Plan (SOPEP). Should the spill require further action, such responsibilities will be taken over by the Combat Agency, in this instance Apache in accordance with the Gump-1 OPEP (EA-00-RI-10016.2).

Response strategies that have been identified as appropriate for the spill scenarios have been categorised as primary and secondary and are detailed in **Table 9-1**. A justification and description of the strategies is provided in **Table 9-2**.

Table 9-1: Primary and secondary oil spill response activities for the Activity

Oil Spill response type	Specific response	Primary	Secondary
Source control	Refuelling: watch alert	✔	
	Bunded areas around stored hydrocarbons, machinery and engines	✔	
	Securing fuel / trimming	✔	
	Drilling a relief well	✔	
Monitor and evaluate	Aerial, Vessel, Tracking Buoys, Trajectory Modelling, Shoreline assessment teams, fluorometry.	✔	
Scientific monitoring	Water quality, sediment quality, shoreline, intertidal and subtidal habitats, megafauna, commercial fishes, etc.	✔	
Mechanical Dispersion	Vessel prop-washing		✔
Chemical dispersion	Enhance the dispersion and biodegradation rates of spilt hydrocarbon		✔
Shoreline protection	Booms acting as physical barriers for hydrocarbons	✔	
Shoreline clean-up	Physical removal, surf washing, rock flushing, bioremediation, natural dispersion	✔	
Oiled wildlife response	Vessel-based Hazing	✔	
	Capture and rehabilitation	✔	

Table 9-2: Applicable oil spill response strategies for the Activity

Strategy	Justification
Source control	Minimises the volume of hydrocarbons lost to the environment by securing the source of the spill, including: • Implementation of the MODU/vessel SOPEP; and/or • Well relief drilling. Spare MODU obtained via Memorandum of Understanding: Mutal Assistance. Total implantation time of ~72 days (Request rig 0.5 days; Spare rig suspends operations at current location 7 days; Spare rig mobilises to site 7 days; Spud and drill relief well 50 days; Intersect wellbore and bottom kill well leading to source controlled 7.5 days).
Monitor and evaluate	Surveillance actions are used to monitor and evaluate the spread of the released hydrocarbon, and to identify and report on any potential contact to flora, fauna, or any other sensitive receptor that may occur while the spill disperses. Surveillance results are used to assist in the escalation and de-escalation of response strategies as required.
Mechanical dispersion	Mechanical dispersion is undertaken by running vessels through the hydrocarbon plume and using the turbulence developed by the propellers or hydro-blasting from vessel hydrants to break up the slick. Once dispersed in the water column in the form of smaller droplet sizes, biodegradation processes are enhanced. **Considered an opportunistic strategy, it may be used on targeted, small, breakaway areas.** Crude: Mechanical dispersion will be used on crude only on targeted, small, breakaway areas where the oil thickness has reduced to a thin surface sheen. Diesel: Mechanical dispersion will unlikely be applied to a diesel spill because of the nature of the product—preferentially relying on evaporation rather than dispersing toxic components of the fuel into the water column. However, its applicability will be assessed during the NEBA.
Chemical dispersion	Chemical dispersant is often applied to break down hydrocarbons and allow/enhance dispersion into the water column, thereby reducing potential shoreline contact. Chemical dispersants can increase the oil concentrations in the water column and increase risk of exposure to organisms that live in the water column. Chemical dispersant may be viable, either by vessel or plane. **Apache considers light crude to be the credible hydrocarbon spill during a loss of well control event from the Activity. Light hydrocarbons are often not amenable to chemical dispersion and volatilisation or evaporation is their preferred fate**. Chemical dispersion will only be considered when of a net environmental benefit. Applicability of chemical dispersant is limited to the conditions and circumstances described in the OPEP.
Containment and recovery	Containment and recovery of light hydrocarbons can offer a preventive form of protection to sensitive receptors. Skimmers (mechanical) and booms may be used at sea. This strategy, however, is often technically unfeasible due to ambient conditions and hydrocarbon characteristics. As described in Section 7.7.1, the target Havarti sandstone formation is expected to have a low persistence in the environment given the low asphaltene and wax content, and the amenability of the hydrocarbon to weathering processes, such as evaporation, given its relatively high volatility. The weather conditions that commonly exist in the Activity area are more conducive to natural dispersion of the hydrocarbon in offshore areas than containment and recovery as a feasible strategy.
Shoreline protection	Protection activities involve the use of booms to: • Protect sensitive receptors; • Deflect spills away from sensitive receptors or shorelines; and • Deflect spills to an area that provides increased opportunity for recovery activities. Activities would be focused on areas of high protection value in low energy environments based upon real time operational surveillance.

Strategy	Justification
Shoreline clean-up	Impacted shorelines will be assessed for their shoreline clean-up potential. This response has the potential to cause more harm due to secondary disturbance associated with the clean-up, so applicability of the strategy is based on aerial surveillance reconnaissance, Oiled Shoreline Response Team (OSRT) observations and NEBA in the shoreline clean-up assessment. . High volume, low pressure flushing may be considered if the oil enters high priority/ slow recovery habitats such as mangroves or wetlands.
Oiled wildlife response	Wildlife operations may be required to deter fauna from an area that has been or is likely to be oiled and if fauna is oiled. It is applicable for fauna that come close to the spill when on the water and shorelines and those affected by hydrocarbons.
Scientific Monitoring	This strategy is to evaluate impacts and recovery from the spill.

9.1.1 Net Environmental Benefit Analysis (NEBA)

During any response incident, the Incident Control Team (ICT) use the NEBA process to inform the development and refinement of Incident Action Plans (IAPs), so the most effective response strategies with the least detrimental environmental impacts can be identified, documented and executed. The Environmental Team Lead is responsible for reviewing the priority receptors identified within the EP and OPEP, and with knowledge of the fate and transport of the spill, apply the NEBA.

The application of the Operational NEBA is to:

- Identify sensitivities within the area potentially affected by a spill at that time of the year;
- Assist in prioritising and allocating resources to sensitivities with a higher ranking; and
- Assist in determining appropriate response strategies

9.1.2 Oil Spill Response Resources

Oil spill response equipment and resources are a combination of Apache, AMOSC, AMSA, DoT, National Plan (NatPlan), OSRL, and other operator resources available through the AMOSPlan mutual aid arrangements. Under the MOU between AMSA and Apache, AMSA will provide all resources available through NatPlan to support an Apache spill response. The DoT coordinates the State Response Team (SRT) oil spill response personnel and equipment resources. The DoT will work with Apache in an oil spill response and will define termination criteria for the shoreline operations designed to reduce the environmental impacts and risk to ALARP in State waters. Where oil contacts shorelines in Commonwealth waters, Apache will work with the Department of the Environment to establish shoreline clean-up priorities, activities and termination criteria.

In the event of an oiled wildlife response, Apache will activate the West Australian Oiled Wildlife Response Plan (WAOWRP) and work with DPaW in determining resources and capability requirements. DPaW and Industry (AMOSC) Oiled Wildlife Advisors (OWAs) ensure minimum standards for oiled wildlife response, as outlined within the WAOWRP, are met and ensure timely mobilisation of appropriate resources (equipment and personnel) through communication with the wildlife logistics team. Apache are able to access:

- AMOSC core group responders;
- DPaW staff and approved volunteers/SMEs;
- Additional local resources under current contracts and suppliers; and
- Access international support through Wildlife Response Services.

During and post-spill scientific response monitoring activities require resources external to Apache and include specialist technical capabilities. Astron Environmental Services Pty Ltd (Astron) is contracted as Apache's primary Control support agency for scientific response monitoring activities. If additional support

is required, Apache has Master Service Agreements with other service providers to support scientific response monitoring activities.

10. CONTACT DETAILS

Further information about the Gump-1 drilling activity can be obtained from:

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