



Spar-2 Vertical Appraisal and Development Well Environment Plan: Summary September 2010

This summary of the Spar-2 EP has been submitted to comply with Regulation 11(7)(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Introduction

Apache Energy Limited (Apache) proposes to drill Spar-2 as a vertical appraisal (Barrow B) and development well (Barrow A) in Commonwealth waters of the Carnarvon Basin, northwest of Western Australia, in permit area WA-4-R. Drilling is proposed to commence late September/ early October 2010 using the *Stena Clyde* drill rig and is expected to take approximately 36 days (based on dry hole) to complete (weather conditions permitting).

Apache's generic Environment Plan (EP) for its drilling programme on the North West Shelf (NWS) in State and Commonwealth waters will be used to manage the well (EA-00-RI-164). A bridging document to this EP, for Spar-2 was approved by the DMP on the 17 September 2010, in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*.

Project Description

The Spar-2 drill site is located approximately 110 km northwest of the nearest mainland point (Mardie Station), 49 km west from Barrow Island, and 64 km and 65 km west and southwest of the nearest Lowendal and Montebello Islands respectively (**Figure 1**) in approximately 105 m (LAT) water depth. The surface hole location for the programme is 20° 36' 32.12" S (Latitude) and 114° 54' 22.02" E (Longitude) (GDA 94, Zone 50).

The drill rig proposed for the Spar-2 drilling programme is the *Stena Clyde* - a self-propelled semi-submersible drilling unit. Further details of the *Stena Clyde* is provided in the Generic EP for Apache's drilling activities on the North West Shelf 2007-2011 (EA-00-RI-164). The drill rig will be positioned using two anchor handling tug supply (AHTS) vessels.

After anchoring the drill rig, drilling of Spar-2 will commence. A 914 mm (36") hole will be drilled using seawater and gel sweeps, then a 762 mm (30") conductor will be set just below the seabed at 192 m.

A 660 mm (26") hole will then be drilled to 1,565 m measured depth from the rotary table (MRDT) using seawater and gel sweeps into the Lower Gearle, then a 508 mm (20") casing will be run and cemented. At this point the Blowout preventers (BOP's) and marine riser will be installed and then a connector integrity and full BOP pressure test will be conducted.

The well will be displaced to synthetic based mud (SBM) when the 508 mm (20") casing shoe track is drilled out and a Leak Off Test (LOT) conducted. A 406 mm (16") hole be drilled into the lower Muderong Shale and a 340 mm (13-3/8") casing set approximately 10 m into the Shale and above the normally pressured Barrow A formation (with a shoe depth of approximately 2,562 m MDRT).

The 340 mm (13-3/8") casing shoe track will be drilled out and a LOT conducted. The 311 mm (12 1/4") hole section will be drilled to the top of the over pressured zone at the base of the Barrow B (Retic Sand 2). Logging of the entire upper Barrow A group will be conducted followed by running and cementing the 244 mm (9 5/8") casing with a shoe depth at 3,395 m MDRT.

A 216 mm (8-1/2") assembly will drill the 244 mm (9-5/8") shoe track and a LOT will be conducted. It is planned that the 216 mm (8.5") section will intersect the Lower Barrow sandstone at a total depth (TD) of 50 m below the base of the Barrow B (Retic Sand 3). The total depth of the well is 3,530 m MDRT. The 216 mm section is considered to have Super Normal pressures. On reaching the total depth the well will be evaluated using wireline logs. If significant hydrocarbons are present a well test will be conducted. Once the evaluation is complete the Lower Barrow B zone will be abandoned appropriately. Completion equipment will then be run to perforate the 244 mm (9 5/8") casing to produce the Barrow A sand.

Vessel Seismic Profiling (VSP) will be performed for the appraisal well and development well.

Once the drilling programme is complete the anchors will be pulled up and the drill rig moved off location.

All work on the well will be undertaken in accordance with the regulations and guidelines set out in the *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGSA)* and the associated *OPGGS(E) Regulations 2009* and *Petroleum (Submerged Lands) Act Schedule of Specific Requirements as to Offshore Petroleum Exploration and Production (2005)*.

Receiving Environment

Physical Environment

The NWS lies in the arid tropics region of Australia, which experiences high summer temperatures and periodic cyclones (with associated rainfall). Rainfall is generally low, with evaporation exceeding rainfall. Mean ocean temperatures range from a minimum of 11°C in winter to a maximum of 37°C in summer. Shelf waters are usually thermally stratified at a depth of about 20 m.

Wind patterns are monsoonal with a marked seasonal pattern. From October to March, the prevailing non-storm winds are from the south-west, west and north-west at an average speed of less than 10 knots. From June to August, winds are generally lighter and more variable in direction than in spring and summer.

Non-storm winds prevail from north-east through to south-east at average speeds of 5-6 knots. Transitional wind periods, during which either pattern may predominate, can be experienced in April, May and September each year.

Biological Environment

The drilling programme occurring primarily in October will coincide with the later phase of the southern migration of humpback whale; turtle nesting, dugong breeding and seabird nesting in the NWS region (see **Table 1**). The potential for and likelihood of impact on the marine fauna is outlined below.

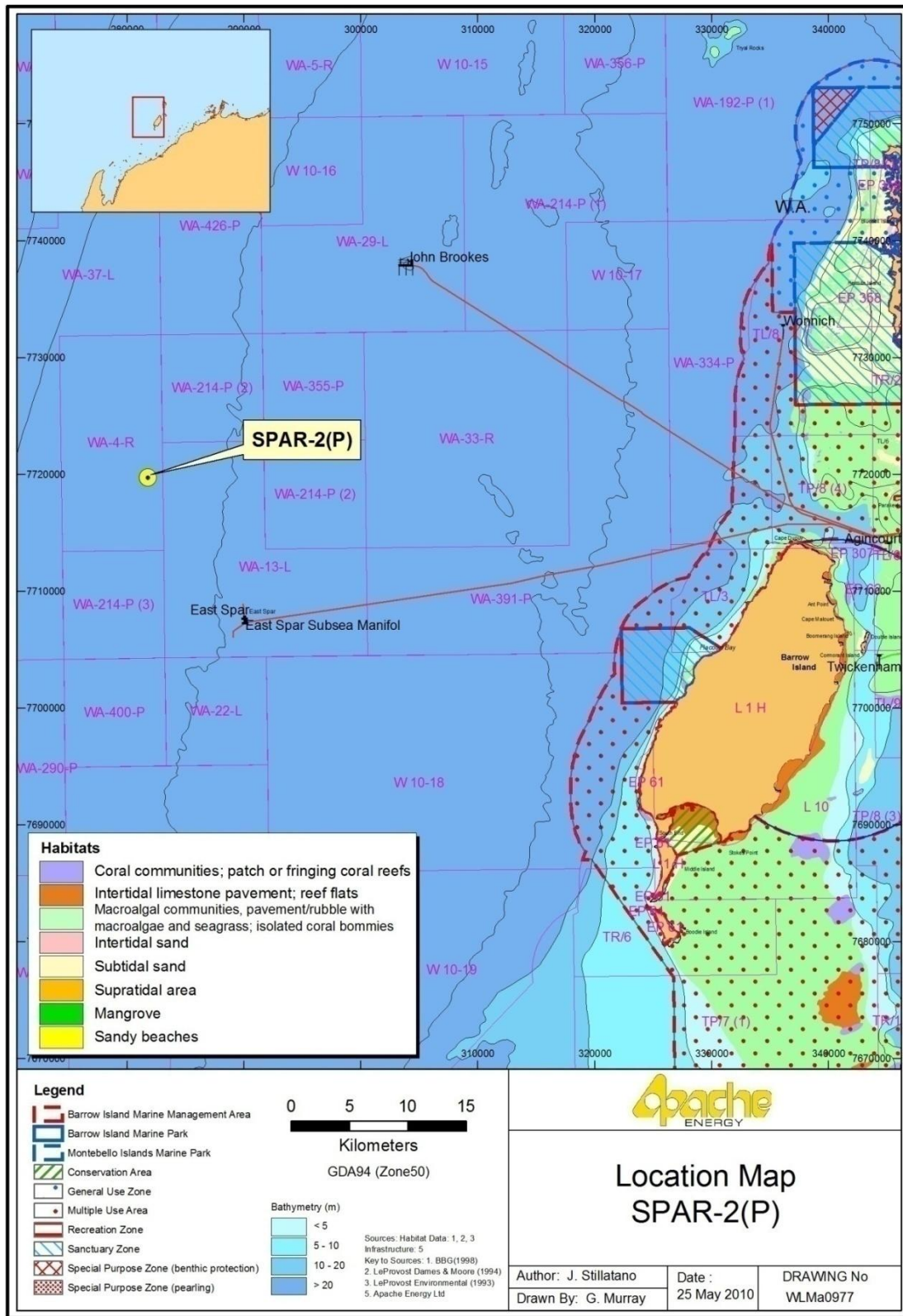


Figure 1: Location of the proposed Spar-2 drill site

Whales

The drilling programme during late September and October will occur during the later half of the humpback whale (*Megaptera novaeangliae*) southern migration period (see **Table 1**). The humpback whale is a cetacean listed as 'threatened' under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

The humpback whale migrates between the Antarctic waters and the Kimberley region of Western Australia. The peak of the northerly migration occurs around June – July, while the southerly return migration peaks around September – October. Northbound whales tend to remain on or within the 200 m contour passing to the west and north of Serrurier Island, westward of Barrow Island and north of the Montebello Islands; whereas the southern migration route is more variable and often in shallower waters to the east of the Montebello/Lowendal/Barrow region. The southerly return migration peaks around early September, with pods preferring to travel in shallower waters, typically between 30 and 100 m depths.

It is possible that migrating humpback whales may pass in the vicinity of the proposed Spar-2 drilling location due to the timing of the drilling programme. The Spar-2 drilling location is approximately 49 km west from the nearest island (Barrow Island), 65 km southwest from the nearest Montebello Islands and 64 km west from the nearest Lowendal Island; however management measures will be in place throughout the drilling programme to avoid potential impact on cetaceans (see **Table 2**).

Dugong

Dugongs (*Dugong dugon*) occur across the tropical coastal waters of Australia from Shark Bay to Queensland and are protected under national legislation and international agreements. Dugongs are herbivorous and are generally associated with seagrass beds, upon which they feed. They are commonly found in shallow (less than 5 m water depth) sheltered areas, often near island or large bays and are highly migratory due to their search for suitable seagrass beds or warmer waters (Marsh et al., 2002¹).

Current knowledge on the size and distribution of dugong populations and their migratory habits in the region between North West Cape and the Dampier Archipelago is limited. Dugongs have been found to breed between September and April. Specific areas supporting Dugongs in Western Australia include Shark Bay, Ningaloo Marine Park and Exmouth Gulf, Pilbara Coastal and Offshore regions (Exmouth Gulf to De Grey River), Eighty Mile Beach and Kimberley Coast (Marsh et al., 2002).

It is unlikely dugongs are unlikely to be encountered in the deeper waters of the drilling location.

Marine turtles

Four species of marine turtle nest on sandy shore sites of Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island, Airlie Island, Thevenard Island, other coastal islands and the Exmouth region. These are the green turtle (*Chelonia*

¹ Marsh, H., H. Penrose, C. Eros & Hugues, J., 2002. Dugong Status Report and Action Plans for Countries and Territories. United Nations Environment Programme, Nairobi. Referred on the Australian Species Profile and Threats Database.

mydas), the flatback turtle (*Natator depressus*), the hawksbill turtle (*Eretmochelys imbricata*), and the loggerhead turtle (*Caretta caretta*). The leatherback turtle (*Dermochelys coriacea*) may also visit the open waters. All five species are listed as either endangered or vulnerable under the EPBC Act.

The survey area is distant to any significant nesting areas of green, flatback, hawksbill and loggerhead turtles along the coast and offshore islands. The nearest turtle nesting sites are located about 49 km to the east (Barrow islands), and approximately 65 km to the east-northeast (Montebello and Lowendal Islands) and approximately 120-150 km to the south-southwest (Muiron Islands and North West Cape respectively) from the Spar-2 drill site. The peak turtle nesting and hatching period generally occurs from September to February depending on the species. For all species, hatchling emergence occurs 6 to 8 weeks after the females have nested (EPA, 2010²).

The across shelf distribution of turtles is not well known, but does vary among the species. For example, green turtles are herbivores and therefore concentrate over depths of less than 20 m that support benthic plant life. Hawksbill turtles also forage in shallow waters on sponges in areas of coral reef. In contrast, loggerhead, flatback and leatherback turtles are known to feed on mid-water plankton and benthic animals, and can forage in mid-shelf water depths (about 50 m). EPA Draft Guideline No. 5 (EPA, 2010) provides current information on the population size and distribution of turtles off Western Australia. Considering this, impacts from the proposed drilling activities on turtle population is considered to be minimal.

It is unlikely that other marine fauna, such as sea turtles, will be encountered given that there is no known feeding or breeding areas within the Spar-2 drilling location.

Seabirds

It is highly unlikely that the Spar-2 drilling programme will have any impact on habitat critical to the survival of any listed migratory seabird species. At least 64 species of birds feed and nest on the surrounding waters and islands within the Barrow/Montebello/Lowendal islands region. The main seabird breeding/nesting season occurs between October and January on the island group.

It is possible that seabird species may fly over the drilling location, however it is not anticipated that the drilling programme will have any impact on the birds due to their mobility; and the distance of the drill site to nesting areas.

Socio-Economic Environment

Dampier and Karratha are the main service and population centres for this region. Local people seeking aquatic recreation such as boating, diving and fishing use the coast and islands of the Pilbara. The open waters of the Commonwealth permit areas do not support significant recreational or tourism activity. Recreational fishing tends to be active within State waters in closer proximity to population centres associated with high number of local visitors and tourism. Commercial fisheries are active along the Pilbara coast; however fishing effort in the open Commonwealth waters is low, with operators favouring the inshore areas.





Further information on recreational and commercial activities that fall under the North Coast Bioregion is addressed in the NWS Generic Drilling EP (EA-00-RI-164).

² Environmental Protection Authority (EPA), 2010. Environmental Assessment Guideline No. 5 (Draft) Protecting Marine Turtles from Light Impacts. EPA, Western Australia. Accessed on the WA EPA website during May 2010.

Table 1: NWS biological and human activity seasons

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Dugong breeding	breeding								breeding				
Hawksbill turtle nesting													
Flatback turtle nesting													
Green turtle nesting													
Loggerhead turtle nesting													
Coral spawning													
Whale migration						north			south				
Whale sharks													
Algae	growing				Shedding fronds				growing				
Seabird nesting													
Prawn trawling													
Tourism													
Spar-2													

Key

-  Peak activity, presence reliable and predictable
-  Low level of abundance/activity/presence
-  Activity not occurring within the area
-  Proposed Drilling Programme

Major Environmental Hazards and Controls

The potential environmental impacts resulting from offshore drilling on the NWS are outlined in detail in Apache’s Generic Drilling Programme EP (EA-00-RI-164).

Table 1 summarises the guidelines and environmental commitments for the Spar-2 drilling programme.

Environmental Management

Extensive environmental management guidelines are prepared for each Apache-drilled well. Apache management documents used to guide the implementation of well-specific environmental management procedures are listed below:

- Environmental Management Policy (February 2010).
- NWS Generic Drilling EP 2007 – 2011 (EA-00-RI-164)
- Contaminated Waste Management Procedure (VI-SA-ON-EN-000).
- Environmental Requirements for Offshore Marine Vessels (AE-91-IQ-202)
- Lighting Management Plan (EA-60-RI-153).
- Refuelling and Chemical Transfer Management Procedure (AE-91-IQ-098)
- OSCP Volume 1 – Operations (NWS) (AE-OO-EF-008/1).
- OSCP Volume 2 – Resource Atlas (NWS) (AE-OO-EF-008/2).
- Hazard Reporting, Incident Notification and Investigation Procedure (AE-91-IF-002).
- Quarantine Procedure (AE-91-IQ-189).
- Vermin Management Plan (EA-60-RI-131).
- Waste Management Plan (EA-60-RI-167).

Table 1: Summary of Apache Environmental Guidelines and Drilling Rig Environmental Commitments for Spar-2

(Spar-2 drilled under NWS 2007-2011 Generic Drilling EP: Doc EA-00-RI-164)

Activity	Requirement
Disposal of drilling fluid and drilling cuttings	<ul style="list-style-type: none"> • Dispose of WBM coatings directly to the seafloor. • Direct SBM cuttings through the Verti-G cuttings dryer to remove and recover synthetic fluid. • Plug the cuttings ditch and use an auger to transport the shaker cuttings directly to the cuttings dryer. Recovered fluid to be returned directly to the active mud system via a transfer pump. Processed cuttings from the dryer to be discharged overboard. • Use a high-efficiency centrifuge to control the SBM solids content, to achieve an average oil-on-cuttings discharge value of less than 10% by dry weight of cuttings per hole section (when combined with dried cuttings). • Follow Apache refuelling procedures (AE-91-IQ-098). • Record volume of drilling cuttings and fluid disposed into the ocean on environmental spreadsheet. Record retort figures for percentage of fluid-on-cuttings and report results to the Apache Environmental Department at the end of the well.
Pipe Dope	<ul style="list-style-type: none"> • Use pipe dope that has the lowest concentration of heavy metals and hydrocarbons but still meets safety and performance criteria. • Record volume of pipe dope used on location on the environmental spreadsheet. Send results to the Apache Environmental Department at the end of the well.
Deck drainage, chemical storage and management	<ul style="list-style-type: none"> • Maintain good housekeeping practices. • Store chemicals in bunded areas away from open drains and chemical containers are to be intact. • Use drip trays under all machinery and fuel points and valves. • In the event of a spill, take all actions to control the spill and divert deck drainage to on board containment tanks for treatment through the oil in water separator. • Ensure absorbent material is on board to use in soaking up chemical or oil spills on deck. • Maintain oil water separators regularly to ensure 15 ppm oil concentration alarm is functional. • Report all releases of oil in water > 30 mg/l (over a 24 hour period) to Apache Perth office. • Report all spills > 80 L to DMP within 2 hours either directly by contacting the DMP Duty Inspector on 0419 960 621 or via the Apache Perth office. • Report all spills < 80 L through Apache incident reporting system.
Liquid Discharges	<ul style="list-style-type: none"> • Discharge excess water from the water maker to sea. • Under routine operating conditions, discharge treated sewage, grey water and main deck drainage at sea level. • Discharge cooling water at barge of hull of drilling rig level to allow for sufficient cooling and oxygenation.
Incident Reporting	<ul style="list-style-type: none"> • Use the Apache incident reporting system to report incidents within 2 hours as per OPGGS (Environment) Regulations 2009, Sub-regulation 26).
Waste Oil Management	<ul style="list-style-type: none"> • Drum waste oil and grease and return to mainland for recycling. • Record volume of waste oil taken off rig and forward results to the Apache Environmental Department at the end of the well.

Activity	Requirement
Spillage of diesel fuel or oil	<ul style="list-style-type: none"> • Follow Apache refuelling procedures (AE-91-IQ-098). • Carry out diesel refuelling during daylight hours only, weather permitting. • In event of a spill take all actions to control it. • Do not use dispersant without AMSA approval. • Report all spills >80L to DMP within 2 hours either directly by contacting the DMP Duty Inspector on 0419 960 621 or via Apache Perth office. • Report all spills <80L through the Apache incident reporting system. • Implement Apache's Oil Spill Contingency Plan (OSCP) if required.
Discharge of combustion products from engines	<ul style="list-style-type: none"> • Include inspections and tuning of engines and equipment on a regular maintenance schedule. • Optimise combustion or well test fluids and gas.
Solid waste management <ul style="list-style-type: none"> • Food scraps • Garbage • Litter • Scrap metal and wood etc 	<ul style="list-style-type: none"> • Macerate all food scraps prior to ocean disposal (rig is 49 km from nearest land mass). • Do not dispose of debris, garbage or litter into the sea (skips need covers to prevent wind blown rubbish – especially plastics and cups). • Segregate industrial waste (scrap metals / drums etc) wherever possible for appropriate disposal onshore. • Do not use polystyrene cups. • Reduce, reuse and recycle waste wherever practicable. • Record the volume and type of waste taken off rig and forward to the Apache Environmental Department at the end of the well. • Undertake a ROV survey to check that no rubbish is left on seabed. Remove any debris if found.
Sewage discharge	<ul style="list-style-type: none"> • Treat sewage to secondary level prior to discharge through the sewage plant (aerates, macerates and chlorinates). This unit meets MARPOL 1973/78 requirements. • Maintain the sewage treatment plant in order to ensure effective treatment.
Light Overspill	<ul style="list-style-type: none"> • Minimise use of non-essential lighting, while maintaining safety standards on the drill rig and support vessel.
Noise	<ul style="list-style-type: none"> • Minimise noise emissions when drilling near noise-sensitive environments.
Fishing	<ul style="list-style-type: none"> • No fishing is permitted from the drill rig whilst it is on location.
Anchoring & Disturbance to the seabed	<ul style="list-style-type: none"> • Side scan sonar survey results used to select a rig approach and drill site location that avoids sensitive seabed features. No sensitive seabed features in immediate vicinity of the well. • No workboats are to anchor in areas where coral reefs occur; a designated area for mooring will be allocated. No sensitive seabed features in immediate vicinity of the well.
Operational Environmental Awareness	<ul style="list-style-type: none"> • Through inductions and educational material present on the rig, all personnel are familiar with the environmental requirements of the EP to ensure these guidelines and procedures are being followed. • Ensure all personnel sign off on the rig register book confirming their induction.

Activity	Requirement
Vertical Seismic Profiling (VSP)	<ul style="list-style-type: none"> Follow DMP (formerly DoIR) <i>Guidelines on Minimising Acoustic Disturbance to Marine Fauna</i> (1997) when undertaking VSP: <ul style="list-style-type: none"> Do not commence VSP unless whales are a minimum distance of 3 km from the rig. Soft-start over a 20 minute period. Ensure rig crew is alert for whales during VSP, with a dedicated whale-watcher on post if a whale is sighted with 3-5 km of the rig. Shut down of VSP if whales are observed within 1 km of the rig.
Large Animal Observations	<ul style="list-style-type: none"> Fill in whale and turtle observation data sheets and send to the Apache Environmental Department at the completion of the drilling programme (Appendix in NWS generic drilling EP 2007-2011 (EA-00-RI-164).

Perth Office Commitments

Activity	Requirement
Prior to drilling	<ul style="list-style-type: none"> NWS generic drilling EP 2007-2011 (EA-00-RI-164) is available to all personnel involved in drilling programme. Ongoing consultations are part of each drilling campaign. In preparing the Generic NWS Drilling Programme EP, Apache consulted with numerous stakeholder representatives. Key stakeholders representatives such as fisheries will be notified of the Spar-2 campaign prior to commencement of drilling.
Discharge of combustion products from engines	<ul style="list-style-type: none"> Report greenhouse gas emissions data to Commonwealth Government annually.
Environmental Audit	<ul style="list-style-type: none"> Audit drilling rigs every six months whilst under contract to Apache (rig audit is scheduled October 2010). Review electronic waste and chemical log received from rig at the completion of the drilling programme.

Consultation

Ongoing consultations are part of each drilling campaign. In preparing the Generic NWS Drilling Programme EP, Apache consulted with numerous stakeholder representatives, including:

- Department of Mines and Petroleum (DMP)
- Department of Environment and Conservation (DEC)
- CALM (Marine branch) (now DEC).
- Fisheries WA (now Department of Fisheries (DoF))
- Marine and Coastal Community Network (MCCN)
- Environment Protection Agency (EPA)
- Marine Parks Reserve Authority (MPRA)
- CALM (Environmental Protection) (now DEC)
- WA Fishing Industry Council (WAFIC)
- Australian Fisheries Management Authority (AFMA)

Further Details

For further information about the Spar-2 drilling programme, please contact:

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