



WA North West Shelf Activities
Stag-31WI, -32WI, -33H & -34H
Production & Water Injection Wells
Environment Plan: Public Summary
December 2006

This summary of the Stag-31, -32, -33, -34 Drilling EP has been submitted to comply with Regulation 11(7)(8) of the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999.

Introduction

Apache proposes to drill two production wells (Stag-33H and -34H), and two water injection wells (Stag-31WI and -32WI) at the Stag platform located in Commonwealth Waters (WA-15-L) of the North West Shelf (NWS), commencing late December 2007. The Stag platform is located 60 km northwest of Dampier (Figure 1).

Apache's generic Environment Plan (EP) for its drilling program 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 Zulimar-1 was approved by the DoIR, in accordance with the Petroleum (Submerged Lands) (Management of Environment) (PSLMoE) Regulations 1999.

Project Description

The proposed Stag drill site locations are outlined below. The wells will be drilled using water-based muds (WBMs) and each well will take between 20 and 25 days to drill.

Water Injection Wells		Production Wells	
Stag-31 WI	Stag-32 WI	Stag-33H	Stag-34H
20 ⁰ 16' 59.18" S 116 ⁰ 16' 52.15" E	20 ⁰ 17' 24.29" S 116 ⁰ 14' 46.00" E	20 ⁰ 17' 23.96" S 116 ⁰ 16' 31.09" E	20 ⁰ 17' 23.90" S 116 ⁰ 16' 30.99" E

Production wells

The drilling procedure for both production wells will be the same. A 406 mm (16") hole will be drilled to approximately 322 m below the seabed with seawater and pre-hydrated gel (SW/PHG), with a 340 mm (13 3/8") conductor casing and diverter system run and cemented. A 311 mm (12 1/4") hole will then be drilled to a depth of 1,350 m BRT with KCL/Polymer. A 244 mm (9 1/2") casing string will then be installed into the hole and cemented into position. The blow-out preventers (BOPs) will then be installed and pressure tested, and drilling will continue with a 216 mm (8 1/2") hole to total depth.

No vertical seismic profiling (VSP) or production testing will take place for the production wells.

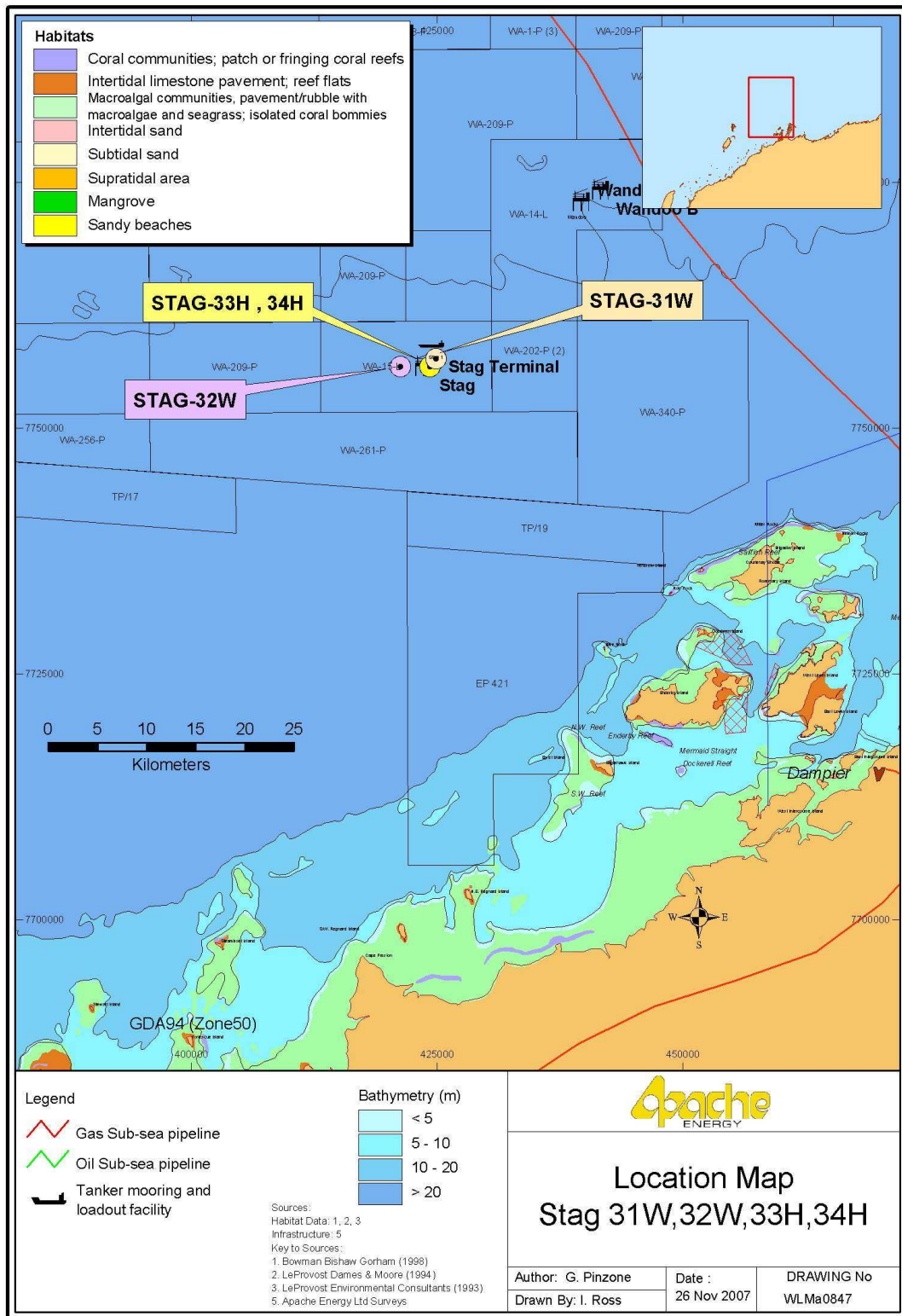


Figure 1 Location of the proposed Stag production and water injection wells

Water Injection Wells

The drilling procedure for each of the water injection wells will be to drill a 916 mm (36") hole to approximately 100 m below the seabed and then install and cement a 762 mm (30") conductor casing and template. A 406 mm (16") hole will then be drilled to a depth of 300 m below the rotary table (BRT) with seawater (90%) and gel sweeps (10%). A 340 mm (13 3/8") casing string is then installed into the hole, tied back to surface via a mudline suspension (MLS) system and cemented into position. The BOPs will then be installed and pressure tested and drilling will continue with 311 mm (12 1/4") hole to the top of the reservoir section at ~1,000 m BRT. A 244 mm (9 1/2") casing string will be cemented in place and tied back to surface. A subsea xmas tree will be installed with the riser tied back to surface via a surface BOP stack. A 216 mm (8 1/2") horizontal section drilled to total depth at approximately 1,900 m BRT and 140 mm (5 1/2") sand screens installed across the reservoir section. A completion will be set.

Flow lines from the existing well heads will be connected and tested to the xmas tree.

All well activities will be undertaken in accordance with the Commonwealth *Petroleum (Submerged Lands) Act 1967* and the PSLMoE Regulations 1999.

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.

The dominant component of the NWS is the Rowley Shelf, comprising extensive cemented calcareous limestone sediments, forming a shallow, gently inclining seabed extending from the coast to 40 km offshore to a water depth of 20 m. The Stag production wells, at 49 m water depth, are located on the mid-continental shelf region (30-100 m water depth), which is characterised by a thick sequence of carbonate rock that is overlain by thin layers of unconsolidated fine to medium grained, carbonate sediments.

Biological Environment

At the water depth in which the Stag production wells are located, the habitats common around the islands of the NWS (such as subtidal sediments, intertidal and subtidal reefs, macroalgal and seagrass beds, intertidal shoals and beaches, mangroves and mudflats) will not be encountered. Benthic infauna (animals that live on or in seabed sediments) are likely to exist at the site, especially if unconsolidated sediments are present. Mobile burrowing species that may be present include crustaceans (crabs and shrimps), worms, sea stars, sea urchins and other small

animals. Spatial and seasonal distribution of such species depends on factors such as substrate composition, season, water depth and temperature.

The demersal habitat (ocean bottom) of the NWS hosts a diverse assemblage of fish, many of which are commercially exploited by trawl and trap fisheries, for example the genera *Lethrinus* (emperor) and *Lutjanus* (snapper). Pelagic fish (those living within the water column) in this area include tuna, mackerel, herring, pilchard and sardine. The inshore habitats in this region are not considered to be significant nursery grounds for commercially important deeper-water fish species.

Whale sharks (*Rhincodon typus*) are oceanic and cosmopolitan in their distribution, however, they aggregate in and near the waters of the Ningaloo Marine Park during autumn, around the Exmouth region. They are occasionally observed from the Stag platform.

Four species of marine turtle nest on sandy shore sites of the Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island, and other coastal islands in the Exmouth region. These are the green turtle (*Chelonia mydas*), flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricata*), and the loggerhead turtle (*Caretta caretta*). All four species are on the National List of Threatened Species. The leatherback turtle (*Dermochelys coriacea*) may also visit the open waters of the shelf. The loggerhead, flatback and leatherback turtles are known to feed on mid-water plankton and benthic animals, and can forage in mid-shelf water depths, so may occur around the Stag platform.

The nationally threatened dugong (*Dugong dugong*) occurs across the tropical coastal waters of Australia from Shark Bay to Queensland. They are herbivorous and are generally associated with seagrass beds, upon which they feed. Dugongs are commonly found in shallow sheltered areas (less than 5 m deep), often near islands or large bays. Dugongs have not been sighted around the Stag platform.

Dolphins are relatively common in the region. Species known to occur in the region are the bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Indo-pacific humpback dolphins (*Sousa chinensis*) and the striped dolphin (*Stenella coeruleoalba*).

A number of whale species, including the short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), tropical byrdes whale (*Balaenoptera edeni*), southern minke whale (*Balaenoptera acutorostrata*) and humpback whale (*Megaptera novaeangliae*), also occur in the region, the most commonly sighted of these being the humpback whale. This species migrates between the Antarctic waters and the Kimberly region of Western Australia. The peak of their northerly migration between the Exmouth Gulf and the Dampier Archipelago occurs around late July to early August, while the southerly return migration peaks around late August – early September. Although the Stag platform is located in the migration corridor, drilling will occur after the peak southern migration period.

Eighteen species of seabird have been recorded over the NWS waters. These include petrels, shearwaters, tropicbirds, frigatebirds, boobies and terns, and silver gulls. Of these, eight species occur year round and the remaining 10 are seasonal visitors.

Socio-Economic Environment

The population centres adjacent to the region in which the drilling program is located are the Port of Dampier and Port Hedland and the smaller coastal and fishing towns

of Onslow and Point Samson. Dampier, Karratha and Port Hedland are the main service and population centres for the 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.

Commercial fisheries are active along the Pilbara coast, however fishing effort in the open Commonwealth waters is low, with operators favouring the inshore areas. Pearling is the key industry in the region. Live pearl shell for subsequent use in the pearl culture phase is harvested by divers from several areas off the Pilbara coast, with pearl culture leases located in the Montebello Islands and the Dampier Archipelago. Prawn trawling activities occur near Onslow and Nickol Bay, the the major target species being the tiger, western king and banana prawns.

No marine or terrestrial conservation areas are located in the vicinity of the Stag platform.

Table 1 summarises the biological and socio-economic features of the NWS.

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			
Whalesharks												
Algae	growing				Shedding fronds				growing			
Seabird nesting												
Prawn trawling												
Tourism												
Drilling												

Key

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

Major Environmental Hazards and Controls

The potential environmental impacts resulting from offshore drilling on the NWS are outlined in detail in the Generic Drilling Program EP. Table 2 summarises the potential impacts of the Stag drilling program.

Table 2. Summary of potential environmental impacts from offshore drilling on the NWS

Potential hazard (risk)	Potential environmental effect (consequence)	Risk ranking
Drill rig and vessel anchoring	Localised disturbance to seabed, such as shallow furrows, dependent on seabed type. Effects are temporary.	Negligible – seabed depressions rapidly filled by sand and detritus and recolonised.
Artificial lights from drill rig (must be kept on 24 hrs due to safety regulations)	Potential disorientation of fauna by lights at night, especially turtle hatchlings.	Negligible – wave direction and magnetic cues are primary influences on turtle hatchlings once they have left the beach. Stag is distant from nesting beaches.
Impacts to marine species from noise generated by the drill rig and support vessels	Potential short-term physiological effects or disruption to behaviour patterns of cetaceans, birds, turtles, fish and other marine life.	Negligible – observations have shown whales resting and swimming in close proximity to operating rigs.
Drill cuttings and fluid discharges	Drilling activities and disposal of drill cuttings and fluids will produce suspended sediments in the water column increasing turbidity, will bury and smother infauna and epifauna and may lead to toxicity and bioaccumulation to marine organisms.	Acceptable – WBMs used rather than synthetic-based muds (SBM). Studies on NWS reveal few long-term impacts on benthic fauna from WBMs.
Sewage, putrescible and solid domestic wastes	Potential localised reduction in water quality - nutrient enrichment. Modification of feeding habits of local fauna.	Negligible – sewage treatment undertaken on rig.
Waste oil, chemicals and oil-contaminated drainage water	Potential localised reduction in water quality.	Negligible – decks kept clean during operations, oily-water separator collects any spilled material.
Cooling water and atmospheric emissions	Potential localised reduction in water quality. Emissions of greenhouse gases. Potential localised reduction in air quality.	Negligible – discharged above water line to allow cooling and oxygenation.
Introduction of foreign marine organisms from drill rig and support vessels	Competition with local marine life and absence of natural predators can alter ecological balance of flora and fauna communities, favouring the introduced species and resulting in loss of flora and fauna diversity and abundance.	Negligible – no ballast required for jack-up drill rig. Rig has been in NWS waters for many months.
Oil or diesel spills	Severe damage of marine habitats (e.g., coral reefs, mangroves, beaches) and death or injury to marine life (e.g., birds, mammals).	Acceptable – oil spill modelling for the Stag platform indicates spills would be unlikely to reach land during a summer scenario. Most of the spill would evaporate.

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 (April 2006).
- Contaminated Waste Management Procedure (VI-SA-ON-EN-000).
- Incident Reporting Procedure (AE-91-IF-002).
- Lighting Management Plan (EA-60-RI-153).
- OSCP Volume 1 – Operations (NWS) (AE-OO-EF-008).
- OSCP Volume 2 – Resource Atlas (NWS) (AE-OO-EF-008/2).
- Quarantine Procedure (AE-91-IQ-189).
- Refuelling Management Plan (DR-91-IG-001).
- Refuelling Operational Procedure Guide.
- Vermin Management Plan (EA-60-RI-131).
- Waste Management Plan (EA-60-RI-167).

Consultation

In preparing the Generic NWS Drilling Program EP, Apache consulted with numerous stakeholder representatives, including:

- DoIR.
- Department of Environment (DoE).
- CALM (Marine branch).
- Fisheries WA.
- Marine and Coastal Community Network.
- Environment Protection Agency (EPA).
- Marine Parks Reserve Authority (MPRA).
- CALM (Environmental protection).
- WA Fishing industry Council.

Further Details

For further information about the Stag-31WI, -32WI, -33H, -34H drilling program, please contact:

Giulio Pinzone
Apache Environmental Scientist
PO Box 477, West Perth, WA 6872
Phone: 08-9422 7205
Email: giulio.pinzone@aus.apachecorp.com