



WA North West Shelf Activities Stag-29H Water Injection Project Environment Plan: Public Summary April 2006

This summary of the Stag Water Injection Project Construction EP has been submitted to comply with Regulation 11(7)(8) of the Petroleum (Submerged Lands) (Management of Environment) [P(SL)(MoE)] Regulations 1999.

Introduction

Apache Energy Limited (Apache) proposes to construct the Stag Water Injection Project, involving the installation of a flexible steel flowline from the Stag Central Production Facility (CPF) to a new water injection well (Stag-29H), in Exploration Permit WA-15-L. This is located in Commonwealth waters off the Western Australia coastline, 60 km northwest of Dampier on the North West Shelf (NWS) (Figure 1). The project aims to improve production from the Stag field by further sweeping the reservoir of oil accumulations.

Apache submitted a Construction Environmental Management Plan (CEMP) to the Department of Industry and Resources (DoIR) for the project in compliance with the P(SL)(MoE) Regulations 1999, which was approved in April 2006.

Project Description

The Stag CPF is located at 20° 17' 24.78" N and 116° 16' 30.99" E (GDA 94, Zone 50) in a water depth of 47 m. The proposed location of the 29H well site is at 20° 17' 24.29" S, 116° 14' 46.00"E (GDA 94, Zone 50). The flowline will be installed between these two points.

The *Mermaid Investigator* dive support vessel (DSV) will be mobilised to the Stag CPF to install the flowline riser assembly. The *Geosea* dynamically positioned DSV will then be mobilised to install four strategic gravity anchors along the flowline alignment, the wellhead template, the flowline, nine concrete stabilisation mattresses over the flowline, and perform the subsea tie-ins to the template and the riser. The Ensco 106 mobile offshore drill unit (MODU), a jack-up rig, will drill the well to a planned depth of 2,350 m below seabed level using water-based muds (WBM). The well will take approximately 20 days to complete. Drilling is planned to commence in July 2006. Given its distance offshore, its deep water location and the use of WBM, drill cuttings will be discharged to the seabed rather than re-injected to the annulus.

Receiving Environment

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 200 m. The Stag Water Injection Project is located on the mid-continental shelf region (30-100 m water depth). A survey of the seabed in the project area found it to be flat, smooth and featureless, with a variable layer of sand, variable gravel content and no rock outcrops. The benthic biota within the vicinity of Stag is comparable to that found over similar substratum and at similar depths over the wider region. The unconsolidated sediments in this habitat support a diverse benthic infauna, consisting predominantly of mobile burrowing species, which include molluscs, crustaceans (crabs, shrimps and smaller related species), polychaete, sipunculid and platyhelminth worms, asteroids (sea stars), echinoids (sea urchins), and other small benthic animals.

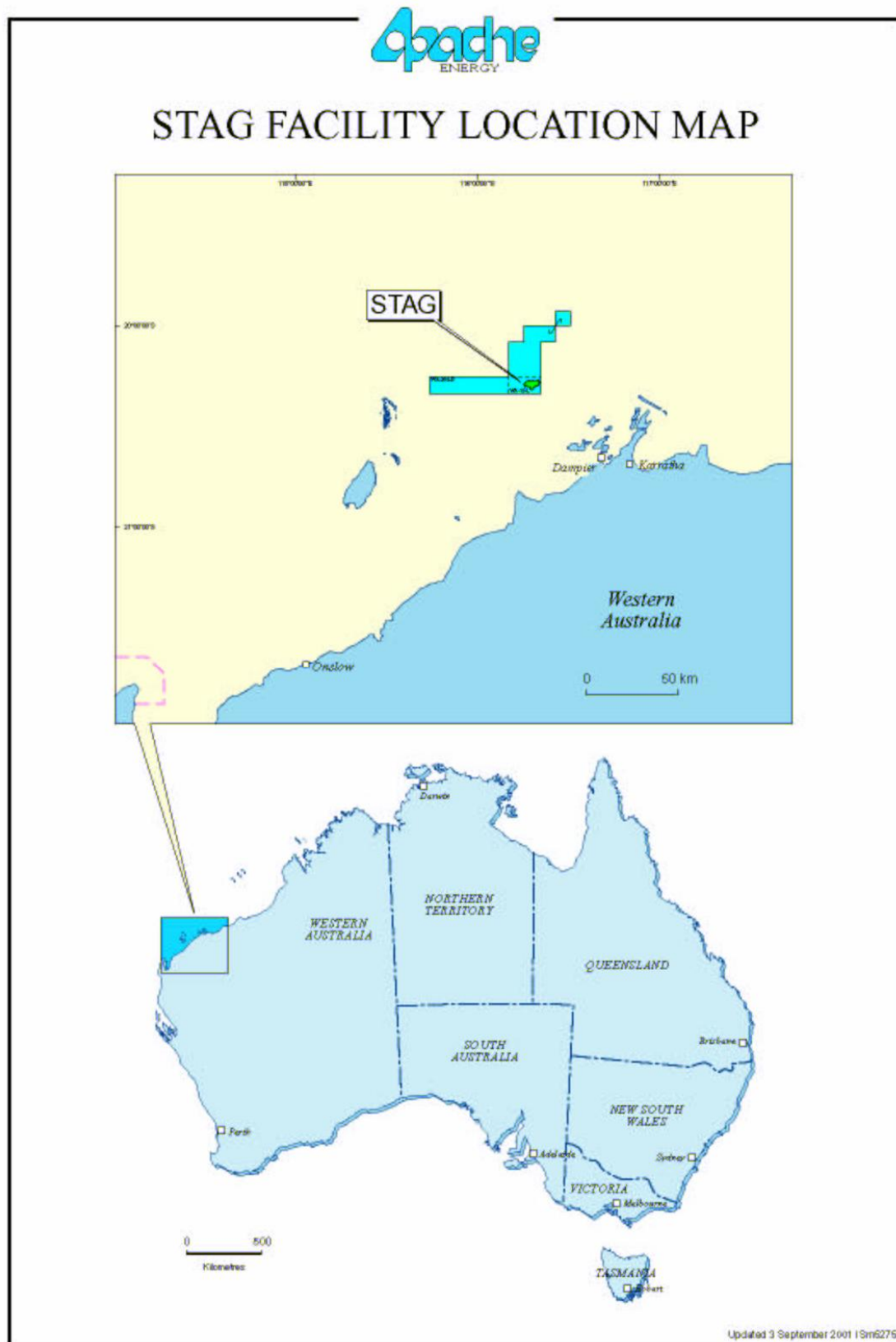


Figure 1 Location of the proposed Stag Water Injection Project

The demersal (deep water) habitat of the NWS hosts a diverse assemblage of fish, many of which are commercially exploited by trawl and trap fisheries. Highly prized demersal fish that use this habitat include species of the genera *Lethrinus* (emperor) and *Lutjanus* (snapper). Pelagic (deep open ocean) fish in this area include tuna, mackerel, herring, pilchard and sardine. Gamefish, such as marlin and sailfish, also occur.

Four species of marine turtles nest on shore sites within the Pilbara region. In order of abundance, the four species of turtles are the green turtle (*Chelonia mydas*), flatback turtle (*Natator depressor*), hawksbill turtle (*Eretmochelys imbricata*) and loggerhead turtle (*Caretta caretta*). These four species are listed as threatened under the *Environmental Protection and Biodiversity Conservation Act 1999*. The nearest turtle nesting sites are located in the Dampier Archipelago, approximately 32 km to the east of the Stag CPF. Other nesting sites include the Montebello and Lowendal Islands (75 km WSW) and Barrow Island (96 km SW).

A range of marine mammals (cetaceans) occur in the waters of this area, some being seasonal visitors while others occur at low densities all year round. The most common species include the humpback whale, false killer whale, southern bottle-nosed whale, bottle-nosed dolphin, Indo-pacific humpbacked dolphin and Risso's Dolphin. The most commonly sighted whale on the NWS is the humpback whale (*Megaptera novaeangliae*). This species undertakes an annual migration between the Antarctic waters and the Kimberley region of Western Australia (where they rest and calve). The peak of the northerly migration through the Northwest Cape to Port Hedland area generally occurs between June-July, while the southerly return migration peaks around September-October.

Major Environmental Hazards and Controls

The potential environmental impacts resulting from the project were assessed during an independently-facilitated hazard identification (HAZID) workshop, using the principles of the AS/NZS 4360:1990 (Risk Management). Table 1 summarises the potential impacts and mitigation measures raised during the workshop. All potential environmental risks are considered to be of negligible risk given routine and project-specific mitigation measures that will be enforced.

Consultation

In preparing the Stag Water Injection Project CEMP and 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 Water Injection Project, please contact:

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Table 1. Summary of potential environmental impacts and mitigation measures of the Stag Water Injection Project

Potential hazard	Potential environmental effect (risk)	Mitigation measures	Risk ranking	Objective	Standards
Mobilisation of equipment and personnel from mainland to offshore spread	Introduction of vermin or weeds to vessels and marine environment	<ul style="list-style-type: none"> AEL Quarantine procedure to be followed. All equipment and materials transferred by Toll Logistics. All equipment and materials transported directly to the offshore vessels rather than via Varanus Island. Internal and external inspection, baiting and external washing of containers will take place. All vessels will have traps, baits and flour trays installed prior to mobilization and monitored throughout the project. Vessels used for construction will not travel to Varanus Island (crew will use facilities on vessels and/or on the Stag CPF). 	Negligible	No introduction of foreign organisms to waters or land near or around project location	<ul style="list-style-type: none"> AEL Environmental Management Policy AEL Quarantine Procedure <i>Quarantine Act 1908</i> (Cmwlth) Australian Ballast Water Mgmt Requirements (AQIS, 2001) Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance (ANZECC) Guidelines for the Control and Management of Ships' Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens (IMO, 1997) APPEA Code of Environmental Practice (s5.4)
Use of foreign vessels in Australian waters	Transfer of exotic marine pests from the hull or ballast of international vessels to NWS waters	<ul style="list-style-type: none"> Vessels will comply with MARPOL, IMO and AQIS requirements regarding ballast management. No hull cleaning will be permitted while on location for this project. The hull of the <i>Mermaid Investigator</i> will not have had time to become fouled as it is a new vessel. The hull of the <i>Geosea</i> was cleaned in November 2005. DNV has classified the vessel as complying with MARPOL and SOLAS regulations. Vessels will dock in Dampier prior to steaming to the project site, where quarantine requirements will be checked by AQIS officials. Pre-audit of vessels will take place prior to arrival at the project site. Project site is remotely located from sensitive commercial marine industries. 	Acceptable risk		

Vessel anchoring (<i>Mermaid Investigator only</i>)	Seabed disturbance from anchor drop and anchor chain drag from four mooring points	<ul style="list-style-type: none"> Seabed survey of the flowline alignment undertaken by Fugro Pty Ltd found no sensitive seabed features. Mermaid will employ their Anchor Handling Procedure. Use of the DPDSV <i>Geosea</i> minimises vessel anchoring requirements to only one vessel. 	Acceptable risk	Minimise seabed damage	<ul style="list-style-type: none"> AEL Environmental Management Policy <i>P(SL)A 1967</i> APPEA Code of Environmental Practice (s5.4)
	Oil spill from rupture of 8" oil pipeline running north from the Stag CPF	<ul style="list-style-type: none"> 'Norwegian buoys' will be used at surface on the two eastern mooring lines to mark the location of the subsea oil pipeline. Mermaid will employ their Anchor Handling Procedure. AEL oil spill indicates the probability of Stag oil reaching sensitive shorelines is very low. AEL OSCP will be activated in response to an oil spill. 	Negligible	Prevent loss of chemicals, fuel or oil to the ocean	<ul style="list-style-type: none"> AEL Environmental Management Policy <i>P(SL)A 1967</i> AEL Vessel Refuelling Procedure (AE-91-IQ-198) AEL OSCP (AE-00-EF-008/1).
Hydrostatic testing of riser assembly	Water pollution – hydrotest water contains corrosion inhibitor; discharge can result in toxicity risk to marine water quality and flora and fauna	<ul style="list-style-type: none"> The quantity of corrosion inhibitor (CRW24058) taken on board the Stag CPF will be minimised to the quantity required for hydrotesting of riser assembly (planned to be less than 1 litre). CRW24058 corrosion inhibitor is water soluble and not expected to bioaccumulate. Only a small volume of treated water (< 1,000 L (1 m³), with less than 1 L of corrosion inhibitor added, at 500 ppm, will be released. Most of the hydrotest water from the riser will be disposed of via the Stag CPF deck drainage system (which is treated prior to ocean disposal). The flowline will be tested in Singapore prior to mobilisation, thereby reducing testing requirements at site. 	Negligible	Prevent water pollution and minimise unnecessary liquid discharges to the ocean	<ul style="list-style-type: none"> P(SL)(MoE) Regulations 1999 (616) AEL Environmental Management Policy APPEA Code of Environmental Practice (s5.4)
Noise from thrusters of the <i>Geosea</i> DPDSV, other vessel noise, and general construction noise	Disturbance to noise-sensitive fauna species, such as cetaceans	<ul style="list-style-type: none"> Extensive research suggests that any adverse effects from underwater generated noise to cetaceans, fish and invertebrates are likely to be localised and temporary. All whale sightings will be reported using the Apache Megafauna Sightings Database. Flowline construction and drilling is scheduled to occur outside the main humpback whale (<i>Megaptera novaeangliae</i>) northern 	Acceptable risk	Minimise acoustic disturbance to sensitive marine life	<ul style="list-style-type: none"> AEL Environmental Management Policy <i>EPBC Act 1999</i>

		<p>migration period through the region (late July).</p> <ul style="list-style-type: none"> No additional helicopter flights (resulting in increased noise levels) are required for the project. 			
Installation of strategic gravity anchors, flowline, concrete mattresses and well head template on seabed	<p>Seabed disturbance Temporary loss of benthic flora and fauna Temporary turbidity in water column</p>	<ul style="list-style-type: none"> Marine habitats impacted by the subsea structures are well represented throughout the surrounding marine area and are not considered to be environmentally sensitive. New infrastructure provides additional colonisation habitat for epibenthic fauna, thus no long-term negative impacts are expected except for the smothering of immobile epibenthic organisms. Seabed survey of the flowline alignment undertaken by Fugro Pty Ltd found no sensitive seabed features. 	Negligible	Minimise seabed damage	<ul style="list-style-type: none"> P(SL)A 1967 AEL Environmental Management Policy APPEA Code of Environmental Practice (s5.4)
Mid-line flange connection	<p>Water pollution – treated water in flowline contains corrosion inhibitor; discharge can result in toxicity risk to marine water quality and flora and fauna</p>	<ul style="list-style-type: none"> Only a small volume of treated water (~ 2,500 L, or 2.5 m³), with less than 1 L of corrosion inhibitor added, at 500 ppm, will be released. CRW24058 corrosion inhibitor is water soluble and not expected to bioaccumulate. 	Negligible	Prevent water pollution and minimise unnecessary liquid discharges to the ocean	<ul style="list-style-type: none"> P(SL)(MoE) Regulations 1999 (616) AEL Environmental Management Policy APPEA Code of Environmental Practice (s5.4)
Leak testing of flowline	<p>Water pollution – leak of treated water from flowline</p>	<ul style="list-style-type: none"> The flowline will be tested in Singapore prior to mobilisation, thereby reducing testing requirements at site and decreasing likelihood of leaks. Hydrotest water contained in the flowline will be injected down the well once the flowline is commissioned. 	Negligible		
Deployment of six 2-tonne bulk sand bags along the flowline near the Stag CPF	<p>Seabed disturbance Introduction of foreign organisms (if bags rupture)</p>	<ul style="list-style-type: none"> Beach sand will be sourced from Dampier in compliance with DoIR/CALM requirements. Bags will be submerged for 2 weeks. Once the flowline is installed, the bags will be cut and disposed of onshore. Any organisms potentially present in sand are highly unlikely to survive at great water depths and pose ecological threat. 	Negligible	As per first row of table	As per first row of table

		<ul style="list-style-type: none"> • Similar methodology successfully executed on the John Brookes project during the near-shore pipeline installation (2004/05). 			
Night-time lighting on construction vessels	May act as an attractant to marine species, such as fish, birds and turtles, which may in turn be exposed to greater risk of predation	<ul style="list-style-type: none"> • On-board personnel will be instructed during induction to minimise the use of night-time lighting wherever possible. • Vessel lighting will be directed inwards, rather than out to sea, wherever possible, where it does not constitute a risk to personnel safety. • Project is located a significant distance from the nearest offshore islands (75 km to Montebello Islands, 32 from Dampier Archipelago), where fauna at sensitive life stages, such as turtle hatchlings and juvenile fish, may be present. • Riser installation only scheduled to last nine days, and flowline installation and connection scheduled to last 10 days, resulting in no long-term impacts. 	Negligible	Minimise the use of night-time lighting where practicable	<ul style="list-style-type: none"> • AEL Lighting Management Plan (EA-60-RI-153)
Waste generation on vessels during construction: - sewage - grey water - food scraps - solid waste	Water pollution Seabed pollution	<ul style="list-style-type: none"> • All vessels will have onboard sewage treatment systems, or store untreated wastes for disposal on the mainland at Dampier or in accordance with MARPOL requirements. • A sufficient quantity of onboard skips and bins, of sufficient size, will be made available on the vessels. • All solid wastes to be placed in onboard skips and bins for disposal back at Dampier. • Waste volumes will be recorded. • Onboard skips and bins will be covered on site and during transportation to Dampier. • All food scraps will be collected and bagged for disposal at Dampier. • Discharge of untreated sewage to the ocean from any construction vessels will not be permitted while on site. • The Geosea Garbage Management Plan will be implemented (Document 040.04). The essential components of this, together with routine Apache waste management practices, are outlined above. 	Negligible	Prevent water pollution and minimise unnecessary liquid discharges to the ocean	<ul style="list-style-type: none"> • MARPOL 1973/78 (Annexes III, IV, V) • P(SL)(MoE) Regulations 1999 (222, 616) • AEL Environmental Management Policy • APPEA Code of Environmental Practice (s5.4)
Refueling support vessels, refueling	Spill of diesel to marine environment.	<ul style="list-style-type: none"> • No at-sea refueling is planned for any project vessels. • In an emergency, where at-sea refueling may be required, the Apache Refueling Management Plan (DR-91-IG-001) will be 	Negligible to unacceptable depending on volume	Prevent loss of chemicals, fuel or oil to the ocean	<ul style="list-style-type: none"> • AEL Environmental Management Policy • AEL Vessel Refuelling

<p>onboard equipment (such as cranes and generators), rupture of vessel fuel tank from collision with another vessel of platform</p>		<p>followed during any at-sea refueling.</p> <ul style="list-style-type: none"> • In the event of a spill, the Apache OSCP (AE-00-EF-008) and/or the GeoSea Shipboard Oilspill Pollution Emergency Plan (SOPEP) (Document 04.14.2) will be put in to action. • Any spillage is to be reported to AEL as an incident using the AEL Incident Reporting Procedure (AE-91-IF-002). • Small spill clean up materials (e.g., absorbent materials) will be provided on the vessels. • Dispensing and refueling points to be within bunded area. • No deck washdown to the ocean will be permitted. • A 500 m exclusion zone exists around the Stag CPF. • Permission required from vessels to enter Stag exclusion zone. • Vessels and Stag CPF will be illuminated at night. • Radio communication will be maintained between vessels at all times. Vessel operations will be in compliance with the AMSA Offshore Support Vessel Code of Safe Practice. • AMSA will be notified of project activities in order that nearby vessels are aware of possible obstruction. • Project site located close to major commercial shipping channels, but the Stag CPF occurs in known petroleum province and is marked on maritime charts. 	<p>and timing of spill.</p>		<p>Procedure (AE-91-IQ-198)</p> <ul style="list-style-type: none"> • AEL OSCP (AE-00-EF-008/1) • <i>P(SL) Act 1967</i> • APPEA Code of Environmental Practice (s5.4) • AEL Drilling Well Control Manual • National Plan to Combat Pollution of the Sea by Oil (AMSA) • WA Marine Pollution Contingency Plan (WESTPLAN)
<p>Drilling</p>	<p>Mostly same potential risks as outlined in this table</p>	<ul style="list-style-type: none"> • Refer to the Generic Drilling EP (EA-00-RI-157, June 2005) for management measures. 			