



Van Gogh Development Drilling Environment Plan: Public Summary October 2007

This summary of the Van Gogh Drilling 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 drill 19 development wells, 2 water injection wells and one gas injection well for its Van Gogh Field Development, located in Commonwealth waters off the Exmouth coast in Exploration Permit WA-155-P(1) using the *Stena Clyde* semi-submersible drill rig. The wells will be drilled from two drill centres, located 43 km from the North West Cape and 58 km from Exmouth (Figure 1).

Apache's Van Gogh Drilling Programme Environment Plan (EP) will be used to manage the wells (EA-00-RI-163). The EP was approved by the DoIR in accordance with the Petroleum (Submerged Lands) (Management of Environment) (PSLMoE) Regulations 1999.

Project Description

The locations of the proposed drill centres (GDA 94, Zone 50) are as follows:

Drill Centre 1	Drill Centre 2
-21° 23' 51.63" S	-21° 23' 12.86" S
114° 04' 04.90" E	114° 04' 43.62" E
366 m below LAT	361 m below LAT

The development will be drilled and completed in a batch mode. This means performing similar operations for each well consecutively before advancing to the next stage.

The drilling procedure for each of the dual lateral wells will be to drill a 914 mm (36") hole section and run and cement a 762 mm (30") conductor. A 406 mm (16") hole section will be drilled from this point, after which a 340 mm (13³/₈") surface steel casing will be run in and cemented. The casing provides structural support to maintain the integrity of the hole and isolates the geological formations. A blow-out preventer (BOP) and marine riser will then be installed and pressure tested. The BOP is used to seal the well in the event of an unexpected fluid or gas flow exceeding the pressure control maintained by the existing mud density. A 311 mm (12¹/₄") hole section will be drilled with 244 mm (9⁵/₈") casing run in and cemented. A final 216 mm (8¹/₂") hole section will then be drilled horizontally to the final planned total depth. A 140 mm (5¹/₂") base pipe with a sand screen will then be run in the hole. For the dual lateral wells a window will be milled in the 244 mm (9⁵/₈") casing and the second lateral 216 mm (8¹/₂") hole section will be drilled. As with the other lateral arm a 140 mm (5¹/₂") base pipe with a sand screen will then be run in the hole.

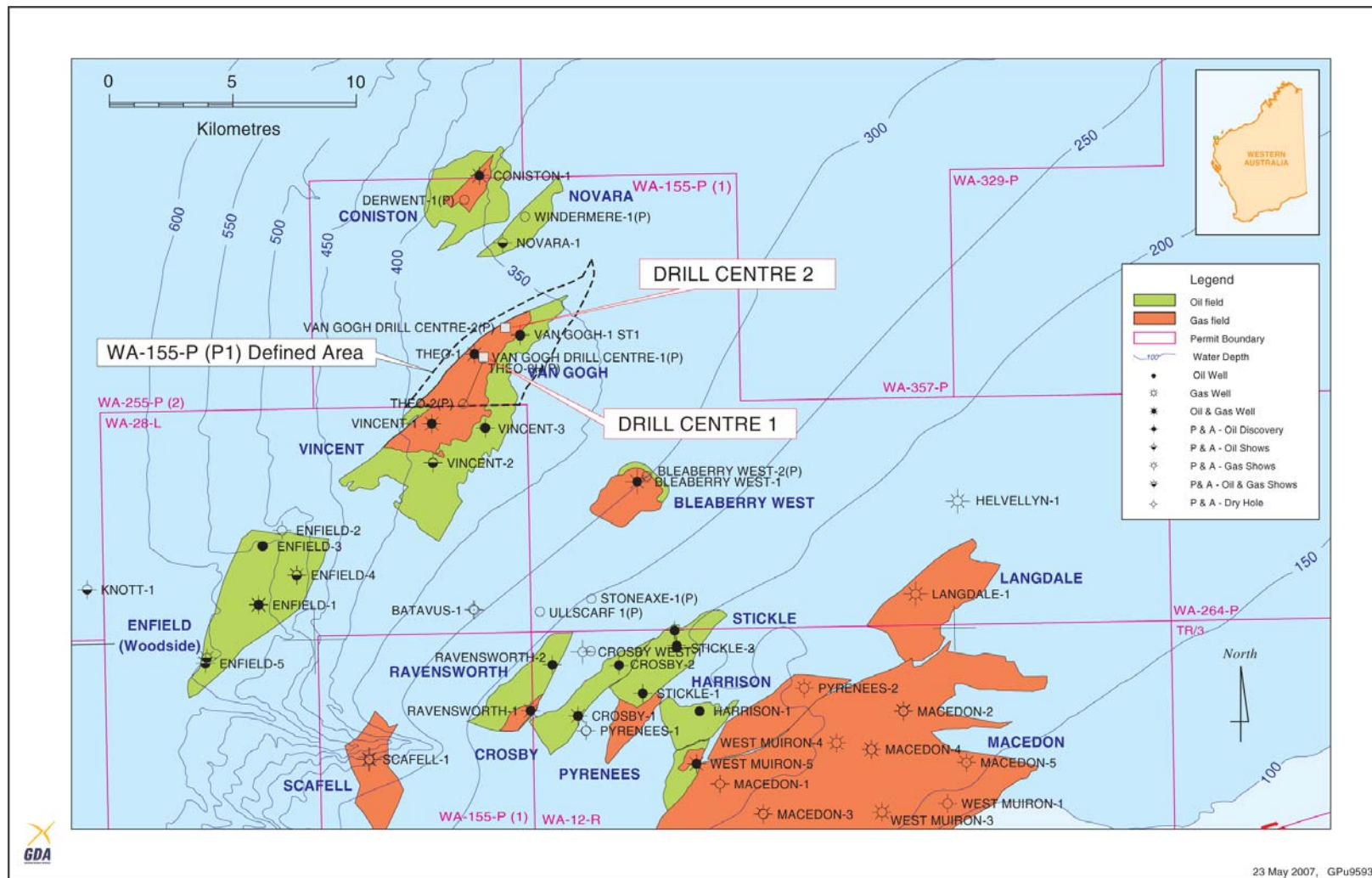


Figure 1 Location of the Van Gogh drill centres

Only water-based muds (WBM) will be used for drilling, consisting of between 92-98% fresh or saline water, with the remaining 2-8% made up of drilling fluid additives.

Receiving Environment

Physical Environment

The Exmouth Sub-basin lies in the arid zone 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 19-24°C in winter to 26-31°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. In January and February, winds are generally persistent from the south-southwest. From March to May, winds shift around to the easterly quadrant, with significant north-easterly winds in May. During June and July, winds are predominantly from the southeast, and August to December is dominated by southwest to southeast wind flows.

The seabed in the Van Gogh Field Development area has been surveyed and was found to slope very gently (1.3% gradient, 0.74° slope) in a west-northwest direction. The seabed is composed of clayey silt with some fine sand and shell fragments. Sediment sampling indicates they are yellow-brown fine sands.

The orientation and degree of drop off the continental shelf influences the oceanography of the area. The dominant surface offshore current is the Leeuwin Current, which carries warm tropical water south along the continental shelf, extending to 150 m in depth, and stronger in winter than in summer. Closer to the coast, the Ningaloo Current flows in a northerly direction along the outside of the Ningaloo Reef.

Biological Environment

The Interim Marine and Coastal Classification for Australia (IMCRA) classifies the drilling area as bordering two meso-scale regions, these being the Ningaloo and Pilbara regions. Marine habitats of the region are illustrated in Figure 2.

Benthic infauna sampling in the drilling locations found that the biota is comparable to that found over similar substratum and at similar depths in the region. In general, unconsolidated sediments support predominantly mobile burrowing species including molluscs (oysters, mussels, abalone, snail, octopus, squid), crustaceans (lobsters, crabs, shrimps) and echinoderms (sea urchins, starfish, sea cucumbers). At the drill sites, sediment infaunal abundance was found to be low, ranging from 40 – 170 individuals/m². Species richness was high for the low number of individuals collected; 94 individuals yielding 36 species. The fauna was dominated by polychaetes (68%) (marine worms) with crustaceans (29%) the only other dominant phyla.

The demersal (near-bottom) habitat of the North West Shelf hosts a diverse assemblage of fish, with up to 1,400 species known to occur. A great portion of these occur in shallower waters than those of the drilling area. Some of the species present in the seep waters of the region include amberjack (*Seriola dumerilii*), mulloway (*Argyrosomus hololepidotus*) and yellowbelly threadfin (*Nemipterus bathybius*).

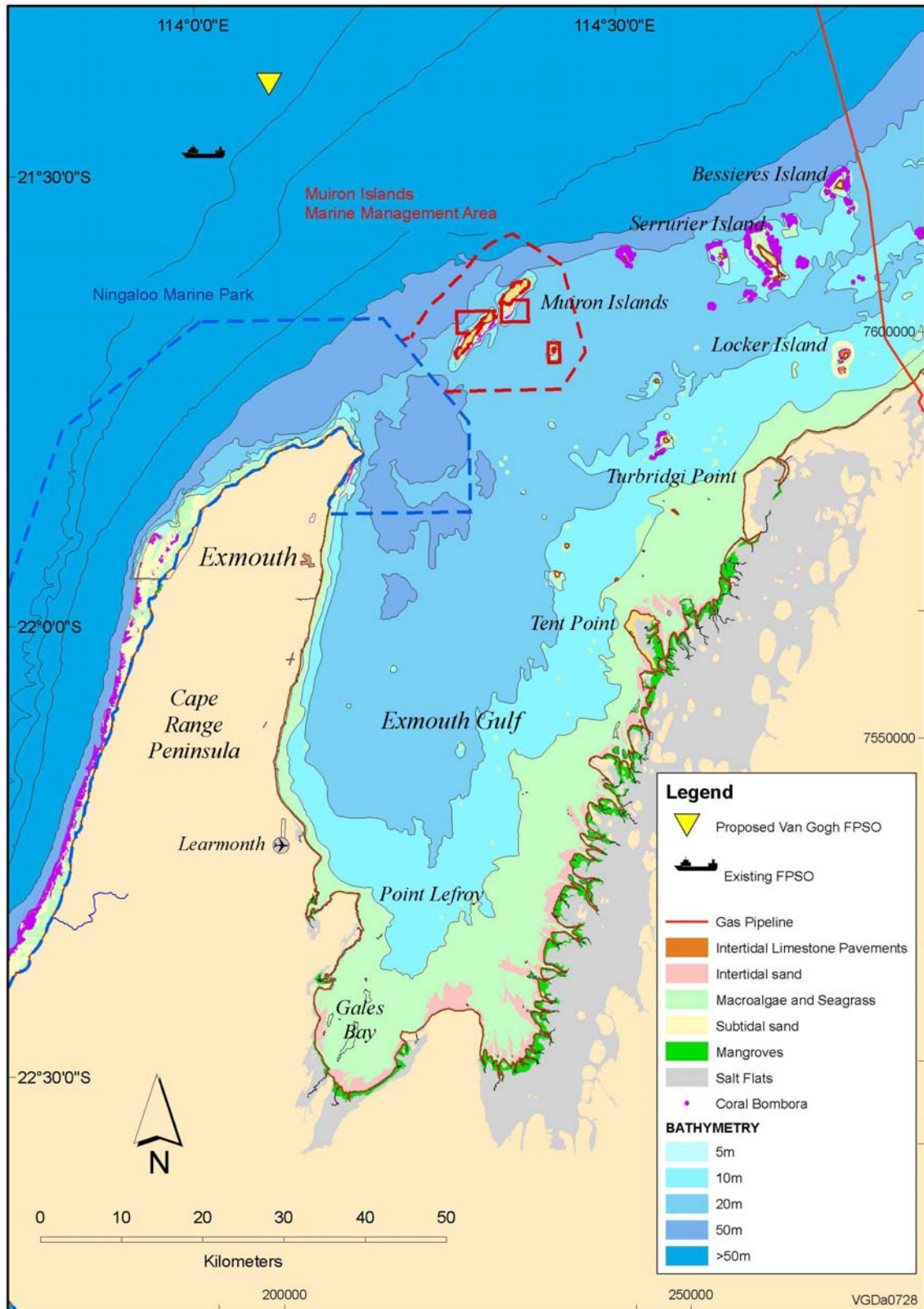


Figure 2 Marine habitats of the Exmouth Gulf and nearby islands (yellow triangle marks approximate area of drilling)

Whale sharks (*Rhincodon typus*) are oceanic and cosmopolitan in their distribution and aggregate in and near the waters of the Ningaloo Marine Park from late March to July each year. Aerial surveys for whale sharks have found only a small number of them occurring in deep waters far from the reef. Thirty-three other shark species are known to occur in the region, while devil rays are generally recorded as occurring in waters less than 100 m deep and congregate in the same areas and times as the whale sharks. Skates are common and widespread in the deepwater environment.

Five species of marine turtle occur in the waters of and nest on sandy shore sites of the Exmouth region. These are the:

- green turtle (*Chelonia mydas*).
- flatback turtle (*Natator depressus*).
- hawksbill turtle (*Eretmochelys imbricata*).
- loggerhead turtle (*Caretta caretta*).
- leatherback turtle (*Dermochelys coriacea*).

All five species are listed as threatened species (endangered or vulnerable) under the EPBC Act. The across shelf distribution, abundance and activity of turtle species is varied but not well known. Common to all species is that hatchlings emerge 6 to 8 weeks after the females have nested. The regional sea turtle population is estimated to be over 50,000 animals. It is unlikely that turtles occur in any great number around the drill sites, with most aerial surveys finding them in water depths less than 150 m. The green and loggerhead turtles are the most numerous in the region.

The nationally threatened dugong (*Dugong dugong*) occurs across the tropical coastal waters of Australia from Shark Bay (WA) 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), with a large population (about 1,000 individuals) known to occur in the eastern part of Exmouth Gulf.

Dolphins are relatively common in the region, with 13 species recorded in the waters of the Ningaloo Marine Park including 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 and is concentrated around the 200 m depth contour. Their southerly return migration in the region peaks around late August – early September, with pods preferring to travel in shallower waters, typically between 30 and 100 m deep. Many cow/calf pairs used the Exmouth Gulf as a resting ground during the southern migration. The crossover between these seasons (the transition season) is when humpback whales are more likely to occur in deeper waters around the Van Gogh drilling area.

Eighteen species of seabird have been recorded over the North West Shelf 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

Exmouth and Onslow are the main service and population centres for this region. Local people seeking aquatic recreation such as boating, diving and fishing use the Exmouth Gulf, waters in the Ningaloo Marine Park and nearby islands. These areas are also favoured by large numbers of tourists who frequent the area (mainly in the winter months) for marine-based activities, such as reef viewing, swimming with whalesharks and game fishing. 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. Prawn trawling is a major industry in the Exmouth Gulf.

The Ningaloo Marine Park and Muiron Islands Management Management Area (MMA) are located south of the proposed drill sites (29 km and 33 km, respectively).

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													
Van Gogh 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 Van Gogh Drilling Programme EP. Table 2 provides a summary of these potential impacts.

Table 2. Summary of potential environmental impacts from the Van Gogh Drilling Programme

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 – rapid infilling of furrows. Only 2 rig moves for entire drilling programme.
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. Van Gogh 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 – WBM used. Studies on North West Shelf reveal few long-term impacts on benthic fauna from WBM. Cuttings will settle close to the drill centres (500 m long x 250 wide), and the area that will experience total suspended solids greater than 2 mg/litre anywhere in the water column is restricted to an area 650 m long x 200 m wide.
Sewage, putrescible and solid domestic wastes	Potential localised reduction in water quality - nutrient enrichment. Modification of feeding habits of local fauna.	Negligible – sewage treatment used 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	Negligible – rig has been working on the North West Shelf prior to this drilling programme.

	in loss of flora and fauna diversity and abundance.	
Impacts to humpback whales from vertical seismic profiling (VSP) noise	VSP is a more benign activity than conventional seismic surveys. Potential short-lived impacts include disruption to navigation and communication, with some research indicating no disruption from normal activities when seismic activity is occurring several kilometres away.	None – no VSP to take place for the Van Gogh Drilling Programme.
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 indicates spills are highly unlikely to reach any reef or coastline.

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 Van Gogh Drilling Programme EP, Apache consulted with numerous stakeholder representatives, including:

- DoIR.
- Department of Environment and Water Resources (DEWR) (Cmwth).
- Department of Industry, Tourism and Resources (DITR) (Cmwth).
- Department of Defence (Cmwth).
- Department of Environment and Conservation (DEC).
- Department of Planning and Infrastructure (DPI).
- Department of Fisheries.
- Shire of Exmouth.
- Cape Conservation Group.
- Marine and Coastal Community Network (MCCN).
- WA Fishing Industry Council (WAFIC).
- Exmouth Professional Fishermen's Association.
- Exmouth Chamber of Commerce.

Further Details

For further information about the Van Gogh Drilling Programme, please contact:

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