



ZEESTER 3D MARINE SEISMIC SURVEY ENVIRONMENT PLAN: PUBLIC SUMMARY

This summary of the Environment Plan for the Fugro Zeester 3D marine seismic survey, which will be acquired within the Roebuck Basin offshore from Western Australia (WA), has been submitted to the WA Department of Mines and Petroleum (DMP), to comply with sub-regulations 11(7) and 11(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

INTRODUCTION

Fugro Multi Client Services Pty Ltd (Fugro) proposes to undertake a three-dimensional (3D) marine seismic survey (Zeester 3D MSS) within the Roebuck Basin offshore from Western Australia (**Figure 1**). The survey will be comprised of a maximum of 7,000 square kilometres (km²) of 3D seismic acquisition in Exploration Permit Areas WA-435-P, WA-436-P, WA-443-P, Release Areas W10-6, W10-8 and W11-9, and adjacent non-acreage areas. Seismic acquisition will take place in an operational area that covers approximately 15,247 km² overlapping these exploration permits, release areas and adjacent non-acreage areas (**Figure 1**).

The Zeester 3D MSS survey is scheduled to commence in December 2011, and is expected to have a maximum duration of six months. It is planned that the survey will be completed by the end of June 2012.

COORDINATES OF THE PROPOSED ACTIVITY

At the closest point, the operational area is located approximately 195 km north of Port Hedland, on the Pilbara coast of Western Australia. The nearest emergent land to the operational area is Cunningham Island (part of Imperieuse Reef), which is located approximately 55 km north of the northern boundary of the operational area polygon. Imperieuse Reef is part of the Rowley Shoals Marine Park (State Waters), which is managed by the WA Department of Environment and Conservation (DEC). The northern boundary of the Zeester 3D operational area is located approximately 100 km south of Mermaid Reef, the most northerly of the Rowley Shoals, which is incorporated into the Mermaid Reef Marine National Nature Reserve (a Commonwealth marine protected area).

At the closest point, the operational area is located approximately 130 km northwest of the Pilbara coastline (at a point approximately midway along Eighty Mile Beach), and approximately 150 km north of Bedout Island, which is about 40 km due north of the mainland coastline at Larrey Point. Bedout Island is an 'A' Class Nature Reserve, managed by the DEC.

Water depths in the operational area range from a minimum of approximately 65 m along the southern boundary to a maximum of approximately 426 m in the northwest corner of the operational area (see **Figure 1**). There are no shallow shoal or bank features within the operational area.

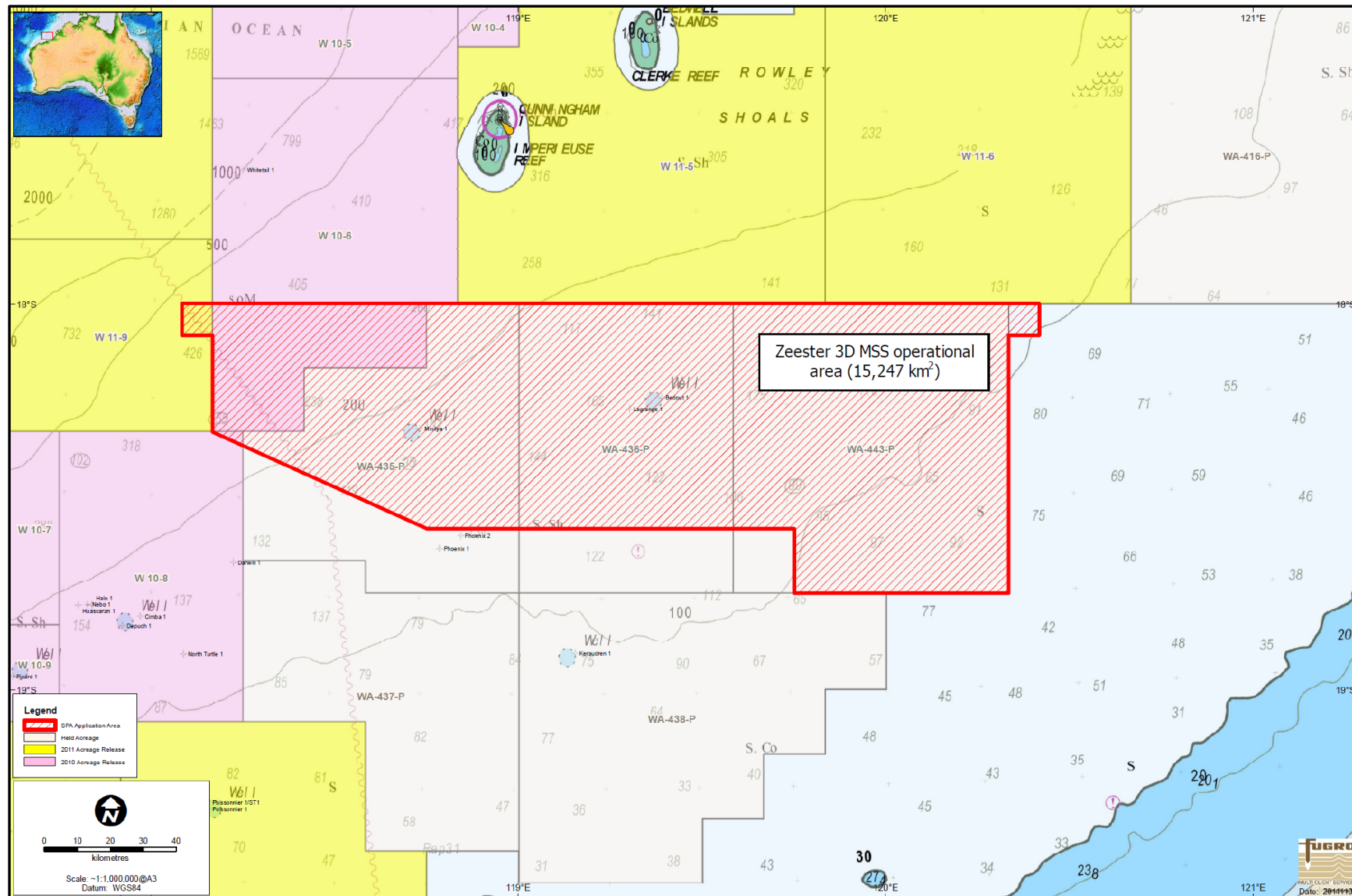
Boundary coordinates operational area are provided in **Table 1** below.

Table 1: Boundary coordinates of the Zeester 3D MSS operational area

Latitude (S)			Longitude (E)		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
118	5	5	17	59	55
118	50	5	17	59	55
119	35	5	17	59	56
120	25	5	17	59	55
120	25	5	18	4	55
120	20	5	18	4	55
120	20	5	18	44	55
119	45	5	18	44	55
119	45	5	18	34	55
118	45	5	18	34	55
118	10	5	18	19	55
118	10	5	18	4	55
118	5	5	18	4	55

Datum: WGS84

Figure 1: Location Map – Zeester 3D Marine Seismic Survey





DESCRIPTION OF THE PROPOSED ACTIVITY

The Zeester 3D MSS survey is scheduled to commence in December 2011, and is expected to have a maximum duration of six months. It is planned that the survey will be completed by the end of June 2012.

During the proposed activities, the survey vessel will traverse a series of pre-determined sail lines within the operational area at a speed of approximately 8-9 km/hr. As the vessel travels along the survey lines, a series of noise pulses (every 8 seconds) will be directed down through the water column and seabed. The released sound is attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive microphones arranged along a number of hydrophone cables (streamers) towed behind the survey vessel. The reflected sound is then processed to provide information about the structure and composition of geological formations below the seabed in an attempt to identify hydrocarbon reservoirs.

The seismic array will comprise of eight solid streamers (Sercel Sentinel), with a maximum length of 6 km. The solid streamers do not contain any fluid filled sections. Streamer spacing will be 100 m, and line spacing will be either 400 m or 500 m, depending on which survey vessel is used (see below). The source (airgun array) tow depth will be 6 m (+/- 1 m) and the streamer tow depth will be 7 m (+/- 1 m). The operating pressure for the airgun array will be approximately 2,000 psi. The airgun array will consist of two sub-arrays, each with a maximum volume of 3,200 cui. These sub-arrays will be fired alternately, with a shotpoint interval of 25.0 m vertical distance, and will produce at source (i.e. within a few metres of the airguns) received sound energy levels (SELs) in the order of 210-220 dB re $1\mu\text{Pa}^2\cdot\text{s}$ at frequencies extending up to approximately 128 Hz.

Fugro proposes to conduct the Zeester 3D MSS using a purpose-built seismic survey vessel. The vessel that will be used to acquire the Zeester 3D survey will be either the M/V *Geo Atlantic*, or possibly the M/V *Seisquest*. The selected vessel will have all necessary certification/registration and will be fully compliant with all relevant MARPOL and SOLAS convention requirements, including having a Shipboard Oil Pollution Emergency Plan (SOPEP) in place, in accordance with Regulation 26 of Annex I of MARPOL 73/78.

The survey vessel will travel within the operational area at an average speed of 4.5 knots (approximately 8.3 km per hour).

A support vessel, the M/V *Cassandra VI*, will accompany the seismic survey vessel to maintain a safe distance between the survey array and other vessels, and to manage interactions with shipping and fishing activities, if required. The support vessel will also re-supply the survey vessel with fuel and other logistical supplies. The support vessel will have a crew of approximately 15 personnel. If the *Seisquest* is used as the survey vessel, then the support vessel for the survey will be the M/V *Sealink 161*.

During the survey, it is likely that the survey vessel will be refuelled at sea using the support vessel, either within or immediately adjacent to the operational area. At sea refuelling of the survey vessel will only take place during daylight hours, and will not take place within a distance of 25 km from the outside boundaries of either the Rowley Shoals Marine Park, or the Mermaid Reef Marine National Nature Reserve.

DESCRIPTION OF THE RECEIVING ENVIRONMENT

The proposed Zeester 3D operational area lies entirely in Commonwealth marine waters in the Northwest Shelf Province of the North-west Marine Region (NWMR). The Northwest Shelf Province is located primarily on the shelf between North West Cape and Cape Bougainville, and encompasses much of the area more commonly known as the North West Shelf (NWS). The operational area is within the Pilbara system of the NWMR, which is characterised by:

- tropical arid climate;
- transition between Indonesian Throughflow (ITF) and Leeuwin Current dominated areas;
- predominantly tropical species;
- high cyclone activity with frequent crossing of the coast;
- transitional tidal zone;

- internal tide activity;
- large areas of shelf and slope; and
- a dry coast with ephemeral freshwater inputs.

Physical Environment

The NWS is subject to an arid (mainly summer rain) subtropical climate with tropical cyclone activity from November to April. The summer and winter seasons fall into the periods September-March and May-July respectively. Winters are characterised by clear skies, fine weather and predominantly strong east to south-east winds and infrequent rain. Summer winds are more variable, but west to south-west predominates. The cyclone season is November to April with the majority of cyclones moving down the northwest coast between 40-400 km offshore and at an average speed of 16 km per hour. During tropical cyclones, mean wind speeds of 56 ms^{-1} have been recorded with gusts up to 69 ms^{-1} . Three to four cyclones per year can be expected, primarily in the December to March period, though cyclones have been recorded as late as June.

Winds are predominantly WSW from October to April and ESE from May to September. Average 10 minute wind speed in non-cyclonic conditions is 6 ms^{-1} with a 5% exceedence value of 12 ms^{-1} .

The Pilbara system is a transitional oceanographic region between the strongly ITF-influenced surface waters to the north and the Leeuwin Current-influenced surface waters to the south. The along-shore pressure gradient in this system results in a predominantly southward movement of the surface water mass, which becomes the source waters of the Leeuwin Current

The Pilbara system is believed to have the strongest internal tides of the entire NWMR, which are thought to be an important physical driver in water depths of between 50 and 500 m depth on the shelf. Internal tides may result in the drawing of deeper cooler waters into the photic zone, stirring up nutrients and triggering primary productivity. The zone between 50 and 500 m depth is thought to be the highest energy zone in the system (possibly correlated with an increased incidence of internal tides) and it is thought that broadly the greatest productivity is found around the 200 m isobath associated with the shelf break

Offshore near surface water temperatures range from 30°C maximum in summer to 22°C minimum in winter. Tides are semi-diurnal and generally flow onshore-offshore with peak neap and spring speeds of 0.3 ms^{-1} and 0.65 ms^{-1} , respectively. Swells up to 2 m can be expected year round offshore with April being the calmest month and June and January the roughest. Wave direction predominantly follows wind direction (ESE in winter, WSW in summer) except during cyclone or storm events. Extreme wave heights offshore, associated with cyclonic activity are in the order of 14 m. Extreme wave heights inshore, associated with cyclonic activity, are in the order of 7-8 m.

The Zeester 3D operational area is expected to have fine-grained and soft seabed sediments. The predominant seabed type is likely to be characterised by deep (>5 m) soft silty sediments that become deeper, softer and finer quite quickly with increasing depth. The thin underlying calcarenite layer (approximately 0.5 m thick) becomes more weakly consolidated and at 300 m water depth is overlaid by up to 15 m of sediment. Sand streamers, approximately 100 m wide and 2-3 km long, support mobile sand ripples and occur occasionally over the sea floor.

The dynamic oceanic environment influences sediment distribution throughout the bioregion. The seafloor of this bioregion is particularly strongly affected by cyclonic storms, long-period swells and large internal tides, which can resuspend sediments within the water column as well as move sediment across the shelf.

Biological Environment

Enhanced pelagic production occurs on the outer shelf as a result of the interaction of surface and deeper water masses on the adjacent shelf break, via vertical mixing and possibly internal wave action. The mixed water masses travel towards shore and can stimulate biological productivity when the deeper nutrient-rich waters move into the photic zone where light allows phytoplankton to take up the influx of nutrients. However, such upwelling events are likely to be sporadic and short-lived. The most favourable conditions for upwelling are associated with a weakening of the ITF during summer, although some upwelling may still occur during winter.

Benthic Habitats

The sandy substrates on the shelf within the Northwest Shelf Province are thought to support low density benthic communities of bryozoans, molluscs and echinoids. Extensive seabed sampling has consistently shown that the soft sediments of the NWS support a low abundance, high diversity invertebrate fauna comprised largely of burrowing polychaete worms and crustaceans. Echinoderms and molluscs also contribute significantly to the faunal composition of soft sediments on the continental shelf and slope in this region.

Sharks and Ray-finned Fishes

The whale shark is listed as Vulnerable and Migratory under the EPBC Act. Although there are no records of the whale shark's presence in the Zeester 3D operational area there have been sightings in the region, and they are known to occur in both tropical and temperate waters and are normally oceanic and cosmopolitan in their distribution. It is possible that they may be encountered during the proposed Zeester 3D survey. Other EPBC Act protected marine species that may occur within the operational area include various species of pipefishes and seahorses.

Marine Reptiles

Five marine turtle species may occur in the Zeester 3D operational area and adjacent waters - the green turtle, leatherback turtle, hawksbill turtle, loggerhead turtle, and the flatback turtle. Green turtles feed on macroalgae and are by far the most common turtle seen in nearshore waters. Loggerhead turtles are carnivorous, feeding mainly on molluscs and crustaceans. Hawksbill turtles feed mainly on sponges and are more often found in deeper waters of the NWS. Green, flatback and loggerhead turtles all breed from September to March, while the hawksbill turtle breeds from July to March. The reefal habitats in the photic zone are key feeding habitats for green and hawksbill turtles.

Green, hawksbill, flatback and loggerhead turtles are known to feed and nest in the Pilbara sub-system of the Northwest Shelf Province. Leatherback and olive ridley turtles also migrate through the sub-system and feed there. No turtle feeding areas are likely to be present in the Zeester 3D operational area, as the area does not include any shallow shoals or banks. The closest important nesting beaches for turtles to the operational area are probably the flatback rookeries at Port Hedland and Cape Thouin, which are located approximately 195 km south and 209 km south-southeast (SSE) of the operational area respectively.

Other EPBC Act protected marine species that may be present in the operational area include seasnakes. Seasnakes are frequently observed in and around offshore islands and the waters of the shelf generally. There is no information on their frequency of occurrence in deeper offshore waters, though individuals are often observed at the surface.

Dugong

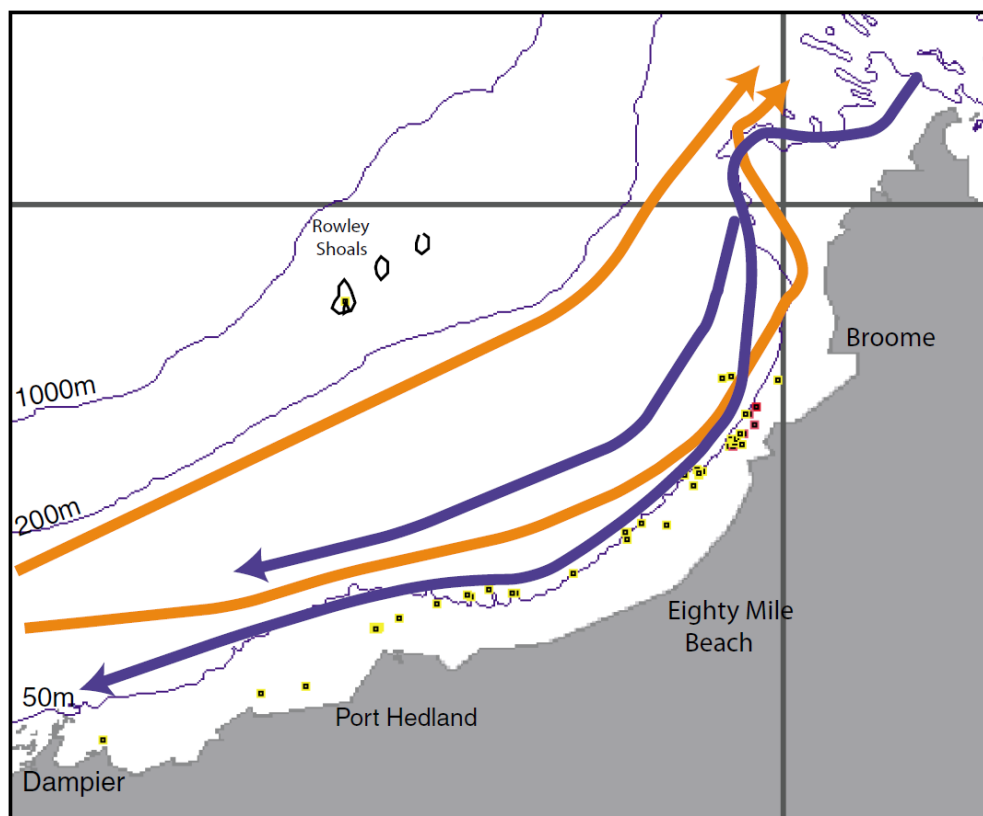
In the Pilbara sub-system of the Northwest Shelf Province, dugongs are believed to be confined to the Coastal Zone, which extends from the coast to the 30 m depth contour. Within this zone, dugongs and seagrass communities are widely distributed, but most are located in WA State waters, well inshore of the proposed operational area. However, seagrass beds are believed to provide critical habitat for dugongs and occur in scattered patches that can be severely degraded by disturbances such as cyclones. Dugongs are known to occur from Dampier to Exmouth, suggesting seagrasses are more prevalent in the southern parts of the Coastal Zone. Turtle grass occurring on sandy substrate of the northern section of the Coastal Zone is believed to be critical for dugong foraging.

Whales and Dolphins

Although whales and dolphins are not expected to be common inhabitants of the operational area, a number of cetacean species have broad distributions that may include the NWS. The humpback whale is the most commonly sighted whale in north Western Australian waters. The species has been observed seasonally to complete their northern migration in the Camden Sound area of the west Kimberley, after feeding in Antarctic waters during the summer months. It is likely that the whales follow a predictable migratory path and migrate both north and south within the continental shelf boundary (200 m bathymetry) (**Figure 2**). However, on the southbound migration it is likely that most individuals, and particularly cow/calf pairs, will

stay closer to the coast than the northern migratory path (**Figure 2**).

Figure 2: Humpback whale migratory routes past the Zeester 3D operational area



It is unlikely that humpback whales will be encountered within the Zeester 3D operational area and adjacent waters during the proposed survey, given that the survey is planned to commence in December 2011, and be completed prior to the commencement of the northbound migration period in 2012, and well in advance of the peak of the northbound migration in this area of the NWS (late July to early August).

The blue whale may be present in the Zeester 3D operational area and surrounding waters. The blue whale is rarely present in large numbers outside recognised aggregation areas. Blue whales are believed to calve in tropical waters in winter and births peak in May to June, however the exact breeding grounds of this species are unknown. The Zeester 3D operational area and adjacent waters does not include any known blue whale feeding, breeding or resting areas. In the NWMR pygmy blue whales migrate along the 500 m to 1,000 m depth contour on the edge of the slope, and are likely to be feeding on ephemeral krill aggregations. The northward component of this migration takes place from May to mid-August, with a peak in July-August, and the southward component occurs from late October to November-December, with a few isolated individuals moving south in January. The migration appears to be centred on the 500 m depth contour.

Consequently, it is possible that blue whales could be encountered in the operational area and adjacent waters during the period when the proposed survey will take place (between December 2011 and the end of June 2011), as water depths in the northwest corner of the operational area extend to approximately 426 m.

Other species whose broad distributions cover the region include whales that are infrequently observed usually restricted to cooler or deeper waters (e.g. killer and Bryde's whales) and are unlikely to be encountered in the area during the survey in significant numbers. There are no known breeding, calving or feeding grounds for any listed threatened or migratory whale species within, or in the immediate vicinity of the Zeester 3D operational area.

By applying comprehensive cetacean interaction management procedures (including the use of 'Standard Management Measures': soft starts, a 2 km low-power zone and 500 m shut down zone, plus the additional mitigation measure of use of two dedicated Marine Mammal Observers [MMOs]), direct adverse physiological effects on any whales that may be encountered during the surveys are extremely unlikely and any potential disturbance would be minimised.

Seabirds and Shorebirds

Based on the results of two survey cruises and other unpublished records, 18 species of seabirds have been recorded over North West Shelf (NWS) waters. These included a number of species of petrel, shearwater, tropicbird, frigatebird, booby and tern, as well as the silver gull. Of these, eight species occur year round and the remaining 10 are seasonal visitors. From these surveys, it was noted that seabird distributions in tropical waters were generally patchy except near islands.

Bedout Island (located approximately 150 km south of the Zeester 3D operational area) supports one of the largest colonies (>1,000 nesting pairs) of brown boobies in Western Australia. It is a sandy, heavily vegetated island on a limestone substrate. The island is a high value seabird nesting location—in addition to the brown boobies, it also has >1,000 nesting pairs of common noddy, >1,000 crested tern, 500-1,000 lesser frigatebird, 100-500 masked booby, as well as lesser crested tern, roseate tern, sooty tern, silver gull and white-bellied sea eagle. Several of these do not nest elsewhere in the Pilbara. Many of these species, including the brown booby, breed during the winter months (May to September).

Eighty Mile Beach, which is located approximately 130 km southeast of the southeast corner of the WA-443-P permit, is one of the most important feeding areas/staging points in Australia for migratory shorebirds. Eighty Mile Beach is considered of international significance given the numbers of birds that feed in the area seasonally, and it is also a listed Ramsar site (Wetlands of International Importance).

Socio-Economic Environment

Heritage Values

At the closest point, the northern boundary of the operational area is located approximately 55 km south of Imperieuse Reef (**Figure 1**). Together, Imperieuse and Clerke Reefs constitute the Rowley Shoals Marine Park (State Waters), which is managed by the DEC. The northern boundary of the Zeester 3D operational area is located approximately 100 km south of Mermaid Reef, the most northerly of the Rowley Shoals, which is incorporated into the Mermaid Reef Marine National Nature Reserve (a Commonwealth marine protected area).

The Proposed Dampier Archipelago Marine Park is located in WA State waters approximately 240 km southwest of the Zeester 3D operational area. The Dampier Archipelago is a Listed Place on the Register of National Estate. In December 2006, the DEC began a planning process to expand the marine park and reserve system in the Pilbara and Eighty Mile Beach regions. Study areas (which could be progressed as future MPAs) in the region include State waters from Cape Keraudren to Spit Point, (including Little Turtle, North Turtle and Bedout islands).

The nearest listed Ramsar site is Eighty Mile Beach, which is located approximately 130 km southeast of the southeast corner of the operational area. Eighty Mile Beach is also a Listed Place on the Register of the National Estate.

A search of the National Shipwrecks database indicates that there are no known historic shipwreck sites within or immediately adjacent to the Zeester 3D operational area.

Cultural Values

There are no known indigenous cultural heritage values or issues for the waters and seabed within and immediately adjacent to the Zeester 3D MSS operational area.

Commercial Fisheries

The operational area lies within the area available for the North West Slope Trawl Fishery (managed by the Commonwealth via the Australian Fisheries Management Authority - AFMA), and historical AFMA logbook

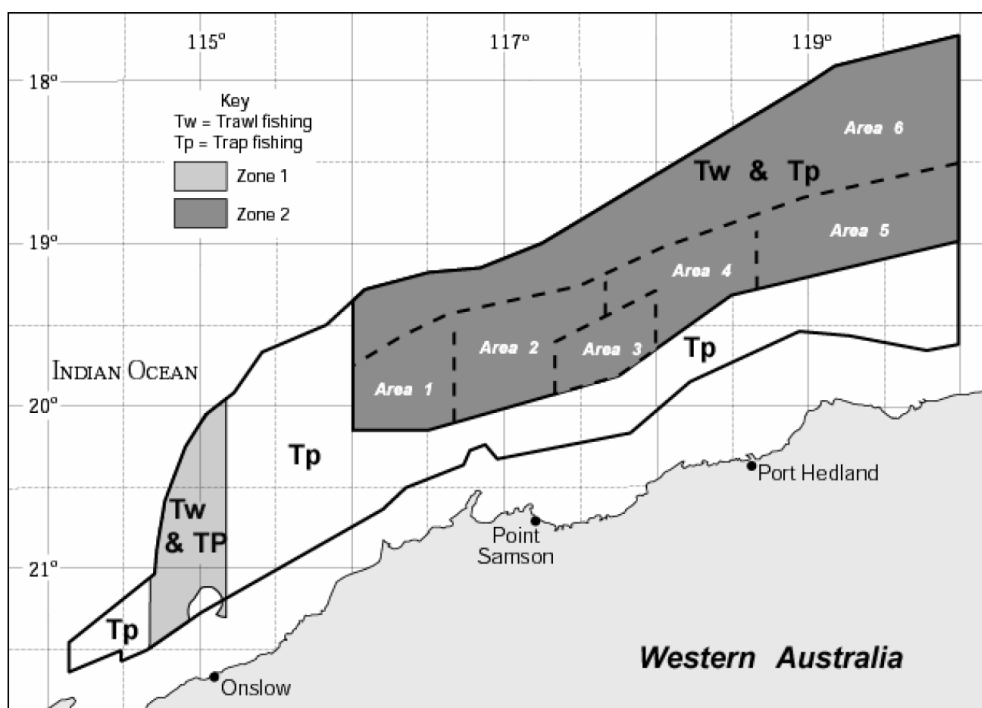
data for 2008-2010 indicate that the North West Slope Trawl Fishery has been active in the area covered by the Zeester 3D operational area.

In WA State waters, the principal commercial fisheries in the North Coast bioregion focus on tropical finfish, particularly the high-value emperors, snappers and cods that are taken by the Pilbara Fish Trawl Fishery and the Pilbara and Northern Demersal trap fisheries. The typical catch is in the order of 3,000 t annually, making these fisheries, at an estimated annual value of around \$12 million, the most valuable finfish sector in the state.

The main commercial fishery that occurs in the area, in the water depth range covered by the proposed Zeester 3D MSS, is the Nickol Bay Prawn Managed Fishery (NBPMF – managed by the WA Department of Fisheries (DoF)). The NBPMF primarily targets banana prawns using otter trawls. The other DoF-managed commercial fisheries active in nearshore and shelf waters off the Pilbara coast are the Pilbara Fish Trawl (Interim) Managed Fishery, the Pilbara Trap Managed Fishery and the Pilbara Line Fishery. The Pilbara Trawl Fishery 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. The Fishery consists of two zones, Zone 1 in the southwest of Fishery (which is closed to trawling) and Zone 2 in the north, which consists of six management areas (**Figure 3**).

The Pilbara Trap Managed Fishery (**Figure 3**) lies north of latitude 21° 44' S and between longitudes 114° 9' 36"E and 120°E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 30 m isobath. The Pilbara Line fishing boat licensees are permitted to operate anywhere within "Pilbara waters". This means all waters bounded by a line commencing at the intersection 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.

Figure 3: Demersal scalefish fisheries of the Pilbara region



Recreational Fisheries

Due to the location of the operational area and distance to coastal areas of the Pilbara there are no recreational activities undertaken in the Zeester 3D operational area or adjacent waters.

Commercial Shipping

The Zeester 3D operational area is adjacent to several shipping routes originating in Port Hedland and the port of Dampier. These routes carry significant traffic comprising bulk carriers and LNG vessels.

Oil and Gas Industry

Exploration Permit Areas WA-435-P, WA-436-P, WA-443-P, Release Areas W10-6, W10-8 and W11-9 and adjacent non-acreage areas have been subject to a considerable level of petroleum exploration activities (seismic surveys and exploration drilling) over the past 30 years or so. There have been three exploration wells (Minilya-1, Lagrange-1, and Bedout-1) drilled in the operational area in the past (see **Figure 1**). At present, there are no petroleum production facilities located within or immediately adjacent to the operational area.

Defence Activities

There are no designated military / defence exercise areas in the waters covered by the Zeester 3D operational area, and the immediate vicinity.

MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

All aspects of the Zeester 3D MSS have been subjected to risk analysis, which has been used to evaluate the potential environmental risks and effects, and characterize risk likelihood and severity. **Table 2** summarises the risk analysis for the key aspects of the survey.

Given the management requirements that will be implemented for all environmental aspects of the survey, the risk of significant adverse environmental effects from the proposed Zeester 3D MSS has been assessed as low for all aspects, apart from acoustic disturbance to cetaceans, interference with commercial fisheries, interference with petroleum production activities, and spills of fuel or oil greater than 80 litres, which have been assessed as medium. The implementation of specific whale monitoring and encounter procedures will be used to minimise the potential for any adverse effects to whales. These procedures comply fully with the Australian Commonwealth Government Guidelines: *EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales* (September 2008). Two dedicated, expert Marine Mammal Observers (MMOs) will be aboard the survey vessel for the entire duration of the Zeester 3D survey. The key role of the MMOs will be to visually monitor the waters around the survey vessel for the presence of cetaceans, turtles and seabirds during daylight hours. The MMOs will be responsible for recording any marine fauna sightings during the survey on the appropriate sightings forms, using the DSEWPC 'Cetacean Sightings Application' software.

The survey will be conducted in water depths of 65-426 m away from any shallow water habitat areas that may be important for turtle feeding. The operational area is located at least 55 km away from any shallow waters that may be important for turtle feeding, and at least 195 km away from any beaches and adjacent shallow waters that are important for turtle nesting, hatching and breeding. The operational area is located at least 130 km from any locations important for seabird breeding (e.g. Bedout Island), and shorebird feeding (e.g. western end of Eighty Mile Beach). The survey will not be operating over critical habitat for feeding, spawning, breeding or migrating fish populations.

At sea refuelling of the survey vessel will only take place during daylight hours, and will not take place within a distance of 25 km from the outside boundaries of either the Rowley Shoals Marine Park, or the Mermaid Reef Marine National Nature Reserve.

MANAGEMENT APPROACH

The environmental management approaches relevant to key aspects of the Zeester 3D MSS are summarised in **Table 2**. The survey will be conducted in accordance with all legislative and regulatory requirements, to the satisfaction of the Regulator (WA DMP prior to 31st December 2011, NOPSEMA post 1st January 2012). Fugro's overall environmental objective for the programme is to avoid or minimise environmental risks to levels as low as reasonably practicable (ALARP).

Table 3: Summary of Environmental Risks and Management Approach for Key Aspects of the Zeester 3D MSS

Hazard/ Incident	Potential Hazard Consequence	Risk and Management Approach
Disturbance to marine fauna	Cetaceans - behavioural reactions (avoidance, diving, increased dive times). Disturbance to marine turtles. Disturbance to fish communities. Disturbance to benthic invertebrates.	Low (turtles, fish, benthic invertebrates), medium (cetaceans) risk. <ul style="list-style-type: none"> • Interaction procedures in place and adhered to • Observation zone of 3 km radius, low power zone of 2 km radius, shut-down zone of 500 m radius • 'Soft start' procedures • Use of two dedicated MMOs for entire duration of the survey • Marine fauna sighting reports completed and returned to Fugro and to the Australian Marine Mammal Centre at the Australian Antarctic Division, using the 'Cetacean Sightings Application' software • Application of vessel-whale interaction procedures for non-acoustic energy source operations
Disturbance to benthic habitats	Small localised disturbance to epibiota in event of loss of equipment	Low risk. <ul style="list-style-type: none"> • The survey will be conducted in water depths of 65-426 m away from any shallow water areas • No anchoring of the either the survey vessel or support vessel will take place during the survey unless in an emergency • All reasonable efforts taken to retrieve lost equipment, and recording and reporting of all items lost overboard
Interference with commercial fisheries	Interference to commercial fishing vessels operating within or near the operational area and surrounding waters. Potential direct and indirect noise impacts on target species. Restriction of access to fishing grounds, loss or damage to fishing gear.	Medium risk. <ul style="list-style-type: none"> • Consultation with fisheries management agencies, fishing industry bodies and individual companies prior to survey commencing, to inform them about the location of operational area and timing of operations • Issuance of Notice to Mariners • Display of appropriate navigational beacons and lights, radar watch • Use of support vessel to warn fishing vessels of survey activities • Recording of sightings of fishing vessels, and consultation with fishermen at sea (if necessary)
Interference with shipping activities	Interference to commercial shipping operating within or near the operational area and surrounding waters.	Low risk. <ul style="list-style-type: none"> • Issuance of Notice to Mariners • Display of appropriate navigational beacons and lights, radar watch • Use of support vessel to warn other vessels of navigation hazard presented by survey activities • Radio warnings to shipping, as required

Hazard/ Incident	Potential Hazard Consequence	Risk and Management Approach
Waste disposal	Localised temporary decrease in ambient water quality from discharge of sewage, grey water, and putrescible waste.	<p>Low risk.</p> <ul style="list-style-type: none"> • Procedures comply with MARPOL requirements • Procedures for treatment and disposal of sewage are in place and relevant discharge requirements are adhered to • Sewage treatment system operational and includes maceration and disinfection • Quantities of treated sewage and putrescible wastes discharged overboard are recorded on the vessel's <i>Waste Log Forms</i> • Correct segregation of solid and hazardous wastes • A vessel <i>Waste Log Form</i> is kept detailing quantities of wastes transported ashore
Fuel and oil spills	Acute toxicity effects on marine fauna such as marine turtles, fishes and seabirds.	<p>Medium risk.</p> <ul style="list-style-type: none"> • Procedures comply with MARPOL 73/78 requirements (e.g. <i>Oil Record Book</i> kept up to date) • Fuel spill contingency procedures are in place and operational • Adherence to the at sea refuelling procedures • At sea refuelling of the survey vessel will only take place during daylight hours • No at sea refuelling of survey vessel within 25 km from the outside boundaries of either the Rowley Shoals Marine Park, or the Mermaid Reef Marine National Nature Reserve • Designated containment areas onboard the vessel for storage of oils, greases and streamer fluid • Sufficient spill response equipment on board to respond to foreseeable spill events • Appropriate actions are taken to minimise pollution • Any significant spills (>80 L) are reported to the relevant sections within the Regulator (WA DMP prior to 31st December 2011; NOPSEMA post 1st January 2012) • Personnel responsibilities are clearly identified
Introduction of marine pests	Introduction and establishment of non-indigenous (i.e. foreign) marine species with consequent impacts on benthic communities, fisheries etc.	<p>Low risk.</p> <ul style="list-style-type: none"> • Procedures comply with AQIS <i>Australian Ballast Water Management Requirements</i> • AQIS ballast water log is kept up to date • Both survey and support vessel have all AQIS clearances to operate unrestricted in Australian waters



CONSULTATIONS

Consultation regarding the proposed Zeester 3D MSS has been undertaken with stakeholder groups, including a number within the commercial fishing industry in Western Australia. The following organisations have been contacted and informed of the proposed operations:

- A Raptis and Sons
- Austral Fisheries Pty Ltd
- Australian Fisheries Management Authority
- Australian Hydrographic Office
- Australian Maritime Safety Authority
- Border Protection Command
- Centre for Whale Research
- Coastwatch
- Commonwealth Fisheries Association
- MG Kailis Group
- Northern Fishing Companies Association
- Recfishwest
- Shark Bay Seafoods
- TunaWest
- WA Department of Fisheries (Karratha and Perth)
- WA Fishing Industry Council
- WA Northern Trawl Owners Association
- WestMore Seafoods

To date, only one of the stakeholders consulted (Shark Bay Seafoods) has raised any issues or concerns relating to the proposed Zeester 3D MSS. Further information concerning the risk assessment process undertaken for the survey, and the potential impacts of seismic airgun noise emissions on benthic invertebrates, has been provided to this stakeholder to address their concerns.

Consultation with all of the stakeholders listed above, and any others identified during the consultation process, will continue during and after the survey, if necessary.

FURTHER DETAILS

For further information about the proposed Fugro Zeester 3D MSS within the Roebuck Basin offshore from Western Australia, please contact:

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