ENVIRONMENT PLAN SUMMARY

Rosemary 3D Multi-Client Marine Seismic Survey 2014

Version/Date: Rev 0, October 2014

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1.0 INTRODUCTION

1.1 Overview

Polarcus Seismic Limited (Polarcus) proposes to undertake a multi-client 3D marine seismic survey (MSS) program, called the Rosemary 3D MSS, in Commonwealth waters on the North West Shelf, between September 2014 and March 2015. The survey acquisition area covers approximately 9,400 km^2 in water depths between approximately 50 and 200 m.

1.2 Location

The survey and the operational areas are bounded by the coordinates listed in Table 1-1. The survey acquisition area is the area over which seismic data will be acquired (Figure 1-1). The area defined as the "operational area" is the physical area used for full power data acquisition within the survey area, plus additional area for sail line run outs (required to obtain full fold coverage), vessel turns, soft-start procedures and vessel manoeuvring (Figure 1-2).

Table 1-1: Bounding Coordinates of the Rosemary 3D MSS Survey and Operational Areas (Datum WGS84)

Survey Area		Operational Area	
Longitude (E)	**Latitude (S)**	**Longitude (E)**	**Latitude (S)**
115.83465	-19.91535	115.25132	-19.77364
115.83465	-19.83201	115.70246	-19.77993
116.16798	-19.83201	115.70276	-19.77924
116.33465	-19.66534	115.70469	-19.69586
116.50131	-19.66534	116.10638	-19.69652
116.75131	-19.41534	116.26986	-19.52977
116.75131	-19.33200	116.35786	-19.46698
116.50131	-19.33201	116.35920	-19.12268
116.50131	-19.24867	116.44934	-19.12243
116.58464	-19.24867	116.44970	-19.12141
116.58464	-19.16534	116.45008	-19.02829
116.91798	-19.16534	117.22634	-19.03121
116.91798	-19.24867	117.22730	-19.62292
117.08464	-19.24867	117.13946	-19.62387
117.08464	-19.49867	116.82406	-19.97785
117.00131	-19.49867	116.72037	-19.97792
117.00131	-19.58200	116.29383	-20.45723

Survey Area		Operational Area	
Longitude (E)	**Latitude (S)**	**Longitude (E)**	**Latitude (S)**
116.91798	-19.58200	115.66797	-20.41050
116.91798	-19.66533	115.55254	-20.31200
116.83464	-19.66533	115.45467	-20.31117
116.83464	-19.74867	115.41797	-20.37984
116.75131	-19.74867	115.25099	-20.37752
116.75131	-19.83200		
116.66798	-19.83200		
116.13557	-20.36016		
115.62006	-20.35603		
115.60940	-20.34293		
115.60277	-20.33657		
115.58902	-20.32854		
115.57791	-20.32539		
115.56877	-20.32456		
115.56077	-20.31835		
115.55099	-20.30777		
115.53946	-20.30089		
115.52863	-20.29687		
115.52149	-20.29429		
115.51212	-20.29290		
115.41808	-20.29205		
115.41799	-19.91535		
115.83465	-19.91535		

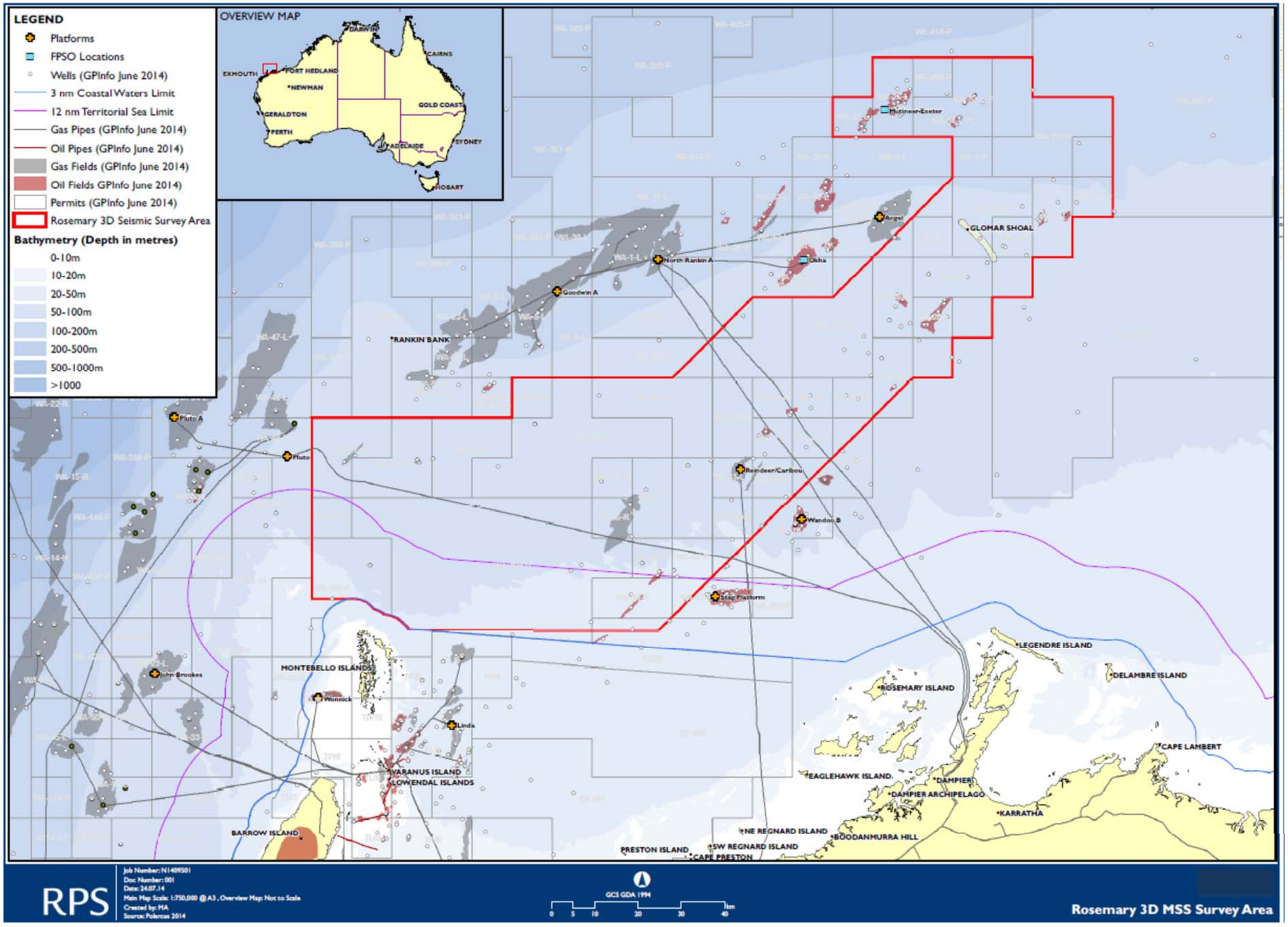

Figure 1-1: Rosemary 3D MSS Survey Area

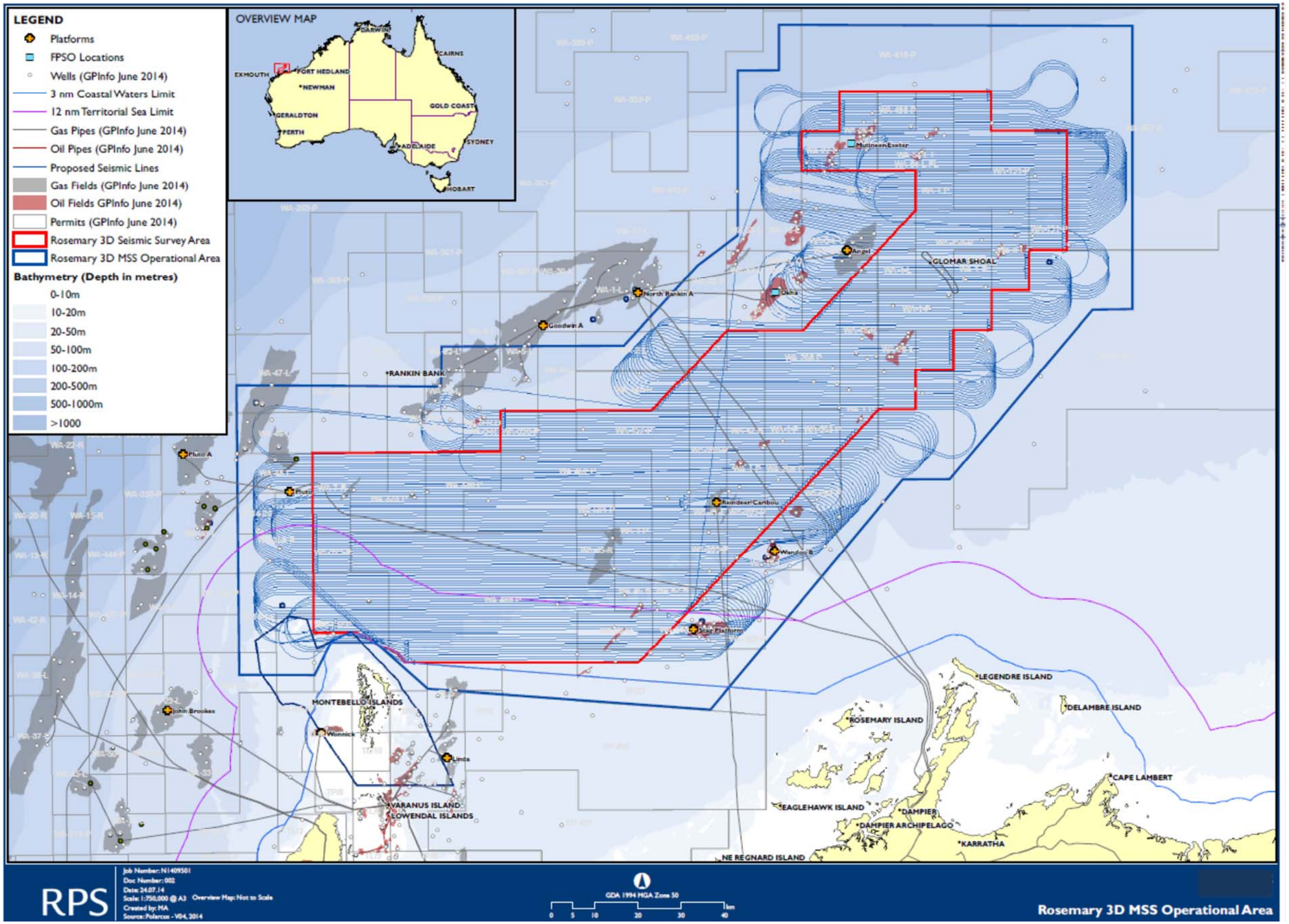

Figure 1-2: Rosemary 3D MSS Operational Area

2.0 EXISTING ENVIRONMENT

2.1 Regional Overview

The Integrated Marine and Coastal Regionalisation of Australia (IMCRA) was developed by the Australian government as a regional framework for planning and biodiversity protection. The Rosemary 3D MSS will take place in the North-west Marine Region (NWMR) of north-western Australia, largely in middle to outer continental shelf waters (approximately 50–200 m water depth). Provincial bioregions represent regional classifications at the largest scale and largely reflect biogeographic patterns in the distribution of bottom-dwelling fish. The majority of the Rosemary 3D MSS lies within the North West Shelf Province, with a small section extending into the North West Shelf Transition. Mesoscale bioregions in, or in the vicinity of, the survey area comprise the Pilbara (offshore) and Pilbara (nearshore) bioregions, which are characterised by a broad continental shelf with a number of limestone islands (typically covered with Holocene sand veneers), including Barrow Island and the Montebello Islands.

2.2 Climate and Meteorology

The region has a tropical climate with hot, humid summers and warm winters, in two distinct seasons. The region exhibits monsoonal climatic patterns characterised by a pronounced cyclone season between December and March, during the wet season. The median annual rainfall is 532 mm, of which over 75% of which falls during the January to March period.

Tropical cyclones typically occur between the months of November to May. Cyclones tend to develop offshore and move south, rarely crossing the coast until they reach the Pilbara. Since 1910, there have been 48 cyclones with wind gusts in excess of 90 km/h in the Karratha, Dampier and Roebourne region.

2.3 Oceanography

The water properties and circulation of the North West Shelf are affected by seasonal, inter-annual and decadal-scale variation in the eastern Indian Ocean and the Indonesian Throughflow (ITF). The major surface currents influencing the region include the ITF, the Leeuwin Current and the Holloway Current, the latter flows south-west across the North West Shelf in May and June. The annual weakening of the Leeuwin Current during summer is known to facilitate the movement of cold nutrient-rich slope waters from the Indian Ocean onto the shelf. The Ningaloo Current is also thought to intrude into the southern part of this bioregion during summer, flowing towards the north as far as Barrow Island.

The surface waters of the North West Shelf Province are tropical year-round, with summer sea surface temperatures around 26 °C, and winter temperatures around 22 °C.

Tides in the North West Shelf Province are large and increase in magnitude from south to north, from amplitudes of about 1 m near Exmouth to over 3 m near Broome. High evaporation rates in the shallower coastal waters result in the slow offshore movement of denser, more saline waters across the North West Shelf. Internal tides, although generated primarily around the shelf break, radiate onshore from the shelf break as far as the stratification of the water layer extends, which can cause mixing of more nutrient-rich water within the photic zone.

2.4 Bathymetry and Geomorphology

The North West Shelf Province bioregion varies in width from around 50 km at Exmouth Gulf to greater than 250 km off Cape Leveque and includes water depths of 0 to 200 m, with more than 45% of the bioregion having a depth of 50 to 100 m. Water depths in the Rosemary 3D MSS area range from approximately 25 to 200 m. The shelf also contains several terraces and steps that extend into adjacent bioregions and reflect ancient coastlines from when the sea level was lower than it is today. The most prominent of these occurs at a water depth of approximately 125 m, and is believed to be an important migratory pathway for cetaceans and other pelagic species such as the whale shark.

The geomorphology of the North West Shelf Province differs to the north and south, with smooth, shelly, sandy and wide shelf and slope habitats to the north, and a narrower shelf and slope with more hard substrates, numerous islands, and seamounts in the south. The shelf gradually slopes from the coast to the shelf break, and displays a number of sea floor features such as banks/shoals and holes/valleys. The Glomar Shoals, which lie in the north-east of the Rosemary 3D MSS area, in water depths of between 26–70 m, are distinguished by highly fractured molluscan debris, coralline rubble and coarse carbonate sand.

Sediments in the North West Shelf Province in the vicinity of the Rosemary 3D MSS area are relatively homogenous and dominated by sands, with a small proportion of gravels. Mud increases slightly within 100 km of the coast and within 100 km of the shelf break but is mostly absent from areas in between. Sediment distribution is strongly influenced by cyclonic storms, long-period swells and large internal tides, which resuspend sediments and move across the shelf.

2.5 Matters Protected by the EPBC Act

The EPBC Act Protected Matters Search report identified 17 threatened and 29 migratory species. Other matters protected by the EPBC Act include:

- Dampier Archipelago Marine Areas (Register of the National Estate)
- Montebello Islands (Register of the National Estate)
- Montebello Islands Marine Area (Register of the National Estate)
- Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves (National Heritage Property)
- Historic Shipwreck (the Trial)
- the Montebello Commonwealth Marine Reserve
- Key Ecological Features, including:
  - continental slope demersal fish communities
  - ancient coastline at 125 m depth contour
  - Glomar Shoals.

Biologically Important Areas (BIAs) were identified for a number of species, including turtles, whales, whale sharks and migratory birds.

- Pygmy blue and humpback whales, for migration.
- Marine turtles, for nesting, inter-nesting and foraging.
- Whale sharks, for foraging area (but not a high density prey or aggregation area).
- Migratory birds, for breeding and nursery areas.

2.6 Biological Environment

2.6.1 Benthic Communities

The sandy substrates on the shelf support benthic communities of bryozoans, molluscs and echinoids. Soft substrates along the Pilbara coast support extensive seagrass communities. Sponge and other filter-feeder communities also grow in areas of hard substrate across the shelf.

The Glomar Shoals are regionally important for their high biological diversity and high localised productivity, and have been identified as one of the key ecological features of the NWMR. The high energy environment in which they are located means that the shoals consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells. The shoals provide important habitat for commercial and recreational fish species.

Benthic habitats of the Montebello Islands include beach slopes, limestone platforms, reefs and shoals. The coral reefs of the Montebello Islands are intermediate between coastal and oceanic reefs and support a highly diverse marine vertebrate and invertebrate fauna, including at least 457 species of fish, 150 species of scleractinian corals, 633 species of molluscs, 170 species of echinoderms and 85 species of crustaceans.

2.6.2 Coral Spawning

Mass spawning of scleractinian corals occurs around the third quarter of the moon on neap, nocturnal ebb tides in March and April each year. There may be a secondary, smaller period of coral spawning around September - October. It is possible that the secondary spawning at Glomar Shoals and the Montebello Islands will overlap the survey timing; however, any impacts on spawning would be expected to be negligible. The survey will be well removed from the reefs around the Montebello Islands and Dampier Archipelago during spawning times.

2.7 Protected Species

2.7.1 Marine Reptiles

There are five threatened marine turtles and one sea snake listed under the EPBC Act:

- Loggerhead turtle (*Caretta caretta*) (Endangered)
- Green turtle (*Chelonia mydas*) (Vulnerable)
- Leatherback turtle (*Dermochelys coriacea*) (Endangered)
- Hawksbill turtle (*Eretmochelys imbricata*) (Vulnerable)
- Flatback turtle (*Natator depressus*) (Vulnerable)
- Short-nosed sea snake (*Aipysurus apraefrontalis*) (Critically Endangered).

The short-nosed seasnake (*Aipysurus apraefrontalis*) has been recorded from Ashmore and Hibernia Reefs, with some records of the species occurring in Exmouth Gulf. The species typically occurs in shallow water (<10 m) in the protected parts of the reef flat and as such is unlikely to be encountered by the survey vessel.

All five turtle species may occur in the operational area during the survey. The key areas of concern for turtles are disturbance to nesting, artificial light impacts on hatchlings (near nesting beaches), vessel collision and underwater noise. The times when turtles are thought to nest in the region are presented in Table 2-1. The closest turtle nesting areas are around the Lowendal and Montebello Islands, Barrow Island and the Dampier Archipelago. During the breeding season, inter-nesting females travel varying distances from the nesting beaches between laying successive clutches of eggs in the same season. The inter-nesting areas have been identified as Biologically Important Areas (BIAs) for the nesting turtles.

The survey timing was amended to avoid potential impacts on nesting turtles, so that seismic acquisition in the southern part of the survey area will now occur after mid-March 2015. This means that the inter-nesting BIAs for all marine turtles, apart from flatbacks, will be avoided altogether during their peak nesting periods (October - February). The Rosemary 3D MSS will be at least 40 km away from any flatback nesting beaches during their nesting period. However, the flatback turtle inter-nesting area defined by DotE

nominally extends 80 km from the nesting beaches at the northern end of the Montebello Islands and around the Dampier Archipelago. The BIA covers the maximum extent of inter-nesting movements of turtles from nesting beaches, based on satellite tracking studies. This inter-nesting area covers a substantial part of the survey area and cannot be completely avoided without significantly compromising the survey objectives.

The BIA being based on the maximum range of the inter-nesting females is intrinsically highly conservative; many of the individual turtles remain near their nesting beaches and as they leave the beaches they spread out and their density consequently decreases rapidly with increasing distance from the beach. Turtle hatchlings leaving the beaches similarly spread out once they reach the open ocean and the risk of the seismic vessel encountering a significant number of hatchlings in any part of the survey area is very low. This means that very few individual turtles would be affected in the BIA between 40 km and 80 km from the beaches. Affected turtles would normally undertake avoidance measures before entering sound ranges that could cause physical injury.

Table 2-1: Nesting Times and BIAs for Marine Turtles

Species	Nesting			Inter-nesting Buffer (BIA)
	Start	Peak	End	
Loggerhead	Nov	late Dec–early Jan	Mar	20 km
Green	Nov	Jan–Feb	Apr	20 km
Hawksbill	year round	Oct–Jan	year round	20 km
Flatback	late Nov–Dec	Jan	Feb-Mar	80 km

The loggerhead turtle (*Caretta caretta*) is distributed throughout tropical, subtropical and temperate waters globally. In Western Australia, loggerhead turtles breed principally from Dirk Hartog Island in Shark Bay, along the Gnaraloo and Ningaloo coast to North West Cape and the Muiron Islands region in the north, although there have been occasional nesting records from the southern Montebello islands, and from Varanus and Rosemary Islands in the Pilbara. Shark Bay is known to contain critical feeding habitat for loggerhead turtles. Turtles dispersing from the North West Cape - Muiron Islands nesting area have ranged north as far as the Java Sea and the north-western Gulf of Carpentaria, and to south-west Western Australia. The BIA for loggerhead turtles overlaps a small part of the Rosemary 3D MSS operational area near the Montebello Islands.

The green turtle (*Chelonia mydas*) is a widely distributed turtle species that nests, forages and migrates throughout northern Australia. Nesting occurs on sandy beaches throughout northern Australia, with Western Australia supporting one of the largest green turtle regional populations in the world, estimated at tens of thousands of individuals. Principal near-coastal rookeries include the Lacepede Islands, some islands of the Dampier Archipelago, Barrow Island, the Montebello Islands, North West Cape and the Muiron Islands. Inter-nesting green turtles are thought to stay within 5-10 km of their nesting beach between laying clutches of eggs. After the nesting season, green turtles may forage widely up to 2,600 km. Green turtles feed primarily on seagrasses and algae, and are likely

to be found foraging in any seagrass habitat and much of the coral reef habitat that occurs along the Western Australian coast from at least Shark Bay to the northern extent of the NWMR.

The leatherback turtle (*Dermochelys coriacea*) is the largest of all turtle species, reaching up to 1.6 m carapace length. Leatherbacks can live in colder waters than the other species due to physiological adaptations and are regularly observed in temperate as well as tropical waters around Australia. Nesting has rarely been observed in Australia (only within the Northern Territory and Queensland), with no mating or major documented nesting sites known. Given the absence of important areas for feeding and nesting, it is unlikely that leatherback turtles will be present in any significant numbers within the vicinity of the survey area.

The hawksbill turtle (*Eretmochelys imbricata*) has a widespread tropical distribution and in Australia uses a number of significant nesting beaches. Key nesting and inter-nesting areas are the Dampier Archipelago, Barrow Island Nature Reserves, Lowendal and Thevenard Islands and the North West Cape north of Exmouth. They nest primarily during October - January, although nesting may occur year round at some locations. Rosemary Island in the Dampier Archipelago supports globally significant hawksbill turtle rookeries.

The flatback turtle (*Natator depressus*) is only found in tropical waters of northern Australia, Papua New Guinea and West Papua (Indonesia), with nesting confined to Australia. Flatback turtles eat jellyfish and soft-bodied benthic invertebrates such as sea pens, sea cucumbers, crustaceans, molluscs and soft corals. The North West Shelf stock nests from approximately Exmouth Gulf to the Lacepede Islands and has significant rookeries on Thevenard Island, Barrow Island, the Montebello Islands, Varanus Island, the Lowendal Islands, islands of the Dampier Archipelago, coastal areas around Port Hedland, along much of Eighty Mile Beach, and inshore islands of the Kimberley region where suitable beaches occur. The flatback rookery on Barrow Island is considered one of the largest in Western Australia.

2.7.2 Marine Mammals

Two species of marine mammals, the blue whale (*Balaenoptera musculus*) and the humpback whale (*Megaptera novaeangliae*), are listed as threatened under the EPBC Act, and eight, including these two, are listed as Migratory (Table 2-2). The key threats identified include underwater noise, entanglement and vessel strike.

Table 2-2: EPBC Act Listed Marine Mammals Occurring in the Vicinity of the Rosemary 3D MSS Area

Scientific Name	Common Name	EPBC Act Status
Balaenoptera bonaerensis	Antarctic minke whale	Migratory
Balaenoptera edeni	Bryde's whale	Migratory

Scientific Name	Common Name	EPBC Act Status
Balaenoptera musculus	Blue whale	Endangered, Migratory
Dugong dugon	Dugong	Migratory
Megaptera novaeangliae	Humpback whale	Vulnerable, Migratory
Orcinus orca	Killer whale	Migratory
Physeter macrocephalus	Sperm whale	Migratory
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	Migratory

2.7.2.1 Blue Whale

The blue whale has two distinct subspecies in the Southern Hemisphere; the pygmy blue whale (*B. musculus brevicauda*) and the southern blue whale (*B. musculus intermedia*). The survey overlaps the pygmy blue whale's BIA for northward and southward migrations in the period between May and December. There is no critical habitat in the survey area (i.e. feeding aggregation areas).

During the northern migration, pygmy blue whales pass Exmouth (April to August) on the way to calving areas in the Banda and Molucca seas. On their southern migration (October to late December) they follow the shelf edge at depths of 500 to 1,000 m, moving faster on the southern migration and coming in closer to the coast in the Exmouth to Montebello Islands area.

2.7.2.2 Humpback Whale

Humpback whales (*Megaptera novaeangliae*) have a cosmopolitan distribution in temperate waters, with whales off Western Australia undertaking an annual migration between feeding grounds in the Southern Ocean and calving and breeding areas off of northern Western Australia. Breeding/calving takes place between mid-August and early September between Broome and the northern end of Camden Sound. The northern migration commences in April, peaks in July and tapers off by August. In the southern migration, humpback whales migrate south to Antarctic feeding grounds from late August to October (cow and calf migration can occur for up to four weeks before and after these migration periods). The southward migrating humpback whales pass through the area north of the Montebello Islands mainly during August – September, but the timing varies between years.

The *Humpback Whale Recovery Plan 2005–2010* identifies important (and potentially critical) habitat as "those areas known to seasonally support significant aggregations of whales, and those ecosystem processes on which humpback whales rely – in particular known calving, resting and feeding areas, and certain sections of the migratory pathways". There are no known calving, resting and feeding areas in the vicinity of the Rosemary 3D MSS; however, it is possible that mothers and calves may rest in the lee of islands of the Dampier Archipelago and the Montebello Islands.

The revised timing of the survey avoids potential disturbance to any humpback mothers and calves resting in the shallow waters to the north of the Montebello Islands.

2.7.3 Seabirds and Shorebirds

A number of important seabird breeding sites are located in areas adjacent to the North-west Marine Region, of which the closest are the Montebello Islands. Twenty-six species of seabirds and waders, including migratory waders, are known in the Montebello Islands Marine Area. The Montebello Islands also provide breeding habitat for 12 species of seabirds. One threatened, and nine migratory, EPBC Act listed seabirds and shorebirds may occur within the vicinity of the Rosemary 3D MSS area (Table 2-3).

Table 2-3: EPBC Act Threatened and Migratory Seabirds and Shorebirds Occurring in the Vicinity of the Rosemary 3D MSS Area

Scientific Name	Common Name	EPBC Act Status
Macronectes giganteus	Southern giant petrel	Endangered, Migratory
Puffinus pacificus	Wedge-tailed shearwater	Migratory
Sterna anaethetus	Bridled tern	Migratory
Sterna bengalensis	Lesser crested tern	Migratory
Sterna caspia	Caspian tern	Migratory
Sterna dougallii	Roseate tern	Migratory
Haliaetus leucogaster	White-belled sea eagle	Migratory, Terrestrial
Hirundo rustica	Barn swallow	Migratory, Terrestrial
Charadrius veredus	Oriental plover	Migratory, Wetlands
Glareola maldivarum	Oriental pratincole	Migratory, Wetlands

The only threatened seabird with potential to occur in the operational area is the southern giant petrel, which is widespread throughout the Southern Ocean and breeds on subantarctic and Antarctic islands. Due to the absence of nesting habitat and critical foraging habitat within the survey area; however, they would be rarely encountered.

The nine migratory seabird species likely to occur are highly mobile and are expected to forage widely over the waters surrounding the emergent roosting sites and nesting sites. Breeding is expected at a number of locations throughout the Montebello/Lowendal Islands and on the Dampier Archipelago.

2.7.4 Sharks and Rays

Six EPBC Act protected species of shark and rays may occur in the vicinity of the Rosemary 3D MSS (Table 2-4). Of these, three are listed as Vulnerable and five as Migratory.

Table 2-4: EPBC Act Listed Sharks and Rays Potentially Occurring

Scientific Name	Common Name	EPBC Act Status
Carcharodon carcharias	Great white shark	Vulnerable, Migratory
Pristis clavata	Dwarf sawfish	Vulnerable
Rhincodon typus	Whale shark	Vulnerable, Migratory
Isurus oxyrinchus	Shortfin mako	Migratory
Isurus paucus	Longfin mako	Migratory
Manta birostris	Giant manta ray	Migratory

The great white shark (*Carcharodon carcharias*) is widely, but sparsely, found in all seas including cold temperate waters in both hemispheres. It is most frequently observed and captured in coastal temperate and subtropical regions, but has also been observed in tropical areas. Great white sharks are widely, but not evenly, distributed in Australian waters; observations are more frequent in and around some fur seal and sea lion colonies. Although unlikely, it is possible that great white sharks may be encountered in the shallower parts of the research area.

The dwarf sawfish's (*Pristis clavata*) distribution in Australian waters is considered to extend from the Pilbara coast in across northern Australia and into the Gulf of Carpentaria. Dwarf sawfish usually inhabit shallow (2 to 3 m) coastal waters and estuarine habitats. A study in north-western Western Australia found that estuarine habitats are used as nursery areas, with juveniles remaining in these areas up until three years of age. Adults are thought to occupy a range within the coastal fringe of only a few square kilometres and show site fidelity. It is therefore unlikely that this species will be encountered during the survey.

The whale shark (*Rhincodon typus*) is broadly distributed in tropical and temperate seas worldwide, feeding on phytoplankton, plankton, krill and small squid or vertebrates. Whale sharks aggregate annually off the Western Australian coast at Ningaloo Reef between March and July, which is identified as critical habitat. This seasonal aggregation is believed to be linked to processes associated with peaks of coral spawning that occur around March–April each year. Following this period, observers have recorded whales migrating north-west to the Indian Ocean, or directly north to Sumatra and Java, or north-east, travelling along the 200 m contour. It is considered credible that whale sharks may be occasionally encountered outside the seasonal aggregation at Ningaloo Reef.

The shortfin mako (*Isurus oxyrinchus*) is an oceanic species and is known to occur in both tropical and temperate waters. It is normally oceanic and cosmopolitan in its distribution and is widespread in Australian waters, occurring from the surface to water depths of at least 500 m. It is occasionally found close inshore where the continental shelf is narrow. It is not normally found in waters below 16 °C.

The longfin mako (*Isurus paucus*) is a widely distributed, but rarely encountered, oceanic tropical shark. This species is a deep-dwelling shark and appears to be cosmopolitan in tropical and warm temperate waters; however its distribution remains unclear within Australia and it is often confused with the more common shortfin mako. Whilst both species may transit the Rosemary 3D MSS area and surrounding waters, the area is unlikely to represent critical habitat (key feeding, breeding, pupping areas) for this species.

The giant manta ray (*Manta birostris*) is usually found offshore, often around oceanic islands, sometimes coastally, and most common in tropical waters. This species is known to aggregate around Ningaloo Reef during autumn and winter. Whilst this species may transit through the Rosemary 3D MSS area and surrounding waters, en-route to the aggregation area at the Ningaloo Reef, it is unlikely to be encountered in large numbers within the survey area.

2.8 Socio-economic Environment

2.8.1 Native Title

An email response from the National Native Title Tribunal stated that there are no relevant Native Title claims in the offshore survey area.

2.8.2 Historic Shipwrecks

The *Tryal* was wrecked in 1622 in approximately 8 m of water at Tryal Rocks, approximately 5 km west of the survey area and approximately 20 km to the north-west of the northern Montebello Islands. The Rosemary 3D MSS will only be operating in waters greater than 20 m deep, so no interactions are expected.

2.8.3 Commercial Fishing

A number of Commonwealth and Western Australian fisheries overlap the area of the Rosemary 3D MSS.

2.8.3.1 Commonwealth Fisheries

The Western Tuna and Billfish Fishery targets four main pelagic species (broadbill swordfish, bigeye tuna, yellowfin tuna, albacore tuna), which are all highly migratory. The number of vessels operating in the fishery has declined in recent years, with less than five vessels operating in the fishery since 2007. Effort data shows fishing effort is concentrated offshore of the 200 m isobath. As such, vessels within this fishery are very unlikely to be encountered.

The North-west Slope Trawl Fishery extends from about 114°E to 125°E off the Western Australian coast offshore of the 200 m isobath. The number of boats in the fishery has been declining, with only two active vessels in operation. The fishery primarily targets scampi, which are found on soft, muddy substrates at depths of between 250 and 500 m, and vessels within this fishery are very unlikely to be encountered.

The Western Skipjack Fishery targets only skipjack tuna. While the area of the proposed activity lies within the boundary of the fishery, effort within this fishery is mainly confined to the southern coast of Australia. In recent years, there has been very minimal activity, with only two vessels operating in 2009 and no vessels operating in 2010, 2011 and 2012. As such, vessels active in this fishery are unlikely to be encountered.

The Southern Bluefin Tuna Fishery targets southern bluefin tuna in the Great Australian Bight. Southern bluefin tuna spawn in the North West Shelf region of Western Australia between September and March. Seismic activity is unlikely to significantly affect breeding fish or larval survival. Migrating adult tuna may transit through the region. Vessels participating in this fishery are unlikely to be encountered.

2.8.3.2 Western Australian Fisheries

The Pilbara Demersal Scalefish Fisheries include the Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF), the Pilbara Trap Managed Fishery (PTMF) and the Pilbara Line Fishery (PLF). The Rosemary 3D MSS overlaps active parts of Areas 1and 2 of Zone 2 of the PFTIMF, and part of the PTMF and PLF.

During 2011 there were three vessels the PFTIMF, three in the PTMF, and seven in the PLF. The effort is concentrated on the trawl segment of the fishery; in 2012 in the effort was 707 days, 441 days and 328 days for the PFTIMF, PTMF and PLF, respectively. It is considered Possible to Likely that vessels operating in this fishery may be encountered during the Rosemary MSS.

Concerns were raised by number of fishers in the Pilbara Demersal Scalefish Fisheries during stakeholder consultation about the potential for seismic noise to impact individual fish and spawning aggregations. The potential for displacement from fishing grounds and damage to fishing gear was also noted. Their concerns are described in Section 7.0, along with an assessment of the risk.

The Onslow Managed Prawn Fishery (Area 3) partially overlaps the area of the Rosemary 3D MSS. There are 12 licences held by this fishery, however there were no operational vessels in the 2012 season. Vessels active in these fisheries are concentrated in inshore areas and will not be present in the vicinity of the Rosemary 3D MSS.

The Mackerel Managed Fishery targets Spanish mackerel, with smaller landings of other species such as grey mackerel and extends from Cape Leeuwin to the Western Australian–Northern Territory border, with most of the catch landed in the Pilbara and

Kimberley regions. The Rosemary 3D MSS overlaps Area 2 of the fishery. There are currently 49 licences in the fishery, of which 15 licences area in Area 2. Fourteen vessels reported as being active in the fishery during 2012–2013. Given the small number of vessels and the large area over which the fishery extends, encounters between fishing vessels and the survey vessel are considered possible.

The main area of the Beche-de-mer Fishery extends north from Exmouth Gulf to the Northern Territory border with catches also taken from the Shark Bay area and the south coast of Western Australia. The harvesting of beche-de-mer is only allowed by diving or direct collection by hand and is prohibited within any marine park, aquatic reserve or sanctuary area. Only one of the six licensed vessels operated in the 2012 season. Due to the low effort in the fishery and the depths of water, it is considered unlikely that vessels would be encountered.

The Marine Aquarium Fish Managed Fishery has 12 licences operating in Western Australia's state waters spanning the coastline from the Northern Territory border in the north to the South Australian border in the south. During the past two years, the fishery has been active in waters from Esperance to Broome with popular areas being around the southern capes, Perth, Geraldton, Exmouth and Dampier. It is primarily a dive-based fishery, which uses hand-held nets or hand-held tools to capture target species. Due to the low effort in the fishery and the depths of water, it is considered unlikely that fishing vessels would be encountered in this area.

The Pearl Oyster Managed Fishery is a quota based dive fishery operating in shallow coastal waters of the North West Shelf targeting Indo-Pacific silver-lipped pearl oysters. The area of the Rosemary 3D MSS overlaps with Zone 1 of the fishery which includes the North West Cape (including Exmouth Gulf) to longitude 119°30"E. There are five licenses in this zone, however it has not been fished since 2008. Due to the low effort in the fishery and the depths of water, it is considered unlikely that fishing vessels would be encountered in this area.

Concerns were raised by the Pearl Producer's Association during stakeholder consultation about the potential for seismic noise to impact pearl shell quality and recruitment to the fishable stock. Their concerns are described in Section 7.0, along with an assessment of the risk.

The Specimen Shell Managed Fishery operates throughout Western Australian waters between the high water mark and the 200 m isobath. Of the 33 licences, only six are active. The fishery is primarily a dive fishery, although one licensee has an exemption to allow the use of an ROV to 300 m. Due to the low effort in the fishery and the depths of water, it is considered unlikely that fishing vessels would be encountered in this area.

There are a number of pearl and aquaculture leases in coastal areas of Montebello and Lowendal Islands. Only those around the Lowendal Islands are active. No interactions are anticipated.

2.8.4 Fish Spawning

The WA Department of Fisheries advised that the following species have spawning aggregation times within the region which may overlap the planned survey:

- Spanish mackerel (Oct – Jan)
- Goldband snapper (Jan – Apr)
- Rankin cod (Aug – Oct)
- Red emperor (Oct – Mar)
- Blacktip shark (Nov – Dec)
- Sandbar shark (Oct – Jan)

Spawning aggregation areas are unknown, however, the risk to eggs, spawn and pelagic fish larvae from underwater noise pulses is considered low due to the short range (few metres) of physiological effects predicted and the very low proportion of the total reproductive output that could be affected in any area by a moving source.

2.8.5 Recreational Fishing

The survey is very unlikely to encounter recreational fishers in the majority of the survey area (i.e. offshore areas). Encounters may occur around the northern Montebello Islands, but are expected to be minimal, if at all. Fishers will be advised of the vessel's movements.

2.8.6 Shipping

There is significant vessel traffic in the NWMR associated with commercial and recreational fishing, tourism, international shipping, and oil and gas operations. There are several major ports adjacent to the region including the ports of Broome, Port Hedland and Dampier, and new ports are under development.

Consultation with AMSA indicated that the Rosemary 3D MSS would encounter shipping traffic, both commercial and locally based vessels, throughout the duration of the survey, particularly related to: two international shipping fairways; traffic associated with the Gorgon Wheatstone expansion and North Rankin complex; vessels travelling along the Montebello-Tryal Rocks recommended track; and local traffic. All vessels will be advised of the seismic survey vessel's movements.

2.8.7 Tourism

Nature-based tourism around the Montebello Island and Barrow Island Marine Reserves is limited to a small seasonal charter vessel industry between April and November. The majority of these visits centre on the Montebello Islands, with activities including SCUBA diving, snorkelling, fishing, mud crabbing, wildlife appreciation, island exploring and a limited amount of surfing. Encounters between the survey vessel and nature based tourism activities are considered unlikely as the majority of tourism activities are carried out within the reserves boundaries which will be largely sheltered from sound waves by the outer islands.

Recreational boating in the area of the proposed survey may consist of cruising yachts sailing along the coast and between the mainland and islands. Cruising yachts typically occur seasonally in the region, though these vessels are expected to be present in very low numbers.

2.8.8 Petroleum Activities

The Rosemary 3D MSS will acquire seismic data in a number of titles within the survey area and will undertake associated activities (i.e. soft starts, run-outs and turns) within the operational area. The survey area covers a number of oil and gas fields operated by the North West Shelf JV (NWS), Apache North-west Pty Ltd (Apache), Santos Ltd, Chevron Australia and Vermilion Oil & Gas Australia (Vermilion). Consultation has been undertaken with the titleholders and Access Authorities granted where appropriate.

2.8.9 Defence

The Rosemary 3D MSS survey and operational areas are outside of the nearest Department of Defence activity area; the North-west Australia Exercise Area.

2.9 Particular Values and Sensitivities

2.9.1 Montebello Commonwealth Marine Reserve

The south-eastern part of the Rosemary 3D MSS overlaps the Montebello Commonwealth Marine Reserve (CMR). The entire CMR is zoned as Multiple Use. It provides representation and protection of continental shelf environments and habitats. It is a resting area for migrating humpback whales and supports resident populations of common bottlenose dolphins and Indo-Pacific humpback dolphins. The Montebello Islands, in the adjacent state waters, have been identified as critical nesting and inter-nesting habitat for green, flatback and hawksbill turtles, and for a number of birds. The Montebello CMR contains the wreck of the *Tryal*, which is the earliest known shipwreck in Australian waters.

2.9.2 Dampier Commonwealth Marine Reserve

The Dampier CMR covers an area of 1,252 km² with depths ranging from approximately 15 to 70 m. There are two types of zoning; Marine National Park Zone (IUCN II) covering 150 km², and Special Purpose Zone (Ports) (IUCN VI) covering 1,102 km². The nearest point of the reserve is approximately 50 km to the south-east of the Rosemary 3D MSS.

2.9.3 Montebello Islands Marine Park (Western Australia)

The coral reefs of the Montebello Islands are intermediate between coastal and oceanic reefs and represent an important ecological link between the southern fringing reefs off North West Cape and Barrow Island and the true oceanic reefs associated with Rowley Shoals. The reserve provides a diverse range of marine habitats and supports a diverse marine vertebrate and invertebrate fauna. It provides habitat for green and hawksbill turtles, which are known to breed on the islands, dugongs, white-bellied sea eagles and the fairy terns. It also an important breeding area for crested terns, Caspian terns, roseate terns, ospreys and white-bellied sea eagles.

An area on the western side of Trimouille Island has been identified as a potential resting area for female humpback whales and their young calves during their southerly migration; however the importance of this area is uncertain. Turtle nesting occurs on the eastern side of Trimouille Island and on the northern side of North West Island, and breeding turtles appear to aggregate on the southern side of North West Island and on the eastern side of Trimouille Island. Only low nesting densities have been recorded; however, densities are expected to vary significantly between years.

The Rosemary 3D MSS operational area overlaps part of the General Use Zone. No activities will occur within the Sanctuary Zone or the Special Purpose Zone.

2.9.4 Barrow Island Marine Park and Marine Management Area (Western Australia)

The marine park is important in providing habitat for species of conservation significance including the green turtle, flatback turtle, hawksbill turtle, dugong, lesser noddy, white-bellied sea eagle and fairy tern. Barrow Island is significant on a national and international scale for marine turtles, with large and significant green turtle and flatback turtle rookeries. The flatback rookery is considered one of the largest in Western Australia and the green turtle rookery is considered the second largest. Barrow Island is approximately 30 km south of the Rosemary 3D MSS.

2.9.5 Montebello/Barrow Islands Marine Conservation Reserves

The ecological and social values of the Montebello–Barrow islands area identified in the *Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007–2017* are listed in Table 2-5.

Table 2-5: Ecological and Social Values of the Montebello/Barrow Islands Area

Ecological Values	Social Values
Geomorphology	Hydrocarbon exploration and production industry
Sediment quality	
Water quality	Pearling
Coral reef communities	Nature-based tourism
Mangrove communities	Commercial fishing
Macroalgal and seagrass communities	Recreational fishing
Rocky shore/intertidal reef platform communities	Water sports
Intertidal sand/mudflat communities	European history/maritime heritage
Sub-tidal soft-bottom communities	Scientific research
Marine mammals	
Turtles	
Seabirds	
Finfish	
Invertebrates	

2.9.6 Proposed Dampier Archipelago Marine Park and Regnard Marine Management Area (Western Australia)

The proposed Dampier Archipelago Marine Park and Regnard Marine Management Area extends from the boundary of the Dampier Port to include Delambre Island and waters adjacent to it at the eastern most limit of the proposed reserve. The proposed boundary then extends along the coastline of Nickol Bay to Dixon Island. The deeper waters of Nickol Bay are excluded.

The proposed reserves lie in the Pilbara Nearshore Marine Bioregion, comprising nearshore waters to 10 m deep. The bioregion is characterised by intertidal mud and sand flats associated with fringing mangals in bays and lagoons, a large tidal range, highly turbid water and the occurrence of fringing coral reefs around some of the islands. The marine biota of the region consists primarily of tropical species as well as many endemic species, with a particularly high diversity of in-fauna associated with the soft sediment habitats and a unique faunal assemblage associated with the coral reef habitats. In addition, a significant number of beaches are important turtle nesting sites and some of the islands support large seabird colonies. The area is considered to be in a relatively pristine condition; however, there are localised areas of species and habitat depletion.

2.9.7 Key Ecological Features

2.9.7.1 Ancient Coastline at 125 m Depth Contour

This key ecological feature is recognised for its biodiversity values (unique sea floor feature with ecological properties of regional significance). The shelf contains several terraces and steps that reflect increases in sea level across the shelf that occurred during the Holocene. This ancient submerged coastline provides areas of hard substrate and therefore may provide sites for higher diversity and enhanced species richness relative to surrounding areas of predominantly soft sediment. Marine fauna associated with the hard substrate of the escarpment is likely to include sponges, corals, crinoids, molluscs, echinoderms and other benthic invertebrates representative of hard substrate fauna in the bioregion. Enhanced productivity in this area may attract opportunistic feeding by larger marine life including humpback whales, whale sharks and large pelagic fish.

2.9.7.2 Glomar Shoals

This key ecological feature is recognised because of its ecological functioning, high biological diversity, high productivity and corresponding aggregations of marine fauna. The Glomar Shoals consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells. The Glomar Shoals appear to be a particularly important site for fish species within the bioregion, probably because of increased biological productivity associated with localised upwelling at this location. Although little studied, it is known to be an important area for a number of commercial and recreational fish species such as rankin cod, brown-striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish. These species are frequently caught at the Glomar Shoals, indicating that the shoals are likely to be an area of high secondary productivity.

2.9.7.3 Continental Slope Demersal Fish Communities

The diversity of demersal fish assemblages on the continental slope in the Timor Province, the North-west Transition and the North West Shelf Province is high compared to elsewhere along the Australian continental slope. The continental slope between North West Cape and the Montebello Trough has more than 500 fish species, 76 of which are endemic. The demersal fish species occupy two distinct demersal community types associated with the upper slope (water depth of 225 to 500 m) and the mid-slope (750 to 1,000 m).

3.0 DESCRIPTION OF THE ACTIVITY

The Rosemary 3D MSS is a typical 3D survey, similar to most others conducted in Australian marine waters (in terms of technical methods and procedures). No unique or unusual equipment or operations are proposed. The survey will be conducted using a purpose-built seismic survey vessel, with the assistance of a support vessel and a chase vessel. None of the vessels will anchor during the activities.

3.1 Survey Vessel

One of Polarcus' "A-class vessels" will be used for the Rosemary 3D MSS. These vessels are all built and operated to the same high specifications and are inter-changeable in terms of their low environmental risk profile. They are amongst the most environmentally sound seismic vessels in the market with diesel-electric propulsion, high-specification catalytic convertors, double-hull and advanced ballast water treatment and bilge water cleaning systems. For the purposes of this Summary EP, descriptions of the vessel *Polarcus Adira* will be used. Confirmation of the vessel to be used for the Rosemary 3D MSS will be notified to NOPSEMA and relevant stakeholders prior to the survey commencing, and relevant vessel specific documents supplied.

The summary vessel specifications for the *Polarcus Adira* are provided in Table 3-1. The vessel carries a maximum number of people on board (POB) of 60.

Table 3-1: *Polarcus Adira* Summary Specifications

Length	92.0 m
Beam	21.0 m
Maximum Draft	7.5 m
Gross Tonnage	7,894 tonnes
Built	2012 (Ulstein)
Classification Type	DNV 1A1, SF, E0, DYNPOS-AUTR CLEAN DESIGN, COMF-V (3), ICE-1A WINTERISED BASIC, NAUT-AW HELDK, BWM-T, SPS
Fuel Type	Marine Gas Oil (MGO)
Total Fuel Capacity (Maximum)	1,925 m^3
Largest Fuel Tank	280 m^3
Cruising Speed	12.0 knots

As a result of the length of the survey (approximately 180 days), helicopters transfers of crew and vessel refuelling at sea will occur at approximately 35 day intervals. At-sea refuelling of the survey vessel will only take place during daylight hours, and will not take place within 50 km from any emergent land, shallow water features or protected area. Refuelling will only be carried out within strict weather limit guidelines.

The *Polarcus Adira* uses a Marine Gas Oil (MGO) fuel with ultra-low sulphur content (< 0.1%) and does not use heavy fuel oil. MGO is produced through distillation and as such, it contains a higher proportion of lighter hydrocarbons than other marine fuel types such as intermediate fuel oil or heavy fuel oil.

3.1.1 Support and Chase Vessels

Polarcus will engage both a support vessel and a chase vessel for the duration of the survey. At least one of these vessels will accompany the survey vessel at all times, to maintain a safe distance between the survey array and other vessels, and to manage potential interactions with shipping and fishing activities. A supply vessel will also re-supply the survey vessel with fuel and other logistics.

3.1.2 Seismic Array

The seismic array will comprise 12 streamers, with a maximum length of 8,100 m. The streamers are towed side by side with approximately 100 m spacing between each streamer. The streamers are solid core, with no fluids. The streamers are fitted with self-inflating buoys, which will return them to the surface if they pass a certain water depth. The streamer's tail buoys are fitted with turtle guards as shown in Figure 3-1 which will prevent entanglement of turtles and other large marine fauna.

Figure 3-1: Turtle Guards Fitted to Tail Buoys

The seismic energy source tow depth will be at 7 m (+/- 0.5 m) and the cable tow depth will be at no deeper than 14 m (+/- 1.0 m). The operating pressure for the seismic energy source will be approximately 2,000 psi and will consist of source-arrays, each with a maximum volume of approximately 3,480 in^3. These sub-arrays will be fired alternately, with a shot-point interval of 12.5 m (oblique flip-flop) horizontal distance. A summary of the seismic survey parameters are provided in Table 3-2 below. Various sources were modelled during the design of the survey (2,380 in^3; 2,900 in^3; 3,480 in^3; 4,240 in^3). It was found that the minimum source size that would achieve the required output to meet the geophysical objectives of the survey would be 3,480 in^3.

Table 3-2: Rosemary 3D MSS Acquisition Parameters

No. of Streamers	12
Streamer Length	8,100 m
Streamer Spacing	100 m
Streamer Depth	14 m (+/- 1.0 m)
Acquisition Speed	4.5 knots
Streamer Fluid	None. Sercel Sentinel® solid streamer
Size of Seismic Energy Source Array	3,480 in^3 (cubic inches)
Nominal Source Pressure	2,000 psi
Seismic Energy Source Interval	25 m
Seismic Energy Source Depth	7 m (+/- 0.5 m)
Peak Sound Pressure Level (SPL)	~ 266 dB re 1µPa (at 1 m)
Frequency Range	1 – 800 Hz

3.2 Time Frame

The proposed survey is scheduled to occur between October 2014 and March 2015, with a total duration of approximately 180 days. Survey timing is dependent on vessel availability, weather conditions and receiving the necessary statutory approvals. The phased survey schedule is shown in Figure 3-2.

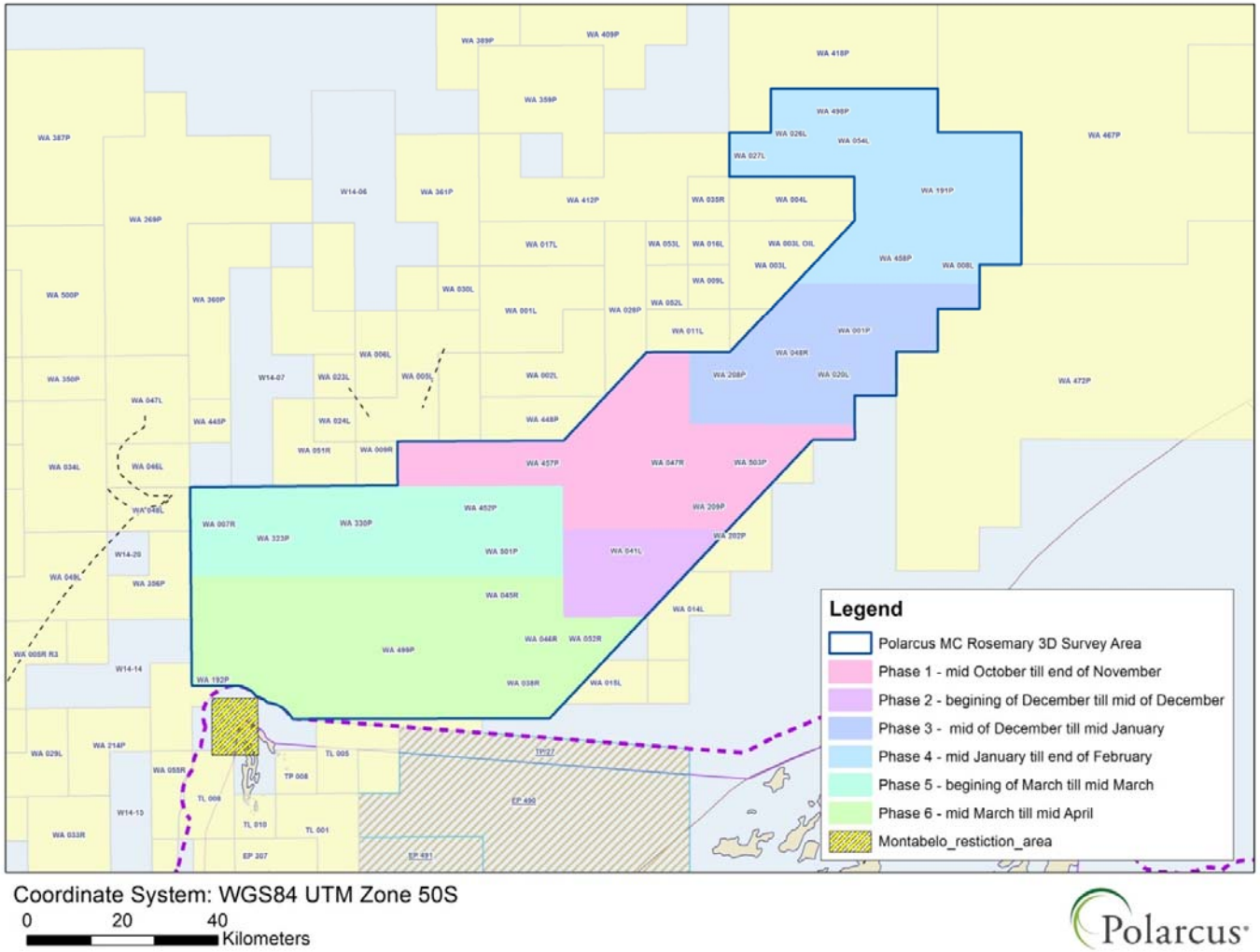

Figure 3-2: Phased Survey Schedule

4.0 ENVIRONMENTAL IMPACTS AND RISKS

4.1 Methodology

Potential environmental hazards associated with all activities were identified, including those associated with routine (planned) or accidental events (unplanned). Environmental hazard identification was undertaken via brainstorming and peer reviews utilising industry experts that cover different "areas" of the survey operation. Reviewers have included vessel representatives, experienced survey proponents, Polarcus representatives and environmental specialists. The environmental risks associated with the survey have been assessed using the following steps:

- define the activity and associated environmental aspects
- identify the environmental values at risk within and adjacent to the survey area
- determine the inherent risk of each identified environmental hazard associated with the proposed survey, using the worst-case environmental impact of the hazard
- with controls implemented, establish if the risk is as low as reasonably practicable (ALARP) and acceptable.
- review the activity and consider additional control measures until the residual risk is ALARP and acceptable.

The risks for each potential impact have been assessed using a qualitative assessment in accordance with the International Organisation for Standardisation (ISO) *31000:2009 – Risk management – Principles and guidelines*, and Standards Australia *Handbook 203:2012 – Managing environment-related risk*.

Within this context a listing of relevant environmental aspects, hazards and possible impacts have been identified which could affect the environment from the survey program. For each hazard, the environmental consequence and the likelihood of occurrence have been assessed.

This Environmental Risk Assessment (ERA) identifies, assesses and prioritises the risks associated with each environmental hazard. The severity of a potential impact is assessed according to the "Definition of Consequence" table (Table 4-1). A likelihood rating is allocated to the environmental hazard according to the categories given in the "Definition of Likelihood" table (Table 4-2). The ranking of environmental hazards was undertaken using the Qualitative Risk Matrix (Table 4-3).

Table 4-1: Definition of Consequence

Consequence		Description
5 Very Serious	S: E: R:	Multiple Fatalities or significant irreversible effects to one or more people Very serious long-term environmental impairment of the ecosystem, significant recovery work over years/decades, Tier 3 Oil Spill Extreme adverse public, political or media outcry resulting in international media coverage critical impact on reputation
4 Serious	S: E: R:	Single Fatality and/or severe irreversible disability to one or more people Serious medium term environmental effects, recovery work over a few months, Tier 2 oil spill Significant impact on reputation and/or national media exposure local community complaint
3 Moderate	S: E: R:	Moderate irreversible disability or impairment to one or more persons. Significant Injury (Lost Time Injury (LTI) or Restricted Work Day Case (RWDC)) Moderate environmental impact with recovery work over a few days/weeks, Tier 1 oil spill, Impact/damage to item of National Environmental Significance (NES) Serious local adverse public media attention or complaints local user concern moderate to small impact on reputation
2 Minor	S: E: R:	Reversible disability requiring hospitalisation or Medical Treatment Injury Minor Impact on biological/physical environment, Negligible remedial/recovery work, <1BBl oil spill Public awareness but no public concern beyond local users Minor impact on reputation
1 Negligible	S: E: R:	Slight Injury (First Aid Treatment) Negligible Impact, Effect contained locally Negligible Impact on Reputation no public or regulator interest

Legend: S: Safety, E: Environment, R: Reputation Impacts

Table 4-2: Definition of Likelihood

Likelihood	Description
E. Very likely	Common occurrence in this type of business
D. Likely	May occur in our business
C. Possible	Possibility of occurring. Has happened in similar businesses
B. Unlikely	Unlikely to occur. A rare event by standards of industry
A. Very Unlikely	Unlikely to happen here or elsewhere. Conceivable under extreme circumstances

Table 4-3: Qualitative Risk Matrix

		Likelihood				
		A: Very Unlikely	B: Unlikely	C: Possible	D: Likely	E: Very likely
Consequence	5. Very Serious					
	4. Serious					
	3. Moderate					
	2. Minor					
	I. Negligible					

Category	Description and Response
High	**High Risk:** Considered intolerable. Work cannot proceed as currently planned. Urgent remedy and resources required for immediate risk reduction.
Significant	**Significant Risk:** Undesirable. Upper management decision to accept or reject risk for the operation to continue.
Medium	**Medium Risk:** Risk reduction measures need to be considered to reduce risks to a level which is as low as reasonably practicable. Generally acceptable level of risk where further risk reduction is shown not to be practicable.
Low	**Low Risk:** Risks are sufficiently low to be acceptable (i.e. at ALARP). Manage for continuous improvement by management.

4.2 ALARP Workshop

An ALARP assessment workshop was held which considered each hazard in turn, with the facilitator describing the hazard, the potential consequence/s and likelihood and the identified controls. For each hazard, the discussion asked a number of questions, including:

- Are the identified controls industry best practice?
- Are the controls and risk levels consistent with practices of other operators in the region?
- Are the risks acceptable?
- Are there additional controls that can be implemented to reduce risks further?
- Are there alternative methods, approaches or processes which can be implemented cost effectively without compromising survey objectives and which further reduce the risk?

Polarcus considered the implementation of controls and mitigation measures for each hazard to minimise potential environmental harm and stakeholder disruption. Additionally, measures were put in place to ensure that the effectiveness of the implemented controls is maintained, through review and improvement. A number of additional management

measures were then adopted for the survey to reduce further the potential risks associated with some hazards.

4.3 Acceptability

The risks of adverse environmental impacts associated with the hazards identified within this EP were reduced to ALARP and to a level where the residual risk levels are considered acceptable, on the basis of a systematic process, as summarised below:

1. The environmental aspects of the survey were identified.
2. The credible, potential "consequence" of each hazard was identified.
3. Acceptable levels of risk were defined for each aspect, incorporating:
   a. principles of ecologically sustainable development (ESD)
   b. other requirements (including laws, policies, standards, conventions)
   c. internal context (e.g. consistency with Polarcus policies, culture and company standards)
   d. external context, including:
      i. the environment
      ii. stakeholder expectations.
4. Industry best practice measures were considered.
5. An ALARP process was undertaken to consider further measures to reduce risk.
6. The assessment was reviewed following the inclusion of the additional measures to determine whether the risks and impacts are ALARP, and to determine whether the risks and impacts are acceptable.

Polarcus' senior management reviewed the impacts, risks and management measures described in this EP, in the context of the steps listed above, and are confident that impacts and risks are ALARP and will meet, or be better than, the acceptable levels defined in the EP.

4.4 Risk Assessment Summary

A summary of the identified risks, their potential environmental impact and the controls applied is provided in Table 4-4.

Table 4-4: Summary of environmental risks, potential impacts and controls

Risk	Potential Environmental Impacts	Controls
Routine Operations		
Marine Organisms on Vessel Hull	Loss of biodiversity, or commercial nuisance impacts due to Introduced Marine Species (IMS)	1. Ship hull and niches free of potential IMS prior to mobilisation 2. Hull anti-fouling coating to be current and in sound condition 3. Submersible equipment to be cleaned of live secondary fouling organisms prior to survey 4. Adherence with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry • Biofouling Record Book kept outlining marine fouling management actions • Biofouling risk assessment shows low risk of IMS presence prior to entry into Australian waters • Submersible equipment free of marine fouling organisms prior to use in the survey area 5. Survey, support and chase vessels will have all necessary AQIS approvals 6. Support and chase vessels risk assessed as posing low risk of introducing marine species 7. Streamers cleaned at least every 35 days during survey
Marine Organisms in Ballast Water	Loss of biodiversity, health risk, or commercial nuisance impacts due to Introduced Marine Species (IMS)	1. Adherence with the Australian Ballast Water Management Requirements, as implemented by the vessel ballast water exchange procedure. 2. No planned ballast water exchanges to take place during the activity 3. If required, ballast water exchange will not occur within 12 nautical miles (nmile) of land 4. Chemical free ballast water treatment system
Presence of Vessel	Interference with or displacement of recreational or commercial fishing, commercial shipping, or oil and gas operators	1. AMSA and AHO to be advised of the survey prior to mobilisation and following demobilisation for issue of Notice to Mariners 2. Pre-survey consultation with relevant stakeholders 3. All relevant stakeholders notified of the survey prior to mobilisation and following demobilisation 4. Regular updates provided to fisheries stakeholders on seismic vessels planned movements 5. Ongoing consultation with all stakeholders 6. Access agreements with O&G titleholders 7. Vessel to maintain appropriate lighting, navigation and communication at all times to inform other users of the position and intentions of the survey vessel, in compliance with the *Navigation Act 2012* and Chapter 5 of the SOLAS Convention 8. Daily reports to be provided to the AMSA RCC 9. Maintain at least 50 km separation between *Adira* and any other seismic vessel during seismic data acquisition

Risk	Potential Environmental Impacts	Controls
		10. Support or chase vessel present at all times. 11. Provide risk assessments on underwater noise impacts on prey and target species to species, to those stakeholders who have identified these risks as a concern. 12. Polarcus requirements, plans and procedures: • Community Consultation Procedure • Commercial Fishing Activity Procedure • Shipping Traffic Procedure
Artificial Lighting	Disruption to behaviour of light sensitive marine fauna.	1. No unnecessary external lighting during the activity (note that lighting for the purpose of safety, navigation or operational purposes is necessary). 2. Pre-mobilisation audit to identify opportunities to reduce deck light spill to the marine environment. 3. No night time operations within 5 nmile of turtle nesting beaches.
Vessel/ Helicopter Noise	Disruption of behaviour of noise sensitive marine fauna and birds	1. Survey vessel to comply with relevant sections of Part 8 of the EPBC Regulations, taking into account limited manoeuvrability of survey vessel, including: ▪ take action to avoid approaching closer to a cetacean than 50 m for a dolphin and 100 m for a whale ▪ do not exceed a speed of 6 knots within the caution zone of a cetacean (300 m) 2 Vessel propulsion systems are maintained in working order 3 Bow and stern thrusters to be used only as required, taking into account vessel requirement to maintain course 4 Helicopter transfers to be in compliance with Part 8 of the EPBC Regulations and avoid sensitive and scheduled areas for seabirds, e.g. island rookeries
Oily Water Discharge	Potential localised and temporary acute toxic effects on marine biota	1. Oil content of any discharged water to be <5 ppm, with exceeds <15 ppm requirement of *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* –Section 9 Prohibition of discharge of oil or oily mixtures into the sea (4) (b) (iii) 2. Oil water separator to be in good working order 3. No discharge within 12 nmile of land or within boundaries of a marine reserve, or within 50 m contour of Glomar Shoals
Grey Water / Sewage Discharge	Adverse effects on marine biota due to localised increase in turbidity and nutrient concentrations	1. Sewage treatment plant to be operational 2. All sewage treated prior to discharge 3. Sewage to be handled, stored and discharged in accordance with *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* –Section 26D Prohibition of discharge of sewage into the sea, including: ▪ all discharges further than 12 nmile from land and at a speed of greater than 4 knots 4. Biodegradable detergents to be used

Risk	Potential Environmental Impacts	Controls
		5. No discharge within the boundaries of a marine reserve or within 50 m contour of Glomar Shoals
Putrescible Waste (Food Scraps) Discharge	Adverse effects on marine biota due to localised increase in turbidity and nutrient concentrations	1. All putrescible wastes to be handled, stored and disposed of in accordance with the Polarcus *Adira* Garbage Management Plan, which is consistent with the requirements of *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* – Section 26F Prohibition of disposal of garbage into the sea (all sub-sections) 2. No discharge within marine park boundaries or within 12 nmile from land. 3. No discharge within the boundaries of a marine reserve or within 50 m contour of Glomar Shoals
Greenhouse Gas Emissions	Greenhouse gas emissions to the atmosphere from engines and incinerator	1. MGO used during the survey to comply with standards outlined in MARPOL 73/78 Annex VI with regards to sulphur content, namely MGO will contain a concentration of sulphur not exceeding 3.5% by mass 2. Vessel to have a valid IAPP 3. Propulsion system to be well maintained and in good working order 4. Use of high specification catalytic converters which have two stage process to reduce NOx emissions by over 90%, residual hydrocarbons by 80 – 90%, soot particles by over 20% 5. Ultra Low Sulphur Diesel (USLD) used when available

Risk	Potential Environmental Impacts	Controls
Close Pass to Facilities (within 500 m exclusion zone)	Loss of streamers; collision with infrastructure	1. SIMOPS plans prepared in consultation with O&G operators prior to undertaking close passes. SIMOPS plan will be consistent with Polarcus close pass procedures 2. Only during daylight hours and suitable weather conditions 3. No planned maintenance undertaken during close passes. 4. Engine Control Room to be fully manned prior to and during the close pass 5. Support vessel prepared and standing by for emergency towing if necessary 6. Prior steering checks completed 7. The workboat activity and any helicopter activity will be suspended 30mins before entry into the close pass zone and will not continue until all in-sea equipment is clear of the platform exclusion zone 8. Redundant propulsion to be available during the survey 9. Current monitoring to be used to establish current and feather patterns in the area, with feather to be monitored and adjusted close pass as required 10. The facility operator will supply verified co-ordinates of any subsurface or hidden obstacles that it is responsible for. These will be entered into the INS system and on the bridge chart systems. The obstacles will be given safety range circles to highlight the Red and Amber zones relating to the close pass, according to type of hazard and in agreement with operator. Any subsurface obstacles will have to be identified and scouted prior to the survey. A surface obstruction will be verified by radar 11. In the event of a loss of a streamer, survey support vessel to recover and tow lost equipment away before it comes into contact with the platform 12. Prior to the start of operations, communication lines (radio frequencies, Operational language, backup channels, telephone numbers etc) will be tested 13. 24hr look ahead planning document sent to platform manager. Each 24 hours, communications between platform and seismic vessel are to be undertaken to ensure prior knowledge of any operations are known well in advance 14. Close-pass distances will be established prior to operations to ensure there is no interference with facility operations, typically 500m for radio-silence and up to 5km for diving operations 15. Facility loading schedules will be assessed to ensure no operational interference, where necessary having additional communications directly to the tanker Master

Underwater Noise From Seismic Source	Temporary or Permanent Threshold Shift (TTS/PTS), or behavioural changes in noise sensitive marine fauna.	1. Survey will be conducted after the northward stage of the humpback whale migration in the North-west Marine Region (May - August) 2. The survey plan has been scheduled so that seismic acquisition on survey lines avoids peak turtle nesting seasons between October and February. 3. No seismic acquisition will occur within 40 km of any flatback nesting beach during their peak nesting season (Dec - Feb) 4. No night time operations within 5nmile of turtle nesting beaches (northern Montebello Islands 5. Two trained Marine Fauna Observers (MFOs) and two PAM operators will be present during all activities (EPBC Act Policy Statement 2.1 Part B) 6. All crew on-board the survey vessel shall be provided with an induction in whale observation, distance estimation, controls and reporting to protect whales during the survey 7. Smaller source size selected (3,480 in^3 rather than 4,240 in^3) to acquire survey data 8. Increased precaution and buffer zones used (EPBC Act Policy Statement 2.1 Part B) 9. Passive Acoustic Monitoring (PAM) on board survey vessel, with PAM system confirmed to be operational and capable of detecting humpback whales (sensitivity in 25Hz – 4 kHz range) and have the ability to filter ambient noise (EPBC Act Policy Statement 2.1 Part B) 10. The seismic vessel will shut down if three whale-instigated shutdowns in 24 hours occur and will move to another seismic line away from pods of whales (EPBC Act Policy Statement 2.1 Part B) 11. Whale sharks to be managed under EPBC Policy Statement 2.1 12. Detailed reports of all cetacean sightings will be recorded using the DotE Cetacean Sightings Application (database) 13. No seismic in less than 20 m water 14. Extended visual or PAM observations for fauna undertaken in the 3 km 'observation zone' by MFO for at least 35 minutes before the commencement of soft-start procedures 15. Soft-start procedures may only commence if no whales or whale sharks have been sighted within the low power or shutdown zone during the pre-startup visual observations. Soft-start procedures will be used each time the acoustic source is initiated gradually increasing power over a 30 minute period (EPBC Act Policy Statement 2.1) 16. If the whale enters the 'low-power zone' (<2 km), the source will be powered down to the lowest possible setting and in the 'shutdown zone' (<500 m) the acoustic source shut-down completely (EPBC Act Policy Statement 2.1 Part B). 17. Use of PAM system to increase ability to detect cetaceans during periods of low visibility 18. Start-up can only resume after the whale has moved outside the low power zone or when 30 minutes have elapsed since the last whale sighting. 19. Maintain at least 50 km separation between *Adira* and any other seismic vessel 20. Vessel crew will be inducted in their environmental management responsibilities and in implementation of Policy Statement 2.1 for avoiding impacts to cetaceans. Training in MFO duties will increase awareness of vessel crew to necessary controls
Non-routine Operations		

Risk	Potential Environmental Impacts	Controls
Vessel Collision Resulting in Fuel Tank Rupture and MGO Spill (< 280 m^3)	Acute/chronic toxic effects on marine life from surface, dissolved and entrained hydrocarbons	1. Vessel has an ice class, double hull design extremely unlikely to rupture even in collision 2. Vessel maintained in good condition 3. Additional spill response equipment on board support vessel 4. Notice to Mariners to be circulated to avoid unexpected encounters at sea 5. Vessel will maintain appropriate lighting, navigation and communication to inform other uses of the position and intentions of the survey vessel 6. The *Polarcus Adira* maintains a 24/7 watch with multiple trained crew (STCW95/Elements of Shipboard Safety) and appropriate navigation safety equipment (e.g. Radar) to ensure early detection of third party vessels to allow for vessel diversion (as necessary) 7. Low speed of vessel (12 knots when transiting; < 5 knots on survey). 8. Adherence to COLREGS in every regard, including adequate lookout/watch, navigational shapes and lights reflecting operations at all times 9. Vessel to provide daily reports to AMSA Rescue Coordination Centre (RCC) 10. Radar onboard (Automatic Radar Plotting Aid) with collision alarm 11. Vessel uses light MGO fuel which is less persistent in the environment 12. Largest single fuel tank is 280 m^3. All fuel tanks can be isolated and contents transferred between them 13. Ongoing consultation with AMSA, O&G and fishing stakeholders 14. Oil Spill Response arrangements tested for survey activities, including AMSAs capacity as the lead response agency in the event of a spill 15. Approved and tested SOPEP on board 16. All relevant crew trained in implementation of SOPEP 17. No activities in less than 20 m water depth >3 nmile from land 18. SIMOPS plans prepared in consultation with O&G operators 19. Support/chase vessels available to intercept other vessels and support seismic vessel 20. OPEP in this document followed in the event of a spill 21. Vessel crew induction to include the following requirements: ▪ Polarcus *Adir*a Shipboard Oil Pollution Emergency Plan (SOPEP) ▪ Polarcus Oil Spill Procedure ▪ Polarcus Bunkering Procedure ▪ Polarcus Bunkering Checklist

Risk	Potential Environmental Impacts	Controls
		▪ Polarcus PTW Refuelling At Sea Checklist ▪ Polarcus Bunkering Offshore In Port Procedure ▪ Ship to Ship Transfer Guide (Petroleum) Edition 4 ▪ DNV Petroleum Service Manual ▪ Polarcus Emergency Response Plan
Refuelling Spill (< 500 L MGO)	Acute/chronic toxic effects on marine life from hydrocarbons	1. Only the seismic vessel will be refuelled at sea. The support and chase vessel will return to port for refuelling. 2. Vessel uses light MGO fuel which is less persistent in the environment 3. Polarcus procedure for selecting refuelling contractor. 4. All fuel transfer equipment maintained and checked before each use 5. Spill kits readily available on board vessels, strategically placed near high risk spill locations. 6. Approved and tested SOPEPs on board both seismic and support vessels. 7. Scupper plugs at hand in case of a hydrocarbon spill on the deck 8. Drip trays will be maintained under any machinery or engines that may leak oil. 9. All personnel are aware of appropriate hydrocarbon/chemical spill response requirements through environmental induction. 10. Spills are cleaned up immediately, reported through the Polarcus incident reporting system and contaminated material contained on-board for on-shore disposal. 11. Good housekeeping/seamanship in stowing chemicals and oils. 12. Drains maintained and monitored. 13. Dry break couplings used 14. Refuelling during daylight hours only 15. No refuelling within 50 km of land, Glomar Shoals or protected area 16. OPEP in this document 17. Polarcus requirements, procedures and plans: ▪ Polarcus *Adira* Shipboard Oil Pollution Emergency Plan (SOPEP) ▪ Polarcus Oil Spill Procedure ▪ Polarcus Bunkering Procedure ▪ Polarcus Bunkering Checklist ▪ Polarcus PTW Refuelling At Sea Checklist ▪ Polarcus Bunkering Offshore In Port Procedure

Risk	Potential Environmental Impacts	Controls
		▪ Ship to Ship Transfer Guide (Petroleum) Edition 4 ▪ DNV Petroleum Service Manual ▪ Polarcus Emergency Response Plan
Loss of Solid / Hazardous Waste Overboard	Contamination of marine environment with localised effects	1. All personnel to comply with requirements of *Polarcus Adira* Garbage Management Plan. 2. All personnel to comply with the requirements of the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* 3. Material selection policy for low toxicity alternatives 4. EP induction to contain information on waste management responsibilities 5. No disposal overboard.
Oil or Chemical Spill Through Deck Drainage	Contamination of the marine environment with localised acute toxic effects	1. MARPOL 73/78 Annex I – Regulations for the Prevention of Pollution by Oil 2. *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* –Section 9 Prohibition of discharge of oil or oily mixtures into the sea 3. Chemicals and oils are stored in suitable containers in bunded areas isolated from the deck drainage system 4. Personnel trained in oil/chemical handling 5. Hydraulic equipment checked for leaks prior to being subjected to a load 6. Weekly inspection of bunded areas and spill kits is undertaken on all vessels 7. MSDS available to all POB 8. Spill kits available 9. Approved and tested SOPEP, with crew to be trained in implementation of the SOPEP and use of clean up equipment 10. Scupper plugs available on board 11. Polarcus requirements, procedures and plans: ▪ Polarcus Shipboard Oil Pollution Emergency Plan (SOPEP) ▪ Polarcus Oil Spill Procedure ▪ Polarcus Chemical Control Procedure ▪ Polarcus Emergency Response Plan ▪ Polarcus Hazardous Substances Handling Storage and Use.
Ozone Depleting Substances	Release of ODS from refrigeration and fire fighting equipment., contribution to global warming	1. Adherence with MARPOL 73/78 Annex VI Prevention of Air Pollution from Ships. 2. No release of an ODS during the activity. 3. Register of all ODS to be maintained onboard.

Risk	Potential Environmental Impacts	Controls
Loss of contents of 20 m^3 of urea during transfer	Acute/chronic toxic effects on marine life from urea pollution	1. Spill kits readily available on board vessels, strategically placed near high-risk spill locations. 2. Approved SOPEP onboard both vessels. 3. Scuppers blocked during transfers. 4. Restricted access to chemical store. 5. All personnel are aware of appropriate chemical spill response requirements through environmental induction. 6. Spills are cleaned up immediately, reported through the Polarcus incident reporting system and contaminated material contained on-board for on-shore disposal. 7. Good housekeeping/seamanship in stowing chemicals and oils. 8. No transfers within 50 km of land, Glomar Shoals or marine protected area 9. Metocean restrictions on urea transfers (inc. daylight transfers only) 10. Polarcus requirements, plans and procedures: ▪ Polarcus Emergency Response Plan ▪ Polarcus Bunkering Procedure ▪ Polarcus Bunkering Checklist ▪ Polarcus Chemical Control Procedure ▪ Polarcus Lifting Operations Procedure

Risk	Potential Environmental Impacts	Controls
Entanglement of / Collision with Marine Fauna	Injury or death of marine fauna	1. Many of the EPS' listed above for 'Underwater Noise' reduce the likelihood of encounters with marine fauna 2. Survey will be conducted after the northward stage of the humpback whale migration in the North-west Marine Region (May - August) 3. Watch maintained for marine fauna prior to deployment of wet equipment, with deployment delayed if entanglement risk is considered high (e.g. marine fauna observed along planned survey line). 4. Support and chase vessels (and seismic vessel when not restricted in its ability to manoeuvre) to comply with Part 8 of the EPBC Regulations, including: ▪ ensure the vessel does not drift or approach closer to the cetacean than 50 m for a dolphin and 100 m for a whale. ▪ immediately withdraw from the caution zone (300 m) around the cetacean if it shows signs of being disturbed. ▪ do not exceed a speed of 6 knots within the caution zone of a cetacean (300 m). 5. Report death or injury of a listed species to the Secretary of DotE within seven days. 6. Survey will be conducted outside peak northward humpback whale migration season in the North-west Marine Region. 7. Two trained Marine Fauna Observers (MFOs) will be present during all activities, with at least one MFO observing during seismic data acquisition. 8. The acquisition schedule has been planned so that survey lines within 30 km of the Montebello Islands will be acquired outside the peak turtle nesting season 9. Whale sharks to be managed under EPBC Policy Statement 2.1 and Section 8 of EPBC Regulations. 10. Guards to be fitted to steamers to reduce the likelihood of turtle entanglement. 11. Any entangled marine life recovered with wet equipment to be returned to the ocean immediately. 12. Polarcus requirements, plans and procedures: ▪ Polarcus Deployment And Recovery Of Streamers Procedure ▪ Polarcus Deployment and Recovery of Deflector ▪ Polarcus Problem and Unusual Recoveries Procedure.
Loss of Equipment, including streamers	Localised disturbance to benthic habitat Disturbance to other users	1. Polarcus streamer deployment and recovery procedure to be implemented. 2. Buoys (including GPS transponder) and automatic recovery devices attached to streamers to facilitate recovery in the event of loss. 3. Independent secondary (i.e. redundant) attachment device connected to streamer to prevent loss in the event of primary attachment failure. 4. Deployment of wet equipment to be carried out only under suitable weather conditions, as determined by the Party Manager and Vessel Master. 5. The seismic array and streamers will be brought on board the vessel at regular intervals for maintenance and cleaning.

Risk	Potential Environmental Impacts	Controls
		6. Sercel Sentinel® solid streamers used for the survey. 7. Ongoing consultation with relevant stakeholders in the event of loss of a streamer, including notification to AMSA. 8. Comply with ERP procedure steps including: ▪ monitoring and avoidance of conditions that may increase risk of streamer loss ▪ retrieve in-water seismic equipment in the event adverse weather conditions are forecast 9. Support/Chase vessel available to assist recovery in the event of streamer loss. 10. All lifting gear to be load rated as appropriate for the working load. 11. Visual inspection of lifting gear every six months and annual load testing for wires. 12. Polarcus requirements, plans and procedures: ▪ Polarcus Deployment And Recovery Of Streamers Procedure ▪ Polarcus Deployment and Recovery of Deflector ▪ Polarcus Problem and Unusual Recoveries Procedure.
Anchoring	Localised disturbance to benthic habitat	1. No anchoring of survey or support vessels during the activity. 2. Redundant propulsion to be available to the *Adira* during the survey.
Vessel Grounding (no oil spilt)	Localised disturbance to benthic habitat	1. Redundant propulsion on vessels during the survey 2. Support and chase vessel available to assist in the event of loss of propulsion / grounding 3. Anchoring available in the event of loss of propulsion 4. No operations in waters less than 20 m 5. No operations within 3 nmile of land
Responding to an Oil Spill	Significant impacts upon fauna and/or habitats due to activities associated with spill response, or discharges such as dispersants	1. Approved and tested SOPEP on board 2. Polarcus Emergency Response Procedure 3. Maritime Emergency Response Service (DNV) 4. Additional spill response equipment on board support vessel 5. Consultation undertaken with AMSA and the WA DoT, to ensure that responses arrangements within the vessels' SOPEP, NATPLAN, WestPLAN-MOP and the DoT MOSCP are interfaced. 6. Consultation undertaken with Department of Parks and Wildlife 7. AMSA to be notified immediately (<1 hr) when a spill is detected. 8. Vessel SOPEP to be implemented immediately in the event of a spill.

Risk	Potential Environmental Impacts	Controls
		9. Insurance is in place to cover the costs of response. 10. NEBA undertaken in consultation with JA 11. Wastes managed under Polarcus Garbage Management Plan, in accordance with NATPLAN *Management and Disposal of Oil Spill Debris.* 12. Stakeholders notified 13. Appropriate Operational and Scientific Monitoring response arrangements 14. Insurance in place appropriate to nature and scale of activity

5.0 MONITORING OF ENVIRONMENTAL PERFORMANCE

5.1 Ongoing Monitoring

The Rosemary 3D MSS will be managed in compliance with the accepted EP for the activity, all applicable laws and regulations, the Polarcus Environment Policy, and the HSE Management System of the vessel.

The objectives of the EP are to ensure that:

- The proposed activity is carried out in a manner consistent with the principles of ecologically sustainable development
- The receiving environment is adequately described, such that all values and sensitivities are identified
- The sources of potential impacts from both planned and unplanned activities are identified
- Potential impacts and risks are acceptable and are reduced to as low as reasonably practicable (ALARP).

The implementation strategy for the EP, including for during emergencies or potential emergencies, describes in detail the arrangements in place to allow Polarcus to continually manage the environmental impacts and risks of their activities to acceptable levels and ALARP. It includes:

- details of when the titleholder will report to the Regulator in relation to the titleholder's environmental performance
- a description of the environmental management system for the activity, including specific measures to ensure that
  - the environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP
  - control measures detailed in the EP are effective in reducing the environmental impacts and risks of the activity to ALARP and an acceptable level
  - environmental performance outcomes and standards set out in the EP are being met
- chain of command, and roles and responsibilities in relation to the implementation, management and review of the EP
- training and competencies, including induction into the EP
- monitoring, recording, audit, management of non-conformance and review of the environmental performance and the implementation strategy, and quantitative records of emissions

Polarcus will maintain a record of environmental performance during the survey, including an assessment of performance in relation to the environmental performance outcomes and standards detailed within the EP. This record will be documented in the form of a Compliance Register. A report on the environmental performance, including the Compliance Register, will be submitted to NOPSEMA for assessment within two months of completion of the survey.

The key measures for ensuring ongoing environmental performance include:

- Pre-survey testing of oil spill response arrangements
- a pre-survey audit
- project kick-off meeting
- an audit during the survey
- post –survey review and report on environmental performance

5.2 Review of the EP

If ongoing performance monitoring or consultation with stakeholders identifies any significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk that is not provided for in the EP than Polarcus will submit a proposed revision of the EP, in accordance with regulation 17 of the OPGGS(E)R.

The EP will be reviewed and a proposed revision submitted to the regulator if:

- the activity is changed, significantly modified, or a new stage added, or
- any significant new environmental impact or risk, or a significant increase in an existing environmental impact is identified, or
- if requested by the regulator.

6.0 OIL POLLUTION EMERGENCY PLAN (OPEP) RESPONSE ARRANGEMENTS

The overall objectives in any marine oil pollution event are to:

- Reduce risk to people, property and the environment.
- Effectively respond to minimise the oil impact area and impacts to protection priorities within that area.
- Remove spill and remediate area to agreed spill termination criteria.

The Oil Pollution Emergency Plan (OPEP) for the EP is based on the seismic vessel's Shipboard Oil Pollution Emergency Plan (SOPEP). The OPEP demonstrates:

- provision for the updating of the plan
- adequate arrangements for responding to and monitoring oil pollution
- arrangements for testing the response arrangements in the OPEP
- arrangements for monitoring of impacts to the environment from oil pollution and response activities
- the response arrangements in the OPEP are consistent with the national system for oil pollution preparedness and response

The OPEP integrates the following plans:

- Rosemary 3D MSS Project Specific EHSQ Plan
- *Polarcus Adira* SOPEP and Polarcus Adira Oil Spill Procedure
- Polarcus Emergency Response Plan and Emergency Response Procedure
- the National Plan for Maritime Environmental Emergencies (NATPLAN), and
- Western Australian plans.

The first point of contact in the event of an oil spill during the survey is the Australian Maritime Safety Authority (AMSA). In the event that a hydrocarbon spill associated with the activity occurs within port the relevant port authority must be contacted.

Oil spill response arrangements detailed in this section and it's interaction with the vessel's SOPEP will be tested prior to mobilisation. Outcomes of this testing will be documented and any corrective actions/improvements implemented prior to mobilisation.

6.1 Vessel SOPEP

The *Polarcus Adira*'s SOPEP contains specific actions to contain and mitigate oil spills for identified credible oil spill threats on/from the vessel. This includes the following scenarios:

- bunkering overflow/transfer system leak/tank overflow
- hull damage/leak

- equipment in machinery spaces
- spills resulting from casualties
- ship grounding
- collision
- hull failure
- fire and explosion.

All personnel on board the *Polarcus Adira* are trained (inducted) in the application of the vessel's SOPEP. Regular SOPEP drills and exercises are carried out on the *Polarcus Adira* in accordance with the vessel's SOPEP to maintain the crew's currency in response equipment and incident response procedures. This verifies emergency response efficiency, effectiveness of procedures and detects any failure in equipment. These drills include, but are not limited to, spill response, collision and grounding and fire and explosion. All drills are documented, debriefings held and corrective actions identified (including revisions to SOPEP) and tracked to completion by the Vessel Master.

On-site response equipment for the prevention/minimisation of loss of oil to sea during the proposed survey is the *Polarcus Adira's* on-board spill response kit equipment. Additional equipment will also be carried on the support vessel. All equipment is stored in dedicated lockers located on the vessel, and identified as spill equipment. All crew are trained in the use of the vessel equipment listed above and the PPE required to appropriately respond to the spill (as contained in MSDSs).

The SOPEP is reviewed at least annually by Polarcus to ensure that it is current and up to date. It is recertified by DNV every five years. An audit of the on-board spill response capability of the *Polarcus Adira* against its SOPEP will be made prior to survey mobilisation to ensure appropriate preparedness.

6.2 NATPLAN

NATPLAN integrates Commonwealth and State Government response frameworks to facilitate effective response to marine pollution incidents through the Australian Emergency Management Arrangements. The Australian Maritime Safety Authority (AMSA) manages NATPLAN, working with State Governments (who have equivalent state plans which integrate into NATPLAN).

6.3 Western Australian Plans

If a spill occurs in Western Australian waters, the State Emergency Plan for Marine Oil Pollution (WestPlan MOP) and the Western Australia Oil Spill Contingency Plan (WA OSCP) apply.

The Western Australia Department of Transport (DoT) is responsible for the preparedness for marine oil response in Western Australian territorial waters. The

Western Australian DoT is the Control Agency, Jurisdictional Authority and the Hazard Management Agency, except if a spill occurs in Port Authority waters. AMSA may request that the Western Australian DoT assume the Control Agency role, even though the spill occurred in Commonwealth waters in situations where oil is likely to impact on the Western Australian shoreline.

Deployment of Western Australian resources outside State waters is coordinated and requested through AMSA.

6.4 Spill Scenarios

Credible spill scenarios identified for the activity are broadly divided into two categories:

- small spill quantities from uncontained deck spills/leaks, in-water equipment leaks or the loss of the contents of the transfer hose (fitted with dry break couplings) during refuelling

- the loss of the full contents of the largest fuel tank (280 m^3 MGO) on the *Polarcus Adira* due to vessel grounding or collision.

The Zone of Potential Impact (ZPI) for a small spill (i.e. < 500 L) is expected to be limited to within approximately 250 m around the release point. The ZPI for a large spill was determined in accordance with the *Interim Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities*. The ZPI includes the area (including subsurface) over which a surface oil parameter of 0.01mm thickness or 10 microns (equal to 10 g/m^2) would spread.

Stochastic spill modelling for surface results for floating oil concentration at or above 10 g/m^2 is shown in Figure 6-1: Predicted ZPI of Floating Oil Concentration at or above 10 g/m^2 from an Instantaneous 280 m^3 Surface Release of MGO Integrated over 20 Locations (i.e. Maximum Spill Range from any of the 20 Locations) between October and March. This forms the ZPI for the EP. Locations potentially affected include:

- Glomar Shoals (5.15% chance of contact)
- Rankin Bank (0.15% chance of contact)
- Dampier Archipelago (0.05% chance of contact)
- Montebello Commonwealth Marine Reserve (5.15% chance of contact)
- Montebello Islands (0.6% chance of contact)
- Lowendal Islands (0.05% chance of contact)
- Outer Barrow–Montebello Shoals (0.05% chance of contact).

The fuel used on the *Polarcus Adira* is Marine Gas Oil (MGO). MGO is a common marine fuel used in vessel engines and is a mixture of both volatile and persistent hydrocarbons. On release, MGO is expected to undergo a rapid spreading and evaporative loss with the remainder becoming dispersed in the water column.

MGO slicks tend to break up quickly and evaporative weathering leaves higher concentrations of less volatile, higher molecular weight hydrocarbons. The heavier components have a strong tendency to entrain in the upper water column as oil droplets in the presence of wind/waves but can re-float to the surface if these energies abate.

Response options for MGO spills are as follows:

- Due to the rapid evaporation and dispersion MGO spills are normally monitored and allowed to naturally weather, if no protection priorities are at risk.

- MGO is dispersible, although not recommended because of the high proportion of toxic materials and their persistence and toxicity in the marine environment may increase with dispersant use. Additionally dispersant use on light products which form very thin films of oil or sheens on the water surface, tend to "punch-through" the thin film into the underlying water causing herding of the oil (not to be confused with dispersion). Dispersant may be used in instances where there is an immediate safety hazard, however the rapid spread of this material makes this strategy ineffective.

- Physical agitation by using propeller wash may assist in the evaporation and break up of spilled MGO however the potential exists to emulsify the oil which leads to decreased degradation rates. This response strategy is not recommended for these types of spills.

- The rapid spreading rate of these oils presents problems for containment strategies at sea but if contained diesel is easily recovered with sorbent or oleophilic disc skimmers.

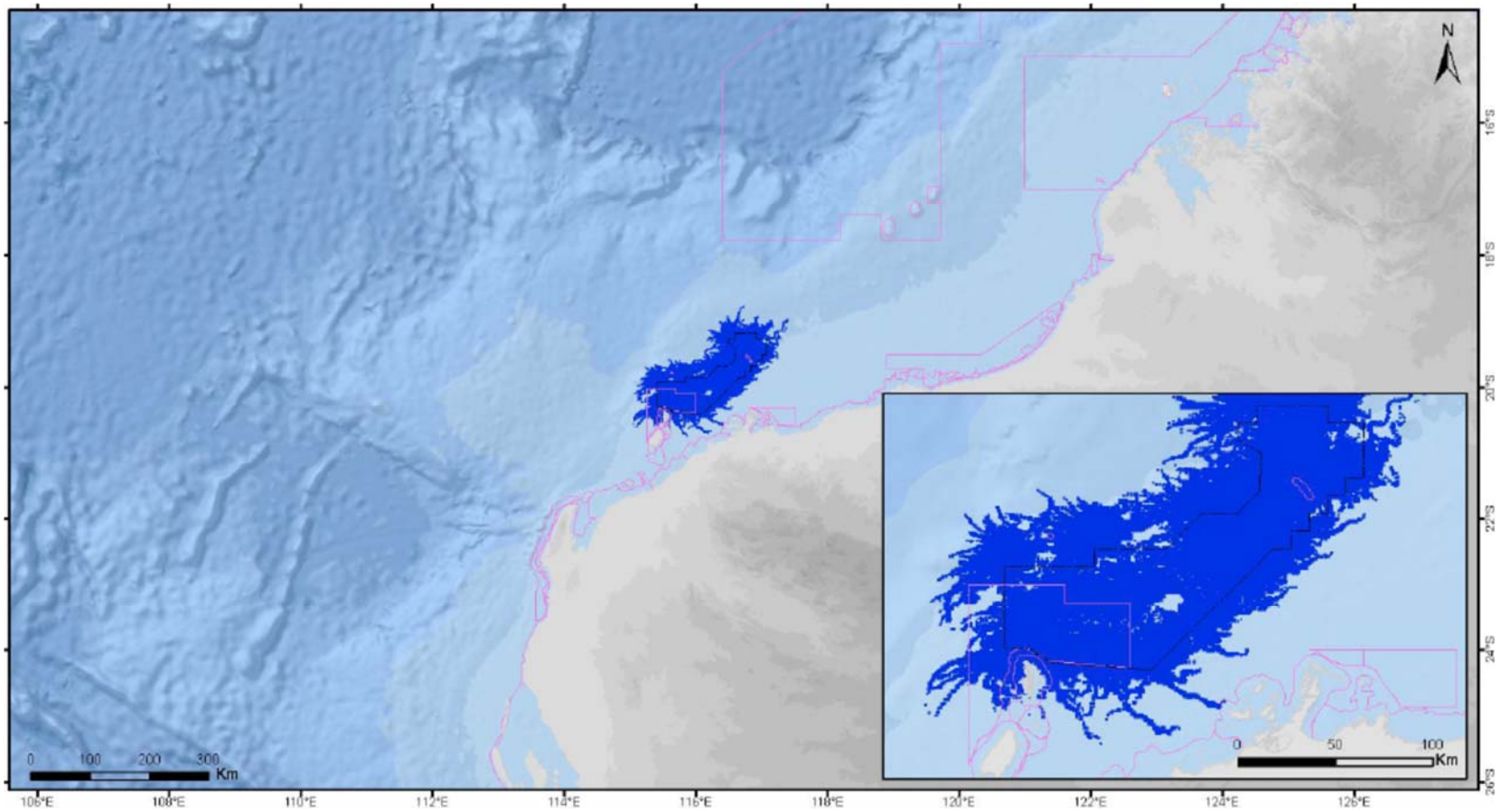

Figure 6-1: Predicted ZPI of Floating Oil Concentration at or above 10 g/m^2 from an Instantaneous 280 m^3 Surface Release of MGO Integrated over 20 Locations (i.e. Maximum Spill Range from any of the 20 Locations) between October and March

6.5 Spill Response

The immediate response to any spill is to implement the vessel's SOPEP. The Vessel Master is responsible for notification and reporting (via POLREP contained in SOPEP) all spills to the marine environment to the AMSA RCC. Once the vessel has transmitted an initial report, further reports will be sent at regular intervals to keep relevant parties (AMSA, Polarcus, NOPSEMA, WA DoT, DMP, etc.) informed.

After providing notification to AMSA, the vessel master notifies the Polarcus Core Emergency Team (CET) who initiates the Emergency Response Plan. The Polarcus CEO normally represents the Polarcus CET and would notify NOPSEMA of the initial incident (and provides regular interval updates). The CET monitors the incident and provides support to AMSA, the Shipboard Oil Pollution Prevention Team and the Vessel Master. The CET also provides updates to affected stakeholders.

6.5.1 Small Spills

A response to a small spill can be handled by on-site or local resources, including the support and chase vessel. If a spill occurs from a vessel, the Master will mount the first response to the incident under the Vessel's SOPEP using the resources immediately available to the vessel (i.e. ship-board equipment). The Master will immediately notify all spills to the Rescue Coordination Centre (AMSA).

A small spill would have a zone of potential impact (ZPI) which is close to the vessel and would be managed and monitored by the Vessel Master until the spill is effectively dispersed or evaporated, with oversight by, and in close cooperation with, AMSA. The Vessel Master is responsible for providing updated reports to AMSA to inform the spill response strategy (at frequencies determined by AMSA). The key steps in response to a Tier 1 spill incident are:

- stopping the leak
- containment of any spilled hydrocarbons
- clean up
- safe disposal of clean-up materials.

AMSA, as Control Agency (CA) for spills in Commonwealth Waters will monitor and continue to assess this level of spill. Note that the Statutory Authority (SA – NOPSEMA) can reassess the response at any time and escalate the response as required.

6.5.2 Larger Spills

A larger spill (< 280 m^3 MGO) response would be managed under NATPLAN. The Vessel Master will notify AMSA who shall be CA for the spill response. The Vessel Master, after

ensuring safety of crew and fire prevention and notification to AMSA, will implement the SOPEP and consider relevant actions such as tank lightering to reduce the oil volume available for release to the environment.

AMSA will determine the appropriate response strategies depending upon the protection priorities at risk within the ZPI. AMSA, depending on the location, prevailing weather conditions, available vessel responses (e.g. tank lightering) and volume spilt, will determine the need for oil spill modelling to confirm protection priorities within the ZPI and possible sea/aerial surveillance to confirm/inform trajectory predictions. All selected response strategies will be in accordance with NATPLAN and a net environmental benefit assessment (NEBA) undertaken for the specific spill. This will include an assessment of all available response strategies and their associated risk to protection priorities in the ZPI. Polarcus will consult with AMSA during this assessment.

The Vessel Master will continue to provide status updates (SITREPs), at the direction of AMSA, throughout the response activity. AMSA will maintain the response until relevant termination criteria are achieved.

Polarcus will implement, assist with, or contribute to (including funding if required) any other requirements as directed by the Control Agency.

6.6 Operational Monitoring (Type I Monitoring)

Type I or operational monitoring, is used to collect information about the oil spill and associated response operations to aid decision-making during the response. Operational monitoring typically ceases once all aspects of response implementation have terminated. Operational monitoring following a spill may include:

- monitoring and surveillance (e.g. vessel/aerial) of the spill, its weathering and proximity to environmentally sensitive locations
- undertaking oil spill trajectory modelling (as necessary) to predict slick movement
- as required, and after a NEBA assessment, deploy appropriate resources or equipment to protect identified sensitive environmental resources within the zone of potential impact (ZPI).

This will inform what further responses may be required, including scientific (Type II) monitoring. The Vessel Master, and the masters of the support and chase vessels will fully cooperate with the relevant Control Agency (AMSA or DoT). Polarcus will implement, assist with, or contribute to (including funding if required) any other operational monitoring as directed by the Control Agency.

Onsite resources will continue to provide status updates (SITREPs), at the direction of AMSA, throughout the response activity. AMSA will maintain the response until relevant termination criteria are achieved.

6.7 Scientific Monitoring (Type 2 Monitoring)

Type II, or scientific monitoring, addresses defined objectives and collects information for the purposes of determining short and long term environmental impacts (both from the spill and the response), post-spill and post-response recovery studies, remediation efforts and scientific research.

The stochastic spill modelling indicates that a number of sensitive areas may be impacted by surface slicks and/or entrained oil from a 280 m^3 MGO spill. The Zone of Potential Impact (ZPI) is defined in section 6.4 above. Environmental receptors potentially affected by a spill from the closest part of the survey area to each receptor, include:

- Protected areas
- Shorelines and intertidal invertebrates
- Corals
- Subtidal communities, including algae and seagrasses
- Cetaceans
- Turtles, including nesting turtles and hatchlings
- Seabirds and shorebirds
- Sharks and fishes, including larval fishes
- Other users

Scientifically rigorous monitoring plans would be developed and implemented in conjunction with Support Agencies, experts and other stakeholders (e.g. WA DoT, WA EPA, WA Department of Parks and Wildlife (DPaW), the WA Marine Science Institution (WAMSI), Australian Institute of Marine Science (AIMS), O&G titleholders and fisheries stakeholders. Scientific monitoring may continue for some time following the termination of the operational response.

Scientific monitoring could include some, or all, of elements described below:

- Oil in sediments: to provide data to assist in assessing and verifying predicted impacts on key habitats and sensitive receptors.
- Surveys of shorelines and intertidal areas: to determine and monitor the impact of the spill, and potential subsequent recovery, on shorelines and intertidal marine coastal habitats.
- Monitoring of subtidal areas: to enable assessment of impacts and subsequent recovery of benthic marine habitats (e.g. corals, macroalgae, seagrass, sponges and other filter feeders, motile invertebrates and associated fishes).

- Bird surveys: to assess any short or longer term environmental effects on seabird and shorebird populations.
- Marine fauna surveys: to assess any short or longer term environmental effects on other species (e.g. turtles, whales, fishes).

Polarcus has an existing contract with RPS to undertake any Type II monitoring. RPS has extensive experience in developing and implementing scientific monitoring programs in the region and has existing relationships with vessel and aircraft contractors, analytical laboratories, equipment suppliers and specialist subconsultants. For each study element, multiple redundancies are built in to ensure that sufficient personnel, equipment and vessels are available at short notice.

7.0 DETAILS OF CONSULTATION

7.1 Consultation Already Undertaken

Consultation with the majority of stakeholders was undertaken between June and October 2014. An information package was sent to stakeholders, detailing the survey characteristics, locations, duration and proposed activities. Relevant stakeholders, including those potentially involved in oil spill response, were invited to provide comments on the survey. A number of stakeholders did not reply or replied only to acknowledge receipt of the invitation with no further comment.

The stakeholders consulted prior to, and during, the preparation of the EP are listed in Table 7-1 along with their objections/claims, an assessment of their merits and Polarcus' response.

Table 7-1: Pre-survey Consultation

Stakeholder	Summary of Response	Assessment of Merits of Adverse Claim/Objection including response to each
Commonwealth Government		
National Offshore Petroleum Titles Authority (NOPTA)	NOPTA is not a Relevant Person	No further action
NOPSEMA	NOPSEMA is not a Relevant Person	No further action
Department of Industry (DoI)	Offshore Resources Branch has no activities that would lead to potential interactions	No further action
Department of the Environment (DotE) - MNES	DotE is not a Relevant Person.	No further action
DotE - National Historic Heritage Section	No immediate concerns. Supplied fact sheet including "current advice for marine planning that outlines general risk mitigation measures and requirements should the survey detect a currently unknown shipwreck within the survey area."	Information incorporated into EP.
DotE - Commonwealth Marine Reserves	Acknowledgement of email	Information incorporated into EP.
Australian Fisheries Management Authority (AFMA	Advised that North-west Slope Trawl Fishery may be active in region.	Requested contact details as link on web page had no response. Provided link to web contacts. Info sent to these Contact was attempted with North-west Slope Trawl Fishery. There has been no response at the time of writing. Will continue to follow up.
Australian Marine Safety Authority (AMSA)	Provided contact advice and maps showing shipping movements in region. Noted requirements for shipping, risks with restricted manoeuvrability, and requirement for good communications. AMSA and RCC to be notified and AHO to be notified two weeks prior to survey to issue NTM.	Information incorporated into EP.
	Confirmation of AMSA's role in an oil spill response. Noted that AMSA is Jurisdictional Authority and Control Agency. Confirmed that if spill were to enter state waters, that AMSA would request assistance from state agencies (e.g. WA DoT, WA DPaW).	Integration between AMSA and DoT under NATPLAN arrangements included in OPEP in this EP.
Department of Defence	Advise hydro.NTM@defence.gov.au two weeks prior for notice to mariners	Information incorporated into EP.
Department of Communications	No declared protection zones in the survey area. Advised that Telstra have the JASAURUS cable and that Trident have plans for cables in the area.	Information incorporated into EP.
Australian Hydrographic Service (AHO	Notice to Mariners (NTM) will be issued	Information incorporated into EP.
Department of Agriculture, Fisheries and Forestry	Advised that should be OK as long as risk is managed. Noted WA requirements.	Information incorporated into EP.
National Native Title Tribunal (NNTT)	Provided search results showing no interactions.	Information incorporated into EP.
Australian Customs and Border Protection Service	No comment but wish to be kept informed.	Information incorporated into EP.
Australian Communications and Media Authority (ACMA)	Advice that Telstra have subsea cables in the area.	Telstra contacted. See below.
Western Australian Government		
WA Conservation Commission	No response	
WA Department of Commerce	No response	
WA Department of Environmental Regulation	Acknowledged receipt	
WA Department of Fisheries	Requested a full range of mitigation strategies and that requirements for minimum source used is analysed. Advised on fishing and fisheries in the North Coast and North West Shelf Province regions. Provided advice on spawning aggregation times. Noted biosecurity requirements.	Information incorporated into EP.
WA Department of Parks and Wildlife	Asked about potential issues associated with Polarcus transiting Montebello Islands Marine Park. Advised that no commercial activities allowed within Sanctuary Zone. DPaW have particular concerns about SEL wrt protected species (resident and migratory). Strongly suggested that buffer zones be used. Sent info flyer while on phone.	Committed to no entry into Sanctuary Zone. Underwater noise modelling commissioned shows very low risk of impact. ALARP workshop held to consider additional measures. Survey planning avoids sensitive BIAs timings for turtles near Montebello Islands. After additional controls implemented, risk is considered acceptable.

Stakeholder	Summary of Response	Assessment of Merits of Adverse Claim/Objection including response to each
WA Department of Mines and Petroleum	Asked about potential issues of Polarcus entering state waters. Advised that as long as data acquisition does not occur in state waters that there is no need for a state EP. Turning circle, run-ins/run-outs and soft starts in state waters are OK	Information incorporated into EP. Will provide EP summary to DMP once accepted by NOPSEMA
WA Department of State Development	No response	
WA Department of Transport (DoT)	Noting survey in Commonwealth waters and that AHO should issue NTM – included Hydro NTM in email	Information incorporated into EP.
	No issues from a Pilbara Regional Services perspective	Noted
	Confirmation of DoT's role in an oil spill response. Noted that AMSA is Jurisdictional Authority and Control Agency. Noted risk of collisions with support vessel. Offered to review OPEP.	Integration between AMSA and DoT under NATPLAN arrangements included in OPEP in this EP.
WA Department of Premier and Cabinet	No response	
WA Office of the Environmental Protection Authority (EPA)	Advising that it is outside of their jurisdiction (i.e. EP Act)	Noted
Industry		
Trident	Have objection or comment	
Telstra	No specific concerns. Potential projects will be notified to Polarcus	
Apache Julimar P/L and Apache North-west P/L	No response	
Carnarvon Petroleum Ltd	Negotiations underway	Ongoing consultation
Chevron Australia P/L	Advising of operations associated with Wheatstone project and requesting clarification on how close the Polarcus vessel may get to the general Wheatstone Platform area	Information incorporated into EP. The final terms of access agreements are still being negotiated. Any requirements from the access agreements will be included into the Project Specific EHSQ Plan.
	Referred to communications over access agreements. Environmental requirements specified in proposed access agreement, including: promptly advise the Company of all reportable environmental incidents in the Titles. provide notification of intended commencement date within the Title at least 10 days prior, and any material change to the schedule and upon the conclusion of the survey. will indemnify the titleholders for any environmental incident, including any clean-up costs and statutory penalties. Take all reasonable steps to avoid any conflict with operations in the Title areas. Timing of survey.	
Flow Energy Ltd (FAR Limited	No response	
Hydra Energy (WA) P/L	Hydra have no concerns, but request to be kept informed Access Authority Agreement	Information incorporated into EP.
Finder No 9 P/L	Access Authority Agreement	
Neon Energy	Access Authority Agreement	
Santos Ltd and Santos Offshore P/L	No response	
Vermilion Oil & Gas Australia P/L	Advice provided on operations and requirements for access into areas	The final terms of access agreements are still being negotiated. Any requirements from the access agreements will be included into the Project Specific EHSQ Plan.
Woodside Energy Ltd	Negotiations underway. Agreement still pending. Woodside will negotiate agreement on the NWS JV, their 100% owned title and on behalf of other titleholders in other areas.	The final terms of access agreements are still being negotiated. Any requirements from the access agreements will be included into the Project Specific EHSQ Plan.
	Referred to communications over access agreements. Environmental requirements specified in proposed access agreement, including: promptly advise the Company of all reportable environmental incidents in the Titles. provide notification of intended commencement date within the Title at least 10 days prior, and any material change to the schedule and upon the conclusion of the survey. will indemnify the titleholders for any environmental incident, including any clean-up costs and statutory penalties. Take all reasonable steps to avoid any conflict with operations in the Title areas. Timing of survey. Requested access to the vessel's position whenever it is within 10 km of their titles	
Fisheries		
Commonwealth Fisheries Association	No response	
Western Australian Fishing Industry Council (WAFIC)	Requested information on how stakeholders were identified. Thanked Polarcus for providing information	Outlined how we identified stakeholders. Requested if there are other concerns or stakeholders we should contact

Stakeholder	Summary of Response	Assessment of Merits of Adverse Claim/Objection including response to each
		Will continue to consult with WAFIC
WA Seafood Exporters	No response	
Westmore Seafoods	No response	
TunaWest	No response	
Recfishwest	No response	
Northern Wildcatch Seafood Australia	No response	
WA Game Fishing Association	No response	
Broome Fishing Club	No response	
Australian Council of Prawn Fisheries	No response	
North Coast Shark Fishery	No response	
Australian Fishing Trade Association (AFTA)	No response	
Kimberley Professional Fishermen's Association	No response	
Jamaclan Marine Services	Noted that John Wakeford would reply. No response	
A. Raptis and Sons	No response	
MG Kailis	No response	
Australian Recreational Fishing Foundation (ARFF)	No response	
Australian Southern Bluefin Tuna Industry Association	No response	
North-west Slope Trawl Fishery	No response	
Austral Fisheries	No response	
Pearl Producers Association	The region between NW Cape and Lacepede Islands is the last remaining sustainable commercial pearl oyster fishery in the world. The main concern is the potential for impact on pearl oyster stocks, especially the recruitment to the fishery and the quality of the pearl oysters. Fishing operations are limited to no more than 35 m depth but it is thought that stocks exist to the 100m depth contour and maybe beyond. Stress from seismic airgun noise may result in pearl oyster being in a condition that is premium for use in pearl culture. Industry has concerns in relation to the impacts on the egg and larvae stages of the pearl oyster life cycle, and on the food web that supports the pearl oysters life cycle. In previous consultation, proponents have agreed a need for research studies to provide a better understanding of potential impacts and are promoting through APPEA and IAGC that this should be completed on an industry-wide approach. PPA believes that operational arrangements can be agreed between the industries to manage potential impacts of seismic surveys on in-situ pearl oyster fishing activities and divers. Pearl industry view is that the risk around seismic survey activity in this region is too high and has preference for no seismic survey activity in the region. Preference is for no seismic survey activity inside the 100 m depth contour without formal independent surveys to assess seabed habitat in deeper waters in this region for pearl oyster dependence, plus research to better understand the impact of seismic airgun noise on pearl oysters, their eggs, larvae, condition of oysters, and the associated food web.	Forwarded email to Polarcus, recommending engagement with IAGC and APPEA to investigate industry responses. Agreed to discuss at next progress meeting. It is considered that the risks of adverse impacts on pearl oysters at any life stage will be negligible. We agree that further research on seismic noise effects on pearl oysters would help to close the issue. Such research needs to be coordinated at an industry level in association with research institutions and the PPA. While research on the distribution of adult pearl oyster stocks is of great benefit to management of the fishery, it will not affect the outcomes of this assessment, as the potential for impacts is extremely low anyway. Fisheries WA holds responsibility for managing the fishery and as part of that to assess wild stocks as necessary.
	Follow up	
	PPA reiterated their concerns as detailed in email. Discussion on potential impacts, existing research on other bivalves (e.g. scallops in Bass Strait) and potential research needs. Noted that research required would need to be multi-pronged over many years, and that an industry response is more appropriate than individual response.	
	Formal response with assessment of merits, and invitation for ongoing consultation.	
Pilbara Demersal Scalefish Fisheries licence holders		
Trawl		

Stakeholder	Summary of Response	Assessment of Merits of Adverse Claim/Objection including response to each
Seafresh Holdings Pty Ltd	Telephone conversation confirmed they had received consultation information. Noted they have been 'swamped' with consultation requests in recent months. Noted that data sent by titleholders is often in formats which make it difficult to interpret (i.e. not able to easily overlay location data on their fishing areas). Noted that seismic operations can cause displacements of their fishing. Suggested that it would be better if O&G titleholders could prepare consultation material relevant to the locations and timings of individual fishers. Email requesting location data in ASCII format. No further response	Polarcus response pointed out that information on locations and timing is not publicly available, but data will be provided in a format easily input to vessel navigation systems. Sent location data in ASCII format. Polarcus agrees that that large number of consultation requests may be fatiguing for fishers, but is required to attempt consultation. Polarcus agrees that targeted consultation would make it easier for fishery stakeholders to respond, however the data required to target consultation is not publicly available.
GNTM Pty Ltd (operated by MG Kailis Pty Ltd)	See consultation records for MG Kailis Pty Ltd below.	
MG Kailis Pty Ltd	Telephone conversation confirmed that GNTM Pty Ltd and EA Morrison & SD Bransby licences are operated by Kailis and requesting consultation information to. No further response to date.	RPS sent consultation information
EA Morrison & SD Bransby (operated by MG Kailis Pty Ltd)	See consultation records for MG Kailis Pty Ltd above.	
Trap		
KJ Lockwood & MN Manifis Trading as Western Offshore Fishing & Charter	No response	
Old Brown Dog Pty Ltd	No response	
Line		
Victor & Marie Filippou	No response	
MG Kailis Pty Ltd	See consultation records for MG Kailis Pty Ltd.	
RnR Fisheries Pty Ltd	No response	
Western Wild Fisheries Holdings Pty Ltd	Telephone conversation: noted his belief that previous seismic operations had impacted their operations. Asked for consultation material to be sent to him. Said that he would forward it on to relevant person. Email response: "In response to your notification of intention to carry out seismic surveys within the Pilbara fishing zone, we wish to formally lodge objection to these surveys for the following reasons. It is our opinion that, in the short term, seismic surveys have an adverse effect on fish stocks with regards to aggregation, stress and in some instances physical harm. (http://www.abc.net.au/science/articles/2003/02/14/784754.htm) There is evidence that seismic surveys have adverse effects on fish stocks in the long term. E.g. effects on breeding, disruption of migratory patterns. (Studies have shown there is increased mortality rate in fish There is some evidence that seismic surveys may affect the primary food chain of targeted line fish, (cephalopods, zooplankton etc.) Ongoing and Increased seismic activity in these areas is limiting the available grounds we are entitled to operate in. Given that each Pilbara line licence is permitted to operate for 5 months per year, a seismic survey will have an immediate effect of reducing our ability to fish within that area by 20%. This does not take into account the after effects of the seismic activity. Increased vessel activity associated with oil and gas exploration, construction and extraction exposes our vessel and crew to additional safety risks, due to vessel interaction, that traditionally we have not had to contend with. We expect fair cooperation and compensation for this disruption." Polarcus preparing response to specific concerns re impacts on fish stocks and food chains and to compensation request. Will maintain ongoing contact to ensure 'fair cooperation' through minimising disruption of planned fishing activities. The ability to vary the survey timing will be necessarily constrained by environmental considerations already integrated into the EP, e.g. avoiding shallow waters adjacent turtle nesting beaches during nesting season.	Sent consultation material by email. Temporary displacement of fishers is considered credible, but any particular location will be affected for a short time while the MSS vessel traverses the ground. Polarcus will notify all identified fisheries stakeholders (including management agencies, industry bodies and licence holders) prior to the commencement of seismic acquisition. A detailed description of the areas and times when seismic acquisition will occur will be provided. Polarcus will request that fishers do not lay traps or set fishing gear within these areas at these times. Polarcus will request contact details for fishers operating in the area, so that they can be advised of detailed timings and locations of the seismic survey. A support vessel and chase vessel will be available to mitigate interactions with commercial fishers. Seismic survey planning will be adapted where possible to avoid specific locations and times identified by fishers. Polarcus will consider a safe navigation distance around the seismic vessels and advise the fishers as part of the activity notification. The information provided in the EP indicates: • that larger mobile fishes will avoid the seismic source and will not be exposed to noise levels high enough to cause physiological impacts, and • site-attached fish in shallow reef habitats will not be exposed to noise levels high enough to be expected to cause physiological damage. Polarcus is preparing a detailed response to the stakeholder/s outlining the evidence for the conclusion that the survey will not adversely affect the fish stocks. The site-attached fishes are not commercial target species, so the response will focus on the larger target species including pelagic species and fish eggs and larvae. Further discussion on the issue will be invited. The bridge watch on the seismic vessel will keep a 24 hour lookout and the chase vessel will be patrolling ahead to spot fishing gear such as trap lines. Coupled with the controls described in the EP, it is considered highly unlikely that loss or damage to fishing gear would occur. Polarcus will notify all identified fisheries stakeholders (including management agencies, industry bodies and licence holders) prior to the commencement of seismic acquisition. A detailed description of the areas and times when seismic acquisition will occur will be provided. Polarcus will request that fishers do not lay traps or set fishing gear within these areas at these times. Polarcus will request maritime contact details for fishers operating in the area, so that they can be advised of detailed timings and locations of the seismic survey. A support vessel and chase vessel will be available to mitigate interactions with commercial fishers.

Stakeholder	Summary of Response	Assessment of Merits of Adverse Claim/Objection including response to each
		The information provided in the EP indicates that there are unlikely to be any significant impacts on spawning or breeding fish. Additionally, no information is available on the locations of spawning fish, so it is not possible to consider exclusion zones. It is considered highly unlikely that the seismic survey would pose safety issues for fishers. The vessel will be supported by a chase and support vessel and has state of the art navigation and communications equipment. The ends of the streamers are clearly marked to show their position to other vessels at night. The information provided in the EP indicates that prey species are only likely to be affected within metres of the seismic source. No significant effects are expected. Polarcus will prepare a detailed response to the stakeholder/s outlining the evidence for this conclusion. The stakeholder has not provided evidence of financial loss, or potential financial loss. Polarcus will engage directly with the stakeholder.
Mr Glenn Money	No response	
Haydn Webb	No response	
Robert & Leigh Mitchell	No response	

7.2 Ongoing Consultation

Polarcus is committed to ongoing consultation with all relevant stakeholders, prior to, during and following the Rosemary 3D MSS. If ongoing consultation identifies any significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk that is not provided for in the EP, Polarcus will revise the EP.

Specific ongoing consultation requirements are identified in Table 7-2. If at any time, additional stakeholders are identified, then Polarcus will contact the new stakeholders and ask for their feedback. If existing stakeholders raise additional concerns then these will be assessed, and a risk assessment undertaken, if necessary, and a response provided.

Table 7-2: Ongoing Consultation

Stakeholder	Ongoing communication schedule
Commonwealth Government	
AMSA	Polarcus provide final survey location and timing to AMSA RCC 2 weeks prior to commencing acquisition (email). Daily reports to RCC
AHO	Polarcus provide final survey location and timing to AHO 2 weeks prior to acquisition (email). Issue Notice to Mariners
WA Government	
Department of Fisheries	Polarcus to provide final survey details to WA Department of Fisheries prior to commencing acquisition (email).
Department of Mines and Petroleum	Polarcus will provide final survey location, timing and vessel communication information >1 month prior to acquisition (email).
Department of Transport	Polarcus will provide final survey location, timing and vessel communication information >1 month prior to acquisition (email).
Oil and Gas	
All oil and gas stakeholders will be, or attempted to be, notified at least three weeks before the survey commencing, at regular periods throughout the survey and at the completion of the survey.	
Chevron Vermillion Woodside	Consultations will continue with these titleholders to finalise access agreements and measure to manage operations in close proximity. Environmental requirements specified in proposed access agreement, including: promptly advise the Company of all reportable environmental incidents in the Titles. provide notification of intended commencement date within the Title at least 10 days prior, and any material change to the schedule and upon the conclusion of the survey. will indemnify the titleholders for any environmental incident, including any clean-up costs and statutory penalties. Take all reasonable steps to avoid any conflict with operations in the Title areas. Timing of survey. If necessary, SIMOPS plans will be developed in conjunction with the titleholders
Fisheries	

Stakeholder	Ongoing communication schedule
Polarcus will notify all identified fisheries stakeholders (including management agencies, industry bodies and licence holders) prior to the commencement of seismic acquisition. A detailed description of the areas and times when seismic acquisition will occur and details of the seismic array, navigational aids (lights and shapes), safe stand-off distances and contact details, will be provided. Polarcus will request that fishers do not lay traps or set fishing gear within the seismic survey areas at these times. A support vessel and chase vessel will be available to mitigate interactions with commercial fishers. Any feedback or complaints received during the survey will be recorded by the Vessel Master and such feedback and responses will be reported in the Survey Close-out Report. Polarcus will request vessel contact details for fishers operating in the area (email, satellite phone, marine radio and facsimile), so that they can be advised of detailed timings and locations of the seismic survey. Polarcus will issue fortnightly updates on vessel movements to fishery stakeholders. While email is the preferred means of transmitting figures and detailed information on the survey plans, fishers may not have reliable access to internet notices at sea. Fishers will be contacted by radio or facsimile if contact cannot be established via email.	
Pearl Producer's Association	Consultation with the PPA will continue.
Western Wild Fisheries Holdings Pty Ltd	Consultation will continue. Polarcus will provide the responses described in Table 7-1 above.

8.0 DETAILS OF THE TITLEHOLDER'S NOMINATED LIAISON PERSON FOR THE ACTIVITY

Polarcus is the titleholder of a Special Prospecting Authority (SPA) and a number of Access Authorities under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act).

The details of the titleholder are:

Polarcus Seismic Limited (ABN: 75 214 908 956)
Address: c/o Polarcus DMCC
Almas Tower, Level 32
Jumeirah Lakes Towers
PO Box 283373, Dubai
UAE
Phone: +971 4 43 60 800
Fax: +971 4 43 60 808
Email: info@polarcus.com

The titleholder's nominated liaison person is:

Name: Nina Neshpor
Address: Almas Tower, Level 32
Jumeirah Lakes Towers
PO Box 283373, Dubai
UAE
Phone: +971 4 43 60 959
Fax: +971 4 43 60 808
Email: nina.neshpor@polarcus.com

If there are any changes to the titleholder, the titleholder's nominated liaison person or a change in the contact details for either the titleholder or the liaison person, NOPSEMA and the National Offshore Petroleum Titles Administrator (NOPTA) will be notified in writing, within 30 days of the change, using the approved form/s.