ENVIRONMENT PLAN

Santos Limited

Santos WA-264-P OBC Seismic Survey

March 2008

CR 1359_2_ExSum_v1-1

Santos

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CONTENTS

1. EXECUTIVE SUMMARY

1.1 The Proponent

Santos Limited (Santos) is the proponent for the ocean bottom cable (OBC) seismic survey within Western Australian Exploration Licence WA-264-P (and one additional line in WA-12-R).

Santos is a major Australian energy company with its headquarters in Adelaide, and is the largest producer of natural gas for the Australian market supplying all mainland States and Territories. The core business of the company is oil and gas exploration and production with interests in every major Australian petroleum province. Santos has been exploring and producing hydrocarbons on the North West Shelf (NWS) offshore north Western Australia for the last 17 years.

1.2 The Proposal

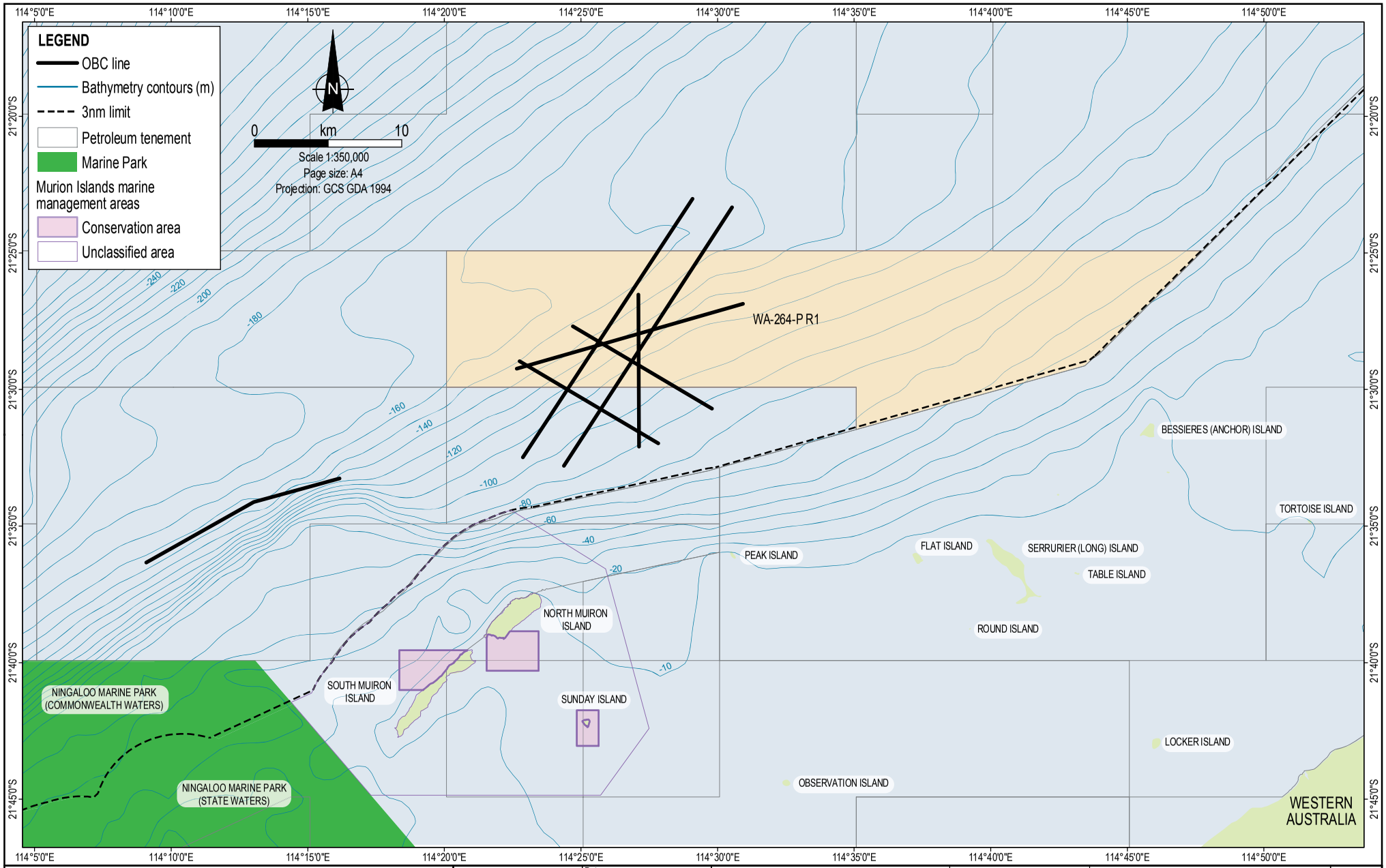
Santos proposes to acquire 99 km (receiver line) / 121 km (source acquisition) of 2D OBC seismic survey data, covering an area of approximately 320 km^2 in Western Australian Exploration Licence WA-264-P and WA-12-R. The survey will be undertaken entirely within Commonwealth waters in the Barrow Sub-basin, which is located in the Carnarvon Basin, in water depths ranging from 70 – 160 m (Figure ES1, ES2).

The proposed WA-264-P OBC Seismic Survey is scheduled to occur over approximately 14 days, with the vessel acquiring data during daylight hours. Deployment vessels will retrieve and deploy cables at night. The Environment Plan covers the activities undertaken as part of the seismic survey.

The survey will be conducted using several vessels, including a support/accommodation vessel, source vessel, recording vessel and a deployment vessel. These vessels are required for the proposed OBC seismic survey within and extending beyond the exploration licence boundaries of WA-264-P (Figure ES2).

The marine seismic survey proposed is a typical 2D OBC seismic survey conducted in Australian marine waters (in terms of technical methods and procedures). An acoustic source array is used with the source vessel transiting over the lines where the receivers have been installed on the ocean floor. The receivers are connected to a recording vessel which is anchored to the side of the survey area. The seismic survey source vessel will complete long-axis acquisition transects of the survey lines that will extend approximately 2 km beyond the end of each receiver line. Following acquisition of this data, the cables will be recovered and the process repeated to cover the 99 km of receiver line required.

The source vessel will consist of a 15 m catamaran, which includes a 5,000 psi compressor, capable of maintaining air to an acoustic source airgun. The acoustic source in this instance will comprise one source array consisting of six air guns with a combined capacity of 900 cubic inches, operating at approximately 15 second intervals.



Source:
Survey lines digitised from 'WA-264P OBC 2D Trial Water Depths", Santos. Accuracy may be compromised.
Petroleum tenements from Geoscience Australia
Marine parks from GEODATA TOPO 250k (Optimum scale 1:250,000)
Murion Islands Marine Management Areas from DEC

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Date: 13.02.2008
MXD: Santos_SeismicSurveyGIS
File Name: NSYSABTF1359AA_02_ES001_GIS_AI

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Executive Summary

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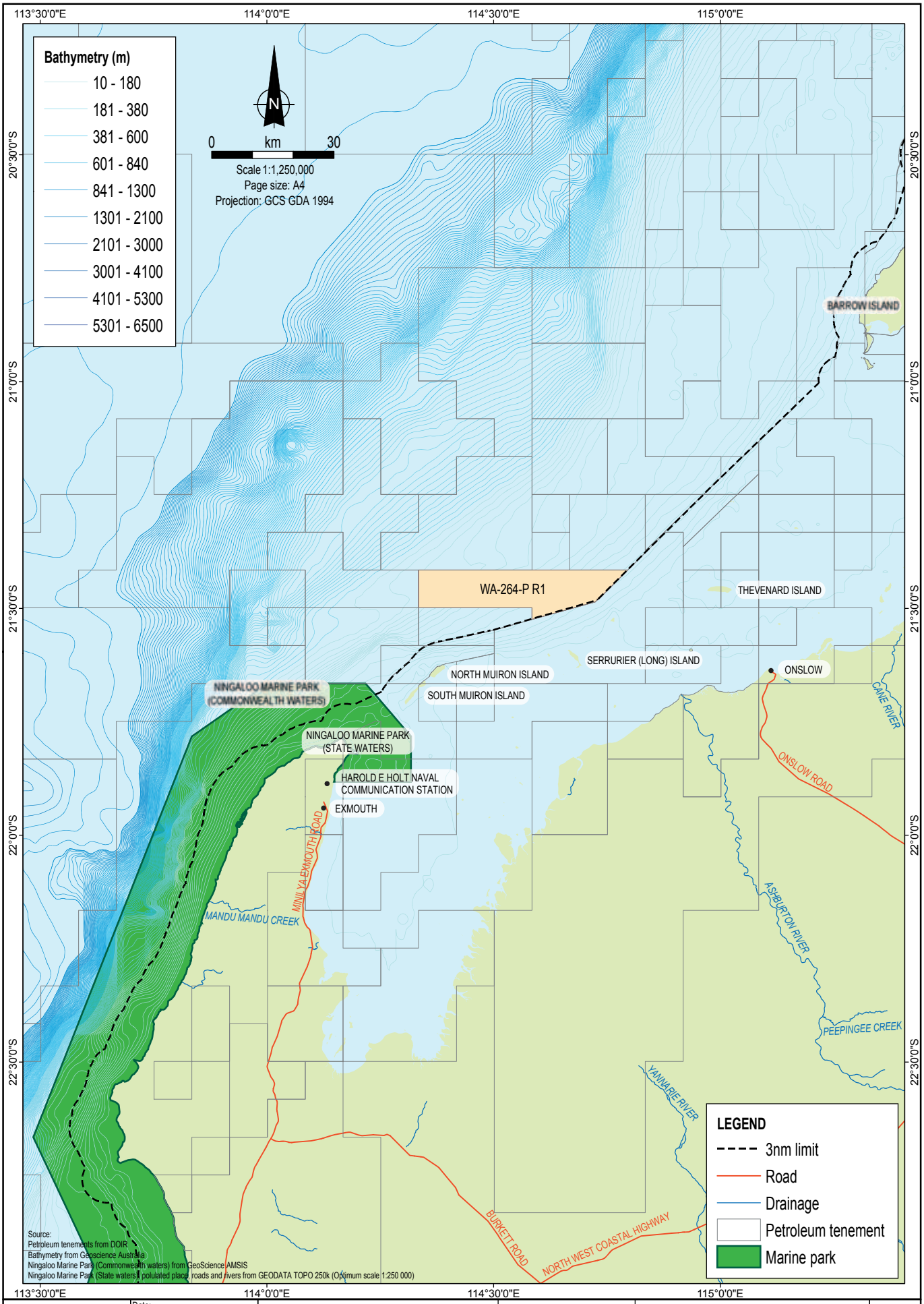
Location of the proposed WA-264-P OBC survey lines

Figure No: ES1



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Date: 21.11.2007
MXD: SantosSeismicSurveyGIS.mxd
File Name: NSYSABTF1359AA_02_F002_GIS_AI

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Executive Summary

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Location of the proposed WA-264-P OBC survey area

Figure No: ES2

1.3 The Environment

The environment regionally and in the location of the survey includes the following:

- Unconsolidated sediments that support a diverse benthic infauna, consisting predominantly of mobile burrowing species, which include molluscs; crustaceans (crabs, shrimps and smaller related species); polychaete, sipunculid and platyhelminth worms; asteroids (sea stars); echinoids (sea urchins), and other small infaunal animals.
- Listed threatened species and listed migratory species that may be found within the region of the survey area. These species are likely to be transient through the permit area and it is highly unlikely that any areas of the permit are habitat critical to their survival.
- The proposed survey will not coincide with any part of threatened humpback whale annual migrations into the survey area.
- The Ningaloo Marine Park (18 km away from survey area) has had a population of 1,000 dugongs, distributed across the whole Ningaloo reef tract. Given this species preference of shallower coastal waters containing seagrasses, it is unlikely that the proposed survey will impact on any migration or breeding behaviour of this species.
- Four species of marine turtle nest on sandy shore sites of the Dampier Archipelago, Montebello Islands, Muiron Islands, Lowendal Islands, Barrow Island, Airlie Island, Thevenard Island, other coastal islands and the Exmouth region. These include the loggerhead turtle, the green turtle, the hawksbill turtle and the flatback turtle. The leathery turtle is also known to visit open waters.
- Sea snakes are widespread throughout waters of the NWS and are frequently observed in the surrounding waters to Varanus Island. They can be highly mobile and cover large distances or they may be restricted to relatively shallow waters and some species must return to land to eat and rest.
- The demersal habitat of the NWS hosts a diverse assemblage of fish, with up to 1,400 species known to occur, with a great proportion of these occurring in shallow coastal waters. Many of these are commercially exploited by trawl and trap fisheries. Pelagic fish in this area include tuna, mackerel, herring, pilchard and sardine, and game fish such as marlin and sailfish.
- Whale sharks, the world's largest fish (growing up to 12 m in length), are oceanic and cosmopolitan in their distribution, however, they do aggregate in and near the waters of the Ningaloo Marine Park during autumn, approximately 20 km from the survey area.
- Corals occur on the submerged limestone reefs and submarine slopes as fringing reefs and patch reefs in the shallow waters (5 to 20 m) to the south, east and north of the Muiron Islands.
- There are currently 3 Marine Conservation Reserves in the North West Shelf region: Ningaloo Marine Park and Muiron Islands Marine Management Area (18 km south), Montebello/Barrow Islands Marine Conservation Reserves (90 km northeast) and Dampier Archipelago Marine Park and Cape Preston Management Area (approximately 200 km north).

1.4 Stakeholder Consultation

In the course of planning the proposed seismic program and developing the Environment Plan, Santos have undertaken consultation with relevant stakeholders in the region to identify regulatory processes, potential environmental issues and management requirements. Santos will undertake ongoing consultation to ensure the seismic survey management arrangements and communications are in place.

Stakeholders of relevance to the WA-264-P OBC Seismic Survey include:

Commonwealth Government

- Department of the Environment, Water, Heritage and the Arts (DEWHA).
- Department of Industry, Tourism and Resources (DITR).
- Australian Safety Maritime Authority (AMSA).

Western Australian State Government

- Department of Industry and Resources (DoIR).

The following organisations have been contacted and informed of Santos' proposed seismic program:

- Australian Fisheries Management Authority (AFMA)- contacted 12 December 2007, AFMA advised there is no identified fishing activity in the location and to consult with WAFIC, CFA and WA Department of Fisheries.
- Western Australian Fishing Industry Council (WAFIC)- contacted 12 December 2007.
- WA Department of Fisheries - contacted 12 December 2007.
- Border Protection Command.
- Commonwealth Fisheries Association- contacted 12 December 2007.

1.5 Environmental Impact Assessment, Management and Mitigation

Referral and assessment of the WA-264-P OBC Seismic Survey under the EPBC Act by the DEWHA determined on 17 December 2007 that the project was not a 'controlled action'.

The components of the seismic survey and survey-related activities that could result in environmental risks and effects include:

- Operation of the seismic source, recording and deployment vessels.
- Discharge of the air source arrays in the survey area.
- Cable placement, anchoring or grounding.
- Routine waste discharges from support vessels where recording personnel will be housed.
- Accidental fuel and oil spills from the support vessels.
- Collision with another vessel.

The Environment Plan provides a detailed assessment of potential impacts. The key points of the assessment, and management and mitigation measures are summarised in Table ES1 below. The summary risk ranking is shown in Table ES1, there are a total of 10 environmental risk

assessments, 7 of these were assessed as having low risk and 3 assessed as having a moderate risk.

Table ES1 Summary of environmental impact assessment results

Impact Assessment	Management and Mitigation	Risk Ranking
Acoustic discharge: High Intensity sound discharge Pathological damage to hearing systems or other organs of marine fauna.	The timing of the WA-264-P OBC seismic survey does not coincide with listed threatened whale activity in the area. DEWHA management guidelines for seismic vessels will be implemented. Highly unlikely that a cetacean will be within 2 km of an active acoustic source, due to the implementation of soft start procedures. Highly unlikely that a cetacean would be exposed for sufficient duration to cause hearing damage.	Low
Acoustic discharge: High Intensity sound discharge Behavioural / lifecycle changes to cetaceans. Avoidance measures.	Stand off or avoidance measures not expected to cause gross changes in behaviour or normal activities. DEWHA management guidelines for seismic vessels will be implemented. Highly unlikely that a whale will be within 2 km of an active acoustic source, due to the implementation of soft start procedures.	Moderate
Acoustic discharge: High Intensity sound discharge impacting fish species Behavioural / lifecycle changes and startle response. Possible pathological effects.	Behavioural changes likely to be localised and temporary (alarm, avoidance, tighter schooling). Any “flight” response is likely to be localised and short term. Effects of seismic on larval fish and invertebrate populations are negligible when compared to total population sizes. Impacts will be limited to the duration of the survey (approximately 14 days including potential standby time). Soft-start procedures will prevent sudden exposure.	Low
Vessel travelling through permit area: Physical presence of the vessel Collision with marine mammals causing injury or death.	Due to the size and speed of the vessel, the noise generated by engines and the acoustic array, it is considered that animals would be able to easily avoid the vessel. DEWHA management guidelines for seismic vessels will be implemented.	Low
Vessel travelling through permit area: Physical presence of the vessel Behavioural changes to marine mammals.	Possible behavioural changes in response to the physical presence of the vessel are considered to be similar, although less intense, than those associated with sound discharges.	Low

Table ES1 Summary of environmental impact assessment results (cont'd)

Impact Assessment	Management and Mitigation	Risk Ranking
Vessel travelling through permit area: Physical presence of the vessel Interference to fishing or third party activities. Potential exists to temporarily exclude fishing activities during the survey. May require minor modification to the course of third party vessels during the survey. Adverse impacts will be localised and short term. Artificial light from vessels attracting marine life (turtles). Vessel anchoring.	Possible that commercial fishing vessels may be operating in the survey area during the time of survey, although fishing activity is expected to be limited. Possible that shipping operators may wish to travel through the survey area during the time of survey, although the permit area is approximately 20km from major shipping lane in the region. Consultation strategy shall be in place to advise of the location and schedule of the seismic survey and to ensure that any impacts on other users are minimised. Seismic Contractor shall remain vigilant for fishing and other commercial vessels during the survey, utilise radar and satellite navigation systems to ensure sufficient warning of other vessels approaching the survey area and establish communications to avoid conflict. Record of consultation with commercial fisheries groups shall be kept and made available to regulatory authorities upon request. AMSA will be formally contacted regarding the survey and standard maritime safety procedures shall be adopted.	Moderate
Vessel travelling through permit area: Routine waste discharges to sea Minor changes to water quality and nutrient level that are short term and localised. Minor changes to feeding patterns of fish species. Low level contamination or toxic effects to fish species and plankton.	Dilution and decomposition will reduce nutrient levels over time. No discharge to sensitive environments (i.e. within 12 nm of any land, in areas of environmental sensitivity or shallow waters). All other waste shall be retained onboard for appropriate disposal on-shore. Waste discharges limited to food scraps and sewage. Sewage treated prior to disposal offshore and food scraps shall be macerated (<25 mm). Disposal will conform to the requirement of MARPOL Annex IV.	Low
Vessel travelling through permit area: Ballast water discharge Introduction of marine pests, introduction of disease or change in local ecological processes.	Ballast water will be managed in strict accordance with the AQIS guidelines.	Low

Table ES1 Summary of environmental impact assessment results (cont'd)

Impact Assessment	Management and Mitigation	Risk Ranking
Cable laying and retrieval: Impact to seabed Pathological effects to fish larvae and ingestion by marine organisms. Smothering of marine flora and fauna.	Seismic cables will be fit for purpose, not outside design life limits and regularly checked for damage. Solid core cables will be used which eliminates leaks. Cables are laid tight, so there is no loose sections that increase the risk of entanglement. Cables are smaller than conventional seismic cables and have smooth outer coating preventing entanglements. No significant features within the survey area identified from known bathymetry. Oil spill response procedures are detailed in the contractor Shipboard Oil Pollution Emergency Plan (SOPEP). All necessary oil spill contingency equipment shall be maintained to ensure it is functional and accessible.	Low
Vessel travelling through permit area: Physical presence of the vessel leading to accidental fuel and oil spills Contamination of marine environment. Pathological effects to fish larvae and ingestion by marine organisms. Smothering of marine flora and fauna. Contamination of landforms.	A major event resulting in a large release of fuel is not considered likely. Collision incidents are unlikely due to: - Fuel capacities of vessels small (Section 5.2.5) limiting the potential for any unlikely spills to reach the nearest sensitive location of the Muiron Islands. - At sea refuelling will be undertaken in accordance with contractor procedures and will only occur when sea states allow for safe transfer operations. In adverse conditions refuelling will be undertaken in port. Spill response measures include: - Spill volumes are likely to be small and the material can be expected to disperse rapidly and breakdown quickly. - Onboard spills will be cleaned up immediately using absorbent pads. The absorbent material will be properly disposed of onshore. - Oil and chemical spill containment and cleanup material (e.g., absorbent) will be available where spills are possible, including on small boats. - The Seismic Contractor vigilant for other vessels during the survey and emergent landforms and utilise radars and satellite navigation system. - Oil spill response procedures are detailed in the contractor Shipboard Oil Pollution Emergency Plan (SOPEP).	Moderate

In summary, the offshore seismic survey is located in Commonwealth waters in the Barrow Sub-basin, which is located in the Carnarvon Basin. The transient nature and short duration of the

survey (14 days) means that the activity has a low to moderate impact on the marine environment.

Stakeholders have been consulted, especially fishing groups, and mitigation measures have been put in place to manage interaction with whales that may be present at the time of the survey.

Detailed management and mitigation measures that will be followed during the project are provided in the Environment Plan. The implementation strategy for the Environment Plan specifically details the measures needed to ensure that the environmental performance objectives and standards are met, and identifies:

- Systems, practices and procedures.
- Specific roles and responsibilities.
- Employee training.
- Monitoring, auditing and recording requirements.
- Emergency response planning.
- Consultation with government and stakeholders.

1.6 Contact Details

Please direct all queries, comments or requests for a copy of the approved WA-264-P OBC Seismic Survey Environment Plan to:

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