



FISHBURN 2D MARINE SEISMIC SURVEY

ENVIRONMENT PLAN SUMMARY

FISH-2012-PLN-0001A

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Abbreviations and Acronyms

AHO	Australian Hydrographic Office
AFMA	Australian Fisheries Management Authority (Cth)
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority (Cth)
APPEA	Australian Petroleum Production and Exploration Association
AQIS	Australian Quarantine Inspection Service (Cth)
AS	Australian Standard
BoM	Bureau of Meteorology (Cth)
CAMBA	China-Australia Migratory Birds Agreement 1974.
EP	Environment Plan
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERP	Emergency Response Plan
FPSO	Floating Production Storage and Offloading Unit
GDA	Geodetic Datum of Australia
IAPP	International Air Pollution Prevention
IMS	Invasive Marine Species
IOPC Fund	International Oil Pollution Compensation Fund
ISO	International Standards Organisation
JAMBA	Japan-Australia Migratory Birds Agreement 1974
JBG	Joseph Bonaparte Gulf
MARPOL	International Convention for the Prevention of Pollution from Ships
MDO	Marine Diesel Oil
MGA	Map Grid of Australia
MMO	Marine Mammal Observers
MSS	Marine Seismic Survey
MSDS	Material Safety Data Sheet
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
OPGGS	<i>Offshore Petroleum and Greenhouse Gas Storage (Act and Regulations)</i>
OSCP	Oil Spill Contingency Plan
OWS	Oily water separator
PMS	Planned Maintenance Systems
RCC	Rescue Coordination Centre
ROKAMBA	Republic of Korea Australia Migratory Birds Agreement
SOPEP	Shipboard Oil Pollution Emergency Plan
STP	Sewage Treatment Plant

1 Introduction

Santos Offshore Pty Ltd (Santos), a fully owned subsidiary of Santos Ltd, is proposing to undertake the Fishburn 2D Marine Seismic Survey (the 'survey') within Commonwealth waters of the Joseph Bonaparte Gulf (JBG).

Exploration Permit WA-459-P was granted to Santos Offshore Pty Ltd in November 2011 and the proposed work program requires the acquisition of a minimum of 300 km of 2D seismic data during the second permit year which is from 8 November 2012 to 7 November 2013. Santos Offshore Pty Ltd is the Instrument Holder and Operator and holds 100% interest in the exploration permit.

This document is a summary of the Fishburn 2D Marine Seismic Survey Environment Plan (the EP) prepared by Santos and approved by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 7 March 2013. It has been prepared in accordance with Regulation 11(8) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations, 2009 (OPGGS (E) Regulations)*.

In accordance with Regulation 4(1) of the *OPGGS (E) Regulations*, the EP applies to a defined 'Petroleum Activity'. For the Fishburn 2D Marine Seismic Survey this is defined as:

'from the time the seismic vessel enters permit area WA-459-P and deploys its seismic array of airguns and streamers until the time the vessel retrieves the array and departs WA-459-P.'

2 Project Location and Coordinates

The survey is located within Commonwealth waters of the JBG, 65 km from the nearest landfall and approximately 230 km north of Wyndham and 320 km west of Darwin. The survey will take place primarily in Permit WA-459-P, but may also extend into adjacent Permit WA-454-P and unallocated acreage (refer Figure 1). Water depths across the permit range from approximately 80 m to 100 m deep. The coordinates and lengths of each seismic line are provided in Table 1.

Table 1: Coordinates and lengths of the proposed seismic lines

Seismic Line Name	Length in Km	GDA 1994 – Degrees Minutes Seconds			
		Latitude - Start	Longitude - Start	Latitude - End	Longitude - End
BNSN12-01	54.25	12°51'24.861"S	127°29'56.240"E	13°15'43.872"S	127°46'50.377"E
BNSN12-02	47.60	13°4'12.596"S	127°20'7.303"E	12°50'52.064"S	127°42'39.495"E
BNSN12-03	54.25	12°53'3.831"S	127°27'26.579"E	13°17'33.591"S	127°44'4.492"E
BNSN12-04	48.98	13°7'44.488"S	127°20'54.990"E	12°54'5.848"S	127°44'9.644"E
BNSN12-05	54.25	12°55'52.092"S	127°23'15.196"E	13°20'6.451"S	127°40'16.410"E
BNSN12-06	49.73	13°10'17.827"S	127°22'1.731"E	12°56'22.803"S	127°45'35.631"E
BNSN12-08	49.98	13°13'56.667"S	127°23'50.052"E	12°59'27.536"S	127°47'12.568"E
BNSN12-10	43.35	13°14'41.643"S	127°28'45.823"E	13°2'11.351"S	127°49'4.922"E
BNSN12-12	42.48	13°16'54.311"S	127°30'52.353"E	13°4'37.414"S	127°50'45.929"E

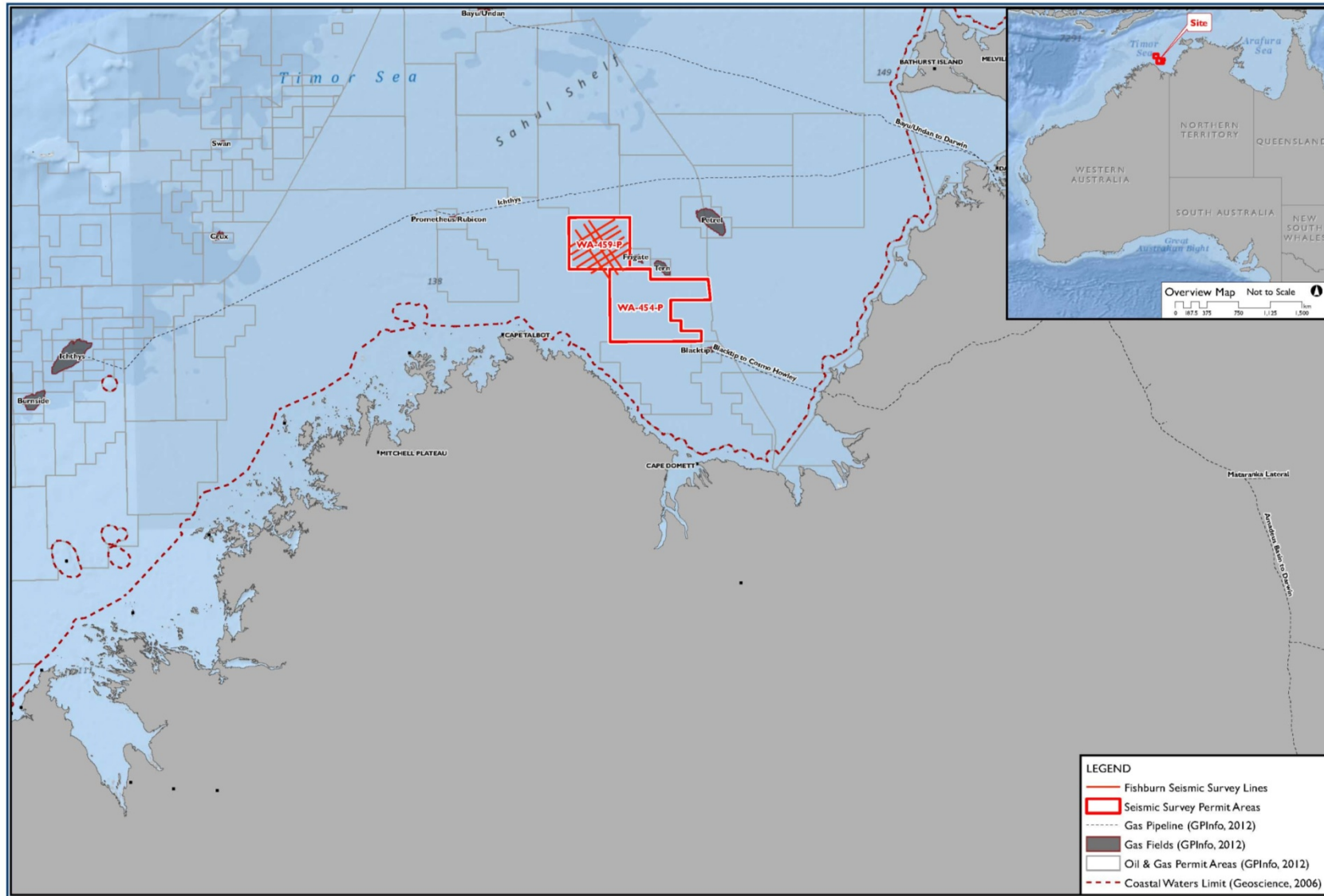


Figure 1

Proposed Seismic Survey Location

3 Project Activity Description

Santos is required to carry out a 2D seismic survey of the permit before 7 November 2013. Due to the survey's small size and short duration Santos plans to opportunistically take advantage of a vessel that may be operating in or transiting through the region during 2013. Consequently the exact timing of the survey and details of the seismic vessel are not known at this stage.

The survey is expected to take between five to eight days to complete, depending on weather conditions and operating efficiencies. It will occur between January and November 2013, depending on vessel availability. Survey operations will be undertaken 24 hours a day. Santos will notify NOPSEMA and other key stakeholders of the commencement date of the survey when known.

The survey will be undertaken by a specialist seismic contractor, using a purpose built seismic survey vessel. Nine seismic lines covering approximately 500 linear km in total are planned. While acquiring the data the seismic vessel will move at a speed of approximately five knots. Although the seismic contractor and survey vessel have yet to be confirmed, it is likely that the seismic energy source will be provided by either a single or double airgun array with a total capacity of between 3,200 cubic inches and 6,300 cubic inches, depending on vessel availability. Operating pressure of the airgun array will be approximately 2,000 psi. The array will be towed astern of the survey vessel at a depth of approximately 6 m and the airguns may be discharged at a seismic pulse interval of approximately 25 m.

Seismic reflections from subsurface layers will be detected by a series of hydrophones inside solid (most likely) or fluid filled streamers which will be no longer than 10,000 m in length and towed behind the vessel at depths of no more than 15 m.

The distance between seismic lines averages 10 km and the vessel may travel up to a maximum speed of 10 knots whilst in transit to the next seismic line. The seismic equipment (array and streamers) will not be retrieved from the water between lines. When seismic data is not being acquired (during line turns or when transiting at night-time or in low visibility), the smallest gun of the array (approximately 40 cubic inches) will be isolated and fired independently to provide a warning to marine fauna of the presence of the equipment.

A support / scout vessel will be used for logistical, safety and equipment management support. Vessels are likely to utilise marine gasoil (marine diesel) and have a bunker capacity of no greater than 800 m³. Due to the very short duration of the survey no vessel refuelling, crew changes or anchoring are anticipated to be required during the survey. Crew changes or anchoring will only occur in the event of an emergency situation.

4 Description of the Receiving Environment

4.1 Physical

The entire JBG is located in the North-West Shelf (NWS) transition province located within both the North Marine and the North-West Marine bioregions of northern Australia. The NWS transition province is heavily influenced by oceanic currents, with the Indonesian Through-flow responsible for bringing cooler oceanic water. Coastal outflows, driven by monsoonal activity contribute to regional biological productivity.

The JBG is an extensive, shallow (typically < 100 m deep) carbonate dominated platform adjacent to the Sahul Shelf and comprises soft substrate expanses with localised rocky outcrops, gravel deposits and raised features. Sediments of the coastal zone include fine mud and silt. The mid-shelf environment is dominated by soft sediments with relatively little seabed structure or sessile epibenthos, with a scattering of shoals, terraces and pinnacles rising from about 80 m to about 40 m depth. Bathymetry and seabed features of the survey area are expected to be representative of those

commonly found throughout the JBG, dominated by soft sediments with relatively little seabed structure.

The climate of the JBG is tropical monsoonal, with a distinct wet summer season (November to April) and dry winter season (May to October). Sea surface temperatures are high during the wet season, averaging 28 to 31°C, and approximately five degrees lower in the dry season.

The wet season is characterised by the north-west and south-west winds of the north-west monsoon with potential for the development of tropical cyclones. The long term annual average rainfall is in excess of 1,000 millimetres (mm), with the majority falling between December and March. The dry season is characterised by north-east and south-east winds generated over inland Australia, resulting in dry and warm conditions with little rainfall and low relative humidity.

The JBG is protected from swells generated in the Southern Ocean and any swells are generated by cyclones or prolonged strong winds. Short period sea waves are generated by local winds and reflect the wind directionality. Tidal ranges exceed 8 m along the western side of the JBG during spring tides.

4.2 Biological

Benthic Environment

The epibenthos of the JBG is generally sparse, although rocky outcrops in the far north-west support high abundances of epibenthic fauna. The benthic assemblages of the survey area are expected to comprise marine invertebrates such as prawns and polychaetes associated with the soft sediments common across the survey area.

Pelagic Environment

Marine migratory species such as cetaceans, sharks, marine turtles, fish and seabirds may traverse the survey area. Ten Threatened species (of which nine are also listed as Migratory) and an additional six Migratory species were identified. The survey area does not contain any Threatened Ecological Communities or critical habitat for any Threatened or Migratory cetaceans, marine turtles, fish, sharks or seabirds.

Four species of shark and ray listed as Threatened and / or Migratory under the EPBC Act may occur in the survey area. The green sawfish has been recorded in the JBG, and it is thought that adults may use offshore waters for foraging, returning seasonally to inshore coastal waters to breed. The species may occur in the survey area but is unlikely to be present in large numbers. Whale sharks may occur in the area; research suggests they are migratory and undergo seasonal movements. As the survey area does not contain any recognised whale shark aggregation areas or areas where seasonal food pulses are known to occur, only very low numbers of transient whale sharks may be present during the survey. Due to their widespread distribution in Australian waters, shortfin and longfin mako sharks may be encountered, albeit in low numbers in the survey area.

Six species of marine turtle may occur in the survey area, all of which are listed as Threatened and Migratory under the *Environment Protection Biodiversity Conservation Act, 1999* (EPBC Act). All six species are known to undertake migrations between foraging grounds and nesting beaches, and four of the listed marine turtle species have been recorded regularly nesting in the region.

Flatback, green, hawksbill, and leatherback turtle nesting seasons may overlap with the timing of the survey. However as the survey area is distant from nesting beaches and areas of importance for these species and / or does not represent suitable foraging habitat, only low numbers of these species are likely to occur within the survey area. The lack of seagrass and reef within the survey area indicates that only low numbers of loggerhead turtles could be expected to be encountered within the area. Olive ridley turtles are known to forage in the northern and southern JBG during the nesting season and moderate numbers of this species may be encountered in the survey area.

Commercial fish species likely to be present within the survey area include barramundi, black jewfish and golden snapper. Barramundi and black jewfish are generally found in tropical and sub-tropical coastal waters, estuaries and lagoons and given the location of the survey in offshore waters would only be expected in low numbers within the survey area. Golden snapper occupy inshore waters of northern Australia migrating out of the mangrove systems and into nearshore or offshore rocky or coral reefs in depths of up to 80 m. Given the absence of rocky or coral reefs within the survey area, large numbers of golden snapper are unlikely to be present.

The streaked shearwater is a listed Migratory species under the *EPBC Act*, and is subject to the CAMBA, JAMBA and ROKAMBA. The survey area does not represent important habitat for streaked shearwaters, and only low numbers of the species would be expected to be encountered in the survey area during operations.

Humpback and killer whales are listed as Threatened under the *EPBC Act* and may occur within the survey area. Humpback whales are present in the Kimberley region between June and November each year. As the timing of the survey is currently uncertain, the survey could overlap with the presence of humpback whales in the broader region. However, numbers are likely to be restricted to only a few individuals given the very short duration of the survey and the distance from important areas for the species. As the survey is distant from known blue whale aggregation areas and there are no known migratory routes or feeding, breeding or resting areas in the vicinity of the survey area, blue whales are not expected to be encountered in the survey area.

Bryde's whale, killer whale and the spotted bottlenose dolphin are listed as Migratory species under the *EPBC Act* and may occur in the survey area on occasion. Given the distance of the survey area from key locations, and the lack of recordings in the region, Bryde's whales are not expected to be present in the survey area. The tropical waters of the survey area are unlikely to represent important habitat for killer whales and any presence in the area would be in very low numbers. Due to the water depths of the survey area and distance offshore, spotted bottlenose dolphins are not expected to be present in the survey area in significant numbers.

4.3 Social and Economic Environment

Petroleum Exploration

The petroleum exploration and production industry is a significant stakeholder in the region. There are several gas fields within the JBG, including the Petrel, Tern, Frigate and Blacktip gas fields. The nearest production facility is the ENI-operated Blacktip gas field, located approximately 110 km to the south of the survey area. The proposed Ichthys pipeline to Darwin passes approximately 15-20 km to the north of the survey area.

Fisheries

A number of Commonwealth and Western Australian-managed commercial fisheries are licensed to operate in the vicinity of the survey area. Commonwealth fisheries include the Northern Prawn, Western Tuna and Billfish, Southern Bluefin Tuna and the Western Skipjack Fisheries. While the duration of the survey is short, the timing is currently uncertain and may overlap the open seasons of the Northern Prawn Fishery and fishing vessels operating in the fishery may be present during the survey. The Southern Bluefin Tuna stock spawns in waters south of Java but most fishing activity in this fishery occurs in southern and eastern Australian waters. Due to the location of the survey and its short duration fishing vessels operating in the fishery are not expected to be encountered and impacts on the fishery from the survey are expected to be minimal. Due to the location and water depths of the survey area, it is also unlikely that fishing vessels operating in the Western Tuna and Billfish and Western Skipjack Fisheries will be encountered.

State managed fisheries include the Northern Demersal Scalefish, Mackerel, Kimberly Gillnet and Barramundi, Northern Shark, and Pearl Oyster Managed Fisheries. The main fishing efforts in the Northern Demersal Scalefish, Mackerel, and Kimberly Gillnet and Barramundi Managed Fisheries are generally located in inshore, coastal waters and river and tidal creek systems. Given the offshore

location and short duration it is unlikely that fishing vessels will be encountered and little or no impact is expected. The Joint Authority Northern Shark Fishery extends into the JBG and includes the survey area. Although there are only two licences in the fishery, it is possible that fishing vessels operating in the fishery may be encountered during the survey. The Pearl Oyster Managed Fishery extends to the WA–NT border however exploratory fishing has shown pearl oyster stocks in the zone to be economically unviable. As such, commercial fishing is not expected to occur and the survey is not expected to result in any impacts on the fishery.

Shipping

Vessel traffic within the JBG is relatively low, mainly associated with existing oil and gas facilities in the JBG. The survey area is not located in the vicinity of any main shipping routes. Stakeholder consultation identified that while a preferred shipping route from Darwin to Exmouth passes through the Permit, only low vessel numbers would realistically be expected to be encountered during the survey.

Recreational and Tourism Activities

Marine-based tourism and recreation in northern Australia includes recreational fishing, cruise-shiping, yachting and diving. Recreational and tourism activities in the vicinity of the survey area are likely to be low, and centred around the coastal, nearshore and estuarine waters outside the survey area.

Defence Areas

There are large areas of northern Australia allocated to defence training including military exercises incorporating the majority of the Northern Territory portion of the JBG, to the east of the survey area. There are no Department of Defence training areas in the vicinity of the survey area.

Heritage

The survey area does not overlap with any Native Title Claim areas or any areas of cultural heritage significance. The nearest historic shipwreck, 'Florence D', is approximately 20 km to the north and north-east of the survey area. There are no World Heritage Areas, National Heritage Places or Commonwealth Heritage Places within the vicinity of the survey area.

4.3.1 Conservation Areas

There are no existing Commonwealth or State marine protected areas within the vicinity of the survey area and the nearest proposed Commonwealth Marine Reserves to the survey area are the Oceanic Shoals Marine Reserve, the Joseph Bonaparte Gulf Marine Reserve and the Kimberley Marine Reserve.

Oceanic Shoals Marine Reserve

The Proposed Oceanic Shoals Marine Reserve (approximately 20 km north of the survey area, Figure 2) covers an area of approximately 42,207 km² and is proposed to be zoned for Multiple Use. The proposed marine reserve includes some of the deepest waters found in the North Marine Region, at approximately 300 m. Threatened olive ridley and loggerhead turtles are known to forage in the area which includes shoals, channels, valleys, limestone pinnacles, shelf breaks and shelf slopes supports high biodiversity, including sponge and coral gardens and aggregations of demersal and pelagic fish.

Joseph Bonaparte Gulf Marine Reserve

The Proposed Joseph Bonaparte Gulf Commonwealth Marine Reserve covers approximately 8,587 km² (approximately 130 km south-east of the survey area, Figure 2) and is proposed to be zoned for Special Purpose and Multiple Use. It covers waters to approximately 75 m depth and is characterised by high primary productivity. The proposed marine reserve is adjacent to coastal areas that are

considered to be of national significance for nesting flatback turtles, and international significance for migratory shorebirds in the East Asian Australasian Flyway migration corridor.

Kimberley Marine Reserve

The Proposed Kimberley Commonwealth Marine Reserve covers approximately 74,469 km², with the eastern boundary located approximately 90 km west of the survey area (Figure 2). The reserve is proposed to be zoned for Multiple Use Zone, Habitat Protection Zone and Marine National Park. The area is considered an important foraging area for migratory seabird, dugongs and dolphins, and is adjacent to important nesting sites for the threatened green turtle. An important migration pathway and nursery areas for humpback whales are contained within the proposed boundaries. The area includes ancient coastline which provides an area of enhanced productivity supporting migrating species, and continental slope demersal fish communities thought to be the second richest in Australia.

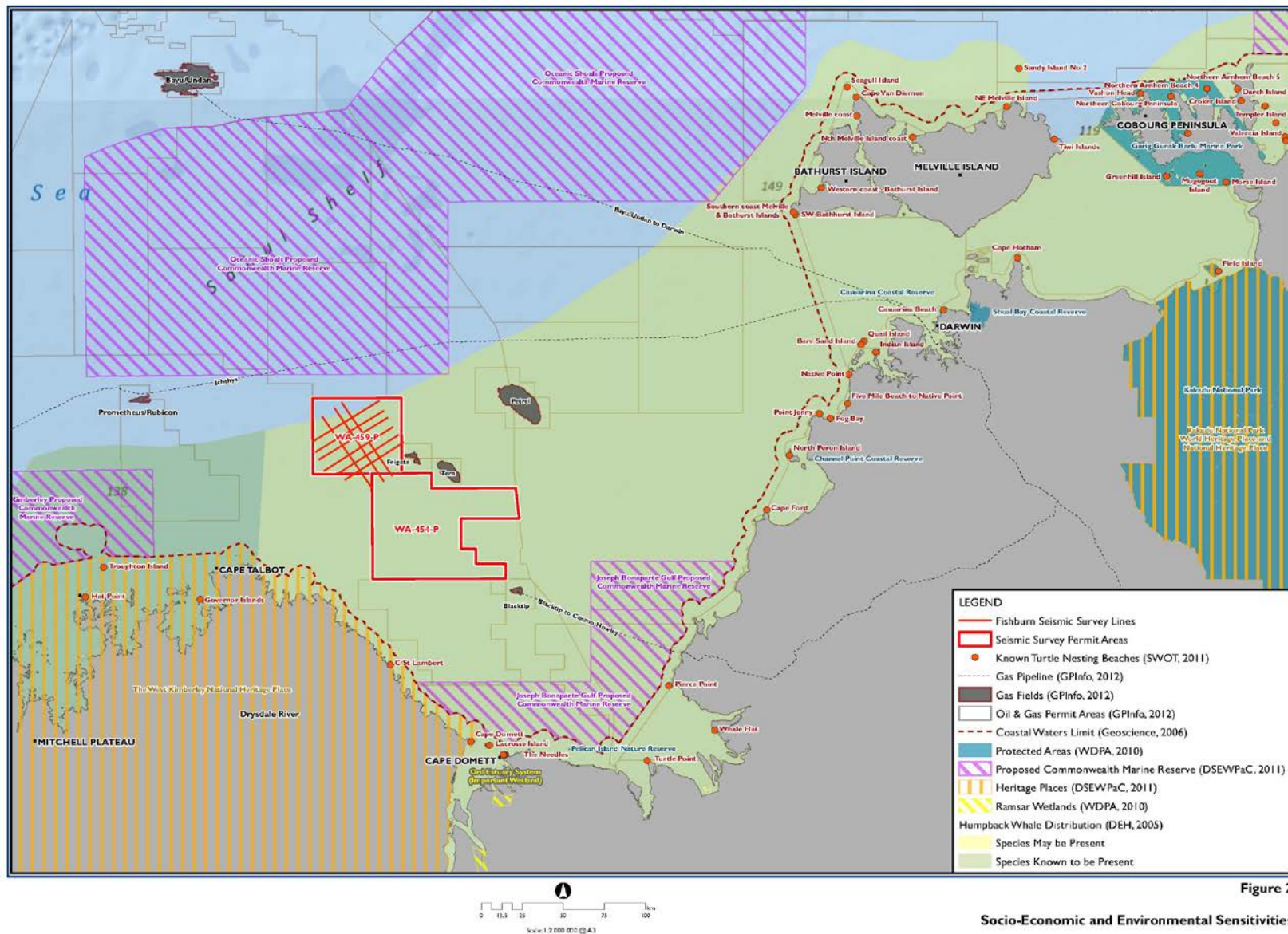


Figure 2

Socio-Economic and Environmental Sensitivities

5 Environmental Hazards and Controls

In accordance with Regulations 13(3) and 13(3A) of the *OPGGS (Environment) Regulations* the environmental impacts and risks associated with the activity and any unplanned consequences of the activity have been evaluated and described in the EP.

The environmental risk management process applied to the Fishburn 2D marine seismic survey is based on the Santos Management System which in turn is based on AS/NZ ISO 31000. The AS/NZ ISO 31000 risk management process is consistent with that described in the *OPGGS (Environment) Regulations* and is based on the key steps shown in Figure 3 below.

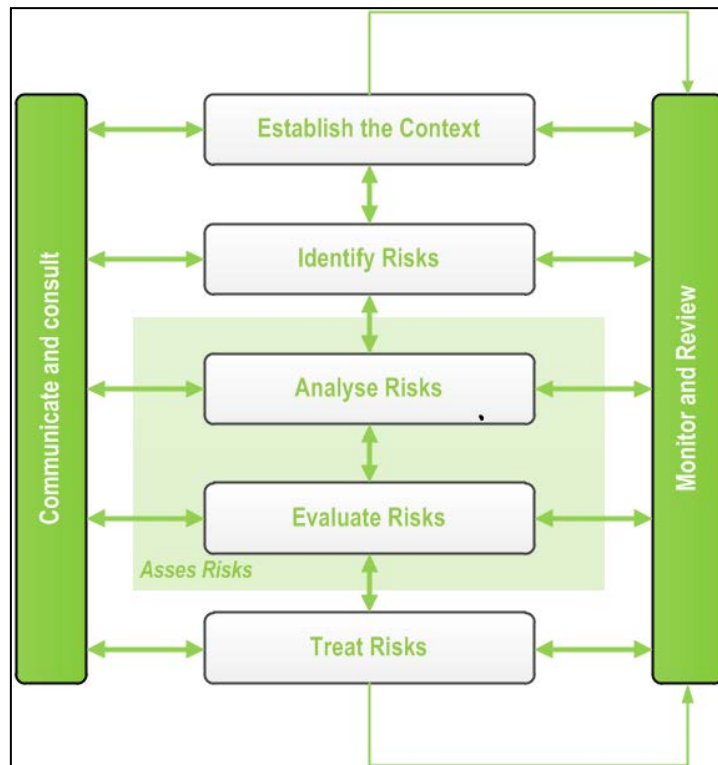


Figure 3: Risk assessment process

The EP describes this process and its outcomes in detail, including the environmental hazards and risk management control. These are summarised in Table 2 below.

Table 2: Major Environmental Hazards and Controls

Major Environmental Hazards	Risk Management Controls
Seismic acquisition noise	<ul style="list-style-type: none"> ▪ Implementation of standard management procedures (A.1 – A.4) as outlined in the EPBC Act Policy Statement 2.1 – Interaction Between Offshore Seismic Exploration and Whales. <ul style="list-style-type: none"> ▪ The 2-km low power zone will be implemented. ▪ Trained Marine Mammal Observers (MMOs) on board the vessel will implement the EPBC Act Policy Statement 2.1. ▪ Soft-start, shut-down and line turn procedures will be in place. ▪ Survey vessel engines and thrusters will be maintained in accordance with the Planned Maintenance Systems (PMS) to ensure they are running at peak efficiency.
Grey water and sewage disposal	<ul style="list-style-type: none"> ▪ MARPOL-approved sewage treatment plant (STP) fitted in the vessel. ▪ No untreated sewage will be discharged within 12 nm of any shoreline. ▪ All sewage on the survey vessel will be treated and discharged through a MARPOL-approved STP. ▪ The survey vessel will have a valid Statement of Compliance for Sewage Pollution Prevention Certificate. ▪ The STP will be maintained in accordance with the PMS. ▪ If there is a failure of the STP, all sewage will be contained within the system's storage tanks until such time as the STP is fixed or storage has reached capacity. Only failing that will sewage be released untreated (in accordance with MARPOL Annex IV, when the vessel is > 12 nm from shore).
Putrescible waste disposal	<ul style="list-style-type: none"> ▪ IMO-approved galley macerator in place. ▪ The survey vessel's galley macerator will macerate food scraps to a diameter of less than 25 mm before being disposed of overboard, in compliance with MARPOL Annex V. ▪ Macerated food waste will not be discharged overboard within 12 nm of any shoreline. ▪ If the macerator fails, all food waste will be bagged and sent ashore for disposal until the macerator is repaired or replaced. ▪ All non-food galley wastes (e.g. packaging, cooking oils and greases) will be transported back to shore for recycling or disposal.
Discharge of cooling and brine water	<ul style="list-style-type: none"> ▪ The survey vessel's engines and RO plant will be maintained in accordance with the PMS so that they are running efficiently within operating parameters. ▪ Scale inhibitors and biocide (which may be used in the RO process), will be dosed appropriately so that they are entirely (or as close as possible to entirely) consumed by the process upon discharge.
Air emissions	<ul style="list-style-type: none"> ▪ Waste incinerator is IMO-compliant (Annex IV). ▪ Survey vessel waste will only be incinerated if the incinerator was installed after 1 January 2000 and is IMO-certified to comply with Appendix IV of Annex VI of MARPOL. ▪ Only marine-grade diesel will be used for the vessel engines (not heavy fuel oil), which is low in sulphur content (<3.5%), thus minimising the generation of SOx. ▪ The survey vessel engines and fixed and mobile equipment are maintained in accordance with the PMS to ensure they operate at maximum efficiency. ▪ If the survey vessel is over 400 t, it will have a current International Air Pollution Prevention (IAPP) Certificate in adherence to Marine Orders Part 97 (Marine pollution prevention – air pollution). ▪ Fuel consumption is measured and recorded daily to enable the early detection and remedy of combustion issues.
Light emissions	<ul style="list-style-type: none"> ▪ Minimal lighting will be pointed down towards the water – the key area requiring lighting for personnel safety purposes is the deck.

Major Environmental Hazards	Risk Management Controls
	<ul style="list-style-type: none"> ▪ Vessel lighting will be managed to meet maritime safety standards at a minimum, including: <ul style="list-style-type: none"> ○ Marine Orders Part 30 (Prevention of Collisions). ○ The Australian Offshore Support Vessel Code of Safe Working Practice (Section 9.1.4 Deck lighting) (AMSA, Version 3, 2002).
Discharge of deck drainage, bilge water and streamer fluid	<ul style="list-style-type: none"> ▪ Kick-plating is in place around the vessel's main deck. ▪ Equipment, hydrocarbon and chemical storage areas are bunded (e.g. engine room). ▪ Hazardous area drains are routed to the bilge tank. ▪ Bilge tank drains via an oily water separator (OWS) set to prevent discharge of oil in water greater than 15 ppm (0.0015%). ▪ The vessel will have a valid International Oil Pollution Prevention certificate. ▪ Equipment with the potential for spills of chemicals or fuels will be located within a bunded area (including portable bunding for items stored on deck). ▪ Bilge water will be directed to the OWS set to prevent discharge of oil in water greater than 15 ppm. ▪ If re-treatment of over-specification bilge water to <15 ppm is not successful, it will be pumped to storage tanks and transferred to shore. ▪ Treated bilge water will only be discharged >12 nm from shore and volumes discharged will be recorded in the Oil Record Book. ▪ Residual oil from the OWS will be collected in tote tanks and transferred to shore for appropriate disposal. ▪ Chemicals will be stored in chemical storage lockers. ▪ A high focus will be placed on housekeeping: <ul style="list-style-type: none"> ○ Spills to deck will be cleaned up immediately using SOPEP kits. ○ SOPEP kits will be stored in various locations around the vessel and will be maintained fully stocked. ○ Scupper plugs will be readily available for use in the event of a spill deck to prevent contaminants draining directly overboard.
Fauna collision with vessel / entanglement with towed equipment	<ul style="list-style-type: none"> ▪ The Australian National Guidelines for Whale and Dolphin Watching will be implemented: <ul style="list-style-type: none"> ○ Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. ○ No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod. ○ Do not encourage bow riding. ○ If animals are bow riding, do not change course or speed suddenly. ○ If there is a need to stop, reduce speed gradually. ▪ EPBC Policy Statement 2.1 – Interaction Between Offshore Seismic Exploration and Whales will be implemented by on board MMOs. ▪ Trained MMOs on board the vessel will implement the above-listed procedures.
Introduction of invasive marine species	<ul style="list-style-type: none"> ▪ Anti-fouling paint applied to survey vessel hull and internal niches. ▪ No discharge of ballast water is expected during the survey. If required, discharge will only occur when > 12 nm from land and in waters > 200 m deep. ▪ The survey vessel will obtain AQIS clearance to operate unrestricted within Australian waters through submission of a completed Quarantine Pre-Arrival Report (QPAR) and ballast exchange records to AQIS prior to arrival in Australian waters (if not already in Australian waters). ▪ If an international vessel, it will have valid International Anti-fouling System Certificates to verify that it complies with the International Convention on the Control of Harmful Anti-fouling Systems on Ships. ▪ In-water seismic equipment will be inspected by an expert prior to entering Australian waters. Cleaning will be undertaken before equipment is immersed in Australian waters. ▪ The survey vessel will comply with:

Major Environmental Hazards	Risk Management Controls
	<ul style="list-style-type: none"> o The Australian Ballast Water Management Requirements (2011, v5). o The National Biofouling Guidance for the Petroleum Production and Exploration Industry (AQIS, 2009).
Interference with other users	<ul style="list-style-type: none"> ▪ The vessel will be lit in accordance with maritime safety requirements. ▪ There will be 24-hour visual, radio and radar watch. ▪ The vessel will be equipped with dual ARPA (X-band and S-band) devices to provide advance warning of vessels that may present a collision risk and a Global Maritime Distress and Safety System (GMDSS). ▪ The survey vessel will be manned by competent, trained and experienced marine crews (i.e. Vessel Master, First Mate and Second Mate will be SCTW95 qualified). ▪ Consultation with fishing industry has taken place and will continue up to and during the survey. ▪ Consultation with adjacent permit holders prior to the survey to identify other petroleum activities (e.g. drilling) in the area that may coincide with the timing of this survey. ▪ Support vessel to assist in hailing other vessels in the area and escort them safely around the towed seismic equipment will accompany the survey vessel. ▪ The location of the survey will be noted in the Notice to Mariners, issued by the Australian Hydrographic Office. ▪ An AusCoast warning will be issued daily by the AMSA RCC, which provides the location of the vessel. ▪ The vessel will travel at low speeds (5 knots [9 km / hr] when acquiring data, 10 knots [18 km / hr] when in transit). ▪ Streamers towed by the survey vessel will be handled in accordance with the vessel Streamer Deployment and Recovery Procedure. ▪ A vessel-specific SOPEP and ERP will be in place and enacted in the event of a vessel-to-vessel collision and/or diesel spill. ▪ Crew SOPEP and ERP training will be undertaken at scheduled frequencies (quarterly intervals).
Inappropriate discharge of hazardous and non-hazardous waste	<ul style="list-style-type: none"> ▪ A survey vessel-specific Garbage Management Plan will be in place, specifying that: <ul style="list-style-type: none"> o Wastes are segregated for onshore recycling, wherever possible. o A Garbage Record Book will be maintained, recording the types and volumes of waste incinerated and offloaded. o Incinerator ash will be compacted, bagged and stored on board for onshore disposal. o Wastes will be compacted where possible and stored in covered waste receptacles. o All waste receptacles are appropriately labelled and secured. o No solid waste will be discharged overboard (except macerated food waste). o There will be a high focus on housekeeping. o Only licensed shore-based waste contractors will be used, who will dispose of waste appropriately. ▪ All survey crew will undergo waste management training. ▪ Up to date MSDS registers will be available in key locations throughout the vessel (e.g. medic's office, bridge). ▪ Chemical drums and dry chemicals will be securely stored in bunded areas. ▪ SOPEP response kits are located throughout the vessel in appropriate locations and used to respond to deck spills of hazardous liquids.
Diesel spill	<ul style="list-style-type: none"> ▪ The vessel will be lit in accordance with maritime safety requirements. ▪ There will be 24-hour visual, radio and radar watch. ▪ The vessel will be equipped with dual ARPA (X-band and S-band) devices to provide advance warning of vessels that may present a collision risk and a Global Maritime Distress and Safety System (GMDSS).

Major Environmental Hazards	Risk Management Controls
	<ul style="list-style-type: none"> ▪ The survey location will be noted in the Notice to Mariners, issued by the Australian Hydrographic Office. ▪ A daily AusCoast warning will be issued by the AMSA RCC, which provides the location of the vessel. ▪ No at-sea refuelling is proposed. ▪ The vessel SOPEP and Santos Incident Management Plan will be implemented in the event of a spill to sea. ▪ Marine diesel spills will be reported ▪ Consultation has taken place with AMSA regarding spill response control roles. AMSA is the Combat Agency in charge of implementing the National Plan in the event of a Tier 2 diesel spill.

6 Management Approach

The Fishburn 2D Marine Seismic Survey will be managed in compliance with the Environment Plan (EP) approved by NOPSEMA under the *OPGGS (Environment) Regulations* and other relevant environmental legislation. The Environment Plan describes the Santos risk management process that will be applied to manage the environmental risk of the survey activity.

The objective of the EP is to ensure that potential adverse impacts on the environment associated with the activity, during both routine and non-routine operations are identified and will be reduced to ALARP and will be of an acceptable level. This includes the definition of risk controls that are in place to manage each of the identified risks and aspects.

The EP defines environmental performance objectives and performance standards that are in place to manage each of the identified environmental risks and aspects. These objectives and performance standards are consistent with those risk control measures described above. The EP also describes the specific measurement criteria which are used to demonstrate that these performance objectives are achieved.

An implementation strategy is described in the EP. The implementation strategy identifies the systems, practices and procedures which are in place to ensure that any environmental risks and impacts are continuously being reduced to ALARP and performance objectives and standards are met. The implementation strategy establishes the chain of command and identifies the roles and responsibilities and training / competency requirements for all personnel in relation to implementing the activity in accordance with the EP and the review of the EP.

The EP describes the types of monitoring and auditing that will be undertaken, the reporting requirements for environmental incidents and reporting on overall compliance of the activity with the EP.

7 Stakeholder Consultation

Santos has been actively involved in stakeholder engagement for offshore petroleum and exploration activities since the development of its Mutineer Exeter FPSO production facility in 2005. The Mutineer Exeter development initiated the long-term relationship between Santos and relevant stakeholders such as commercial and recreational fisheries, conservation organisations, recreational organisations, non-government organisations and government agencies.

Initial consultations were undertaken in September 2012 during preparation of the EP, with stakeholders informed of the location of the seismic lines and the survey characteristics. Relevant stakeholders, including those potentially involved in oil spill response were invited to provide comments on the survey. Stakeholders consulted include:

- Australian Fisheries Management Authority (AFMA)
- Australian Hydrographic Office
- Australian Institute of Marine Science
- Australian Marine Conservation Society
- Australian Marine Oil Spill Centre (AMOSOC)
- Australian Maritime Safety Authority (AMSA) (Maritime Operations Division and Emergency Response Division)
- Australian Petroleum Production and Exploration Association (APPEA)
- Australian Southern Bluefin Tuna Industry Association
- Raptis and Sons
- Commonwealth Fisheries Association
- Department of the Chief Minister (NT)
- Department of Defence (Commonwealth)
- Department of Fisheries (WA)
- Department of Mines and Energy (NT)

- Department of Mines and Petroleum (WA)
- Department of Primary Industries and Fisheries (NT)
- Department of Resources, Energy and Tourism (Commonwealth)
- Department of Sustainability, Environment, Water, Population and Communities (Commonwealth) (Dept. SEWPaC)
- Department of Transport (Marine Safety and Oil Spill Response Coordination)
- Jamaclan Marine Services
- National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)
- NPF Industry Pty Ltd
- Northern Prawn Fishery (Qld) Trawl Association
- Northern Territory Amateur Fishermen's Association
- Northern Territory Environment Centre
- Northern Territory Seafood Council
- Recfishwest
- Western Australian Fishing Industry Council
- Western Australian Northern Trawl Owners Association
- Western Australian Seafood Exporters (Norm Peovitis)
- World Wildlife Fund.

The consultation process identified the following issues:

- The survey area intersects with the fishing zones for Commonwealth-managed fisheries: the Western Tuna and Billfish Fishery, the Western Skipjack Fishery, the Southern Bluefin Tuna Fishery and the Northern Prawn Fishery. However, only the Northern Prawn Fishery has been active in the area in the last three years. Activity was low and no activity has occurred since 2009.
- The State (Western Australian) managed Northern Shark Fishery has been active in the area of the proposed survey.
- No conflict with recreational fishing is foreseen in relation to the proposed survey.
- A preferred shipping route from Darwin to Exmouth passes through the survey area with low levels of vessel traffic likely to be encountered.
- A range of government and fishing industry stakeholders specifically require advance notification of the timing of the survey.
- Comments were received from the Southern Bluefin Tuna Industry and have been considered and addressed. Given that the proposed survey location is approximately 320 km east of this fishery's spawning grounds in the region south of Java, the short duration of the survey program and that fishing activity for Southern Bluefin Tuna is confined to southern and eastern Australian waters, the impacts on this fishery from the survey are expected to be minimal. Santos has undertaken to contact all stakeholders again once survey dates and details of the seismic vessel are known.

Most stakeholders were first contacted approximately two months prior to the initial submission of the EP, with four additional groups contacted following NOPSEMA review of the original EP. All stakeholders will be contacted again once the survey vessel and commencement date are known. Stakeholder responses received at this time will be applied to a review of the project risk assessment and, if necessary, the EP will be updated. In the event this involves changes to the environmental risk profile of the activity, or new environmental risks or impacts are identified that are not included in the existing EP, the EP will be re-submitted to NOPSEMA as per *Regulation 17*.

Future Consultation

Prior to the commencement of the seismic survey Santos will:

- notify NOPSEMA at least 48 hours before the start date
- notify AMSA in relation to the potential mobilisation of spill response resources
- notify AHO at least 3 weeks prior to commencement of the survey
- advise all stakeholders of the vessel and timing of the survey, once known, and invite comment regarding the confirmed timing

- consult with adjacent permit holders to determine if any planned nearby activities coincide with the survey timing (once known). For example, development drilling may commence in the Petrel-Tern-Frigate fields (Bonaparte LNG) in 2013.

8 Contact Details

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