



Pivot 2D Marine Seismic Survey Environment Plan Summary

Geotechnical Operations

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TABLE OF CONTENTS

1.	INTRODUCTION	4
2.	LOCATION OF THE ACTIVITY	4
3.	DESCRIPTION OF ENVIRONMENT	6
3.1	Physical Environment	6
3.2	Biological Environment	6
3.3	Socio-economic Environment	7
3.3.1	Marine Conservation Reserves	8
4.	DESCRIPTION OF THE ACTION	9
4.1.1	Survey Vessels.....	9
5.	MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS	10
6.	MANAGEMENT APPROACH	10
7.	CONSULTATION	10
8.	CONTACT DETAILS	11
9.	REFERENCES	11
	APPENDIX A:	12

1. INTRODUCTION

Woodside Energy Ltd (Woodside), will undertake a two dimensional (2D) marine seismic survey (MSS), referred to as the Pivot 2D MSS, in offshore Commonwealth waters approximately to the north-west of North West Cape, Exmouth. The Pivot 2D MSS operational area covers Petroleum Exploration Permits WA-271-P R2, WA-461-P, WA-463-P, WA-430-P, WA-394-P, WA-384-P, WA-335-P and WA-255-P R1 (see **Section 2** for further location details (**Figure 2-1**)). The survey is required to assist in the exploration of WA-461-P & WA-463-P and will fulfil the permit year three work program commitments. The Pivot 2D MSS will take approximately five to seven days to complete. The actual timeframe is dependent on vessel availability and prevailing weather conditions but will most likely occur in February or March 2013.

This document provides a summary of the Environment Plan (EP) that was accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in accordance with Regulation 11(1) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Environment Regulations).

This EP summary has been prepared as per the requirements of Regulation 11 (7) and (8) of the Environment Regulations.

2. LOCATION OF THE ACTIVITY

The proposed Pivot 2D MSS will occur in offshore Commonwealth waters north-west of North West Cape. The operational area boundary, at its closest, is approximately 40 km west of the Muiron Islands and 19 km north-west of North West Cape. Water depths range between approximately 400 m in the east to 2,000 m in the west of the operational area (**Figure 2-1**).

The area referred to as the 'operational area' includes:

- 'Survey acquisition lines' (i.e. the lines along which seismic acoustic emissions will occur for the purposes of acquiring data), which are approximately 385 km in total length; and

- The 'survey acquisition lines' are surrounded by a 'buffer' area (referred to as the operational area) of approximately 3.5 – 10 km (where 5 km is the average in width, and a 10 km buffer is applied to the end of each 2D line to allow for vessel turning, which provides the total 'operational area' of approximately 3,403 km²). Within this operational area the seismic source may be discharged at or below full capacity (power) for the purpose of run-outs, source testing and soft starts.

The boundary coordinates for the proposed Pivot 2D MSS 'operational area' are presented in **Table 2-1**, and in **Figure 2-1**.

Table 2-1: Approximate boundary coordinates for the 'operational area'*

Location Point	Latitude	Longitude	Location Point	Latitude	Longitude
1	21°35'19.068"S	113°40'7.450"E	22	21°54'55.395"S	113°10'41.805"E
2	21°34'43.447"S	114°0'4.816"E	23	21°51'0.963"S	113°11'11.799"E
3	21°39'55.360"S	114°0'4.821"E	24	21°51'0.549"S	113°4'20.114"E
4	21°39'55.360"S	114°0'4.720"E	25	21°38'38.544"S	113°4'12.785"E
5	21°41'5.968"S	113°58'23.984"E	26	21°38'39.019"S	113°10'4.823"E
6	21°42'43.437"S	113°56'4.840"E	27	21°35'21.304"S	113°10'4.819"E
7	21°44'7.439"S	113°54'4.842"E	28	21°35'21.347"S	113°13'11.559"E
8	21°45'31.417"S	113°52'4.805"E	29	21°29'55.386"S	113°13'52.937"E
9	21°46'55.370"S	113°50'4.730"E	30	21°29'55.375"S	113°19'42.280"E

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10	21°49'26.868"S	113°49'5.086"E	31	21°34'55.384"S	113°19'4.404"E
11	21°50'58.202"S	113°48'29.112"E	32	21°34'55.372"S	113°20'4.818"E
12	21°50'59.816"S	113°38'8.424"E	33	21°35'21.234"S	113°20'4.819"E
13	21°55'36.866"S	113°37'33.239"E	34	21°35'21.043"S	113°23'59.309"E
14	21°54'58.521"S	113°31'47.636"E	35	21°28'46.975"S	113°24'48.839"E
15	21°51'0.440"S	113°32'18.033"E	36	21°12'51.004"S	113°39'18.352"E
16	21°51'0.776"S	113°27'50.913"E	37	21°16'21.390"S	113°43'42.299"E,
17	21°55'34.505"S	113°27'16.417"E	38	21°31'2.721"S	113°30'21.193"E
18	21°54'56.456"S	113°21'30.834"E	39	21°35'20.587"S	113°29'48.943"E
19	21°51'11.033"S	113°22'0.661"E	40	21°35'20.098"S	113°34'17.651"E
20	21°51'11.089"S	113°17'1.988"E	41	21°29'13.198"S	113°35'4.134"E
21	21°54'55.399"S	113°16'32.172"E	42	21°29'51.300"S	113°40'48.758"E

*Datum: GDA94

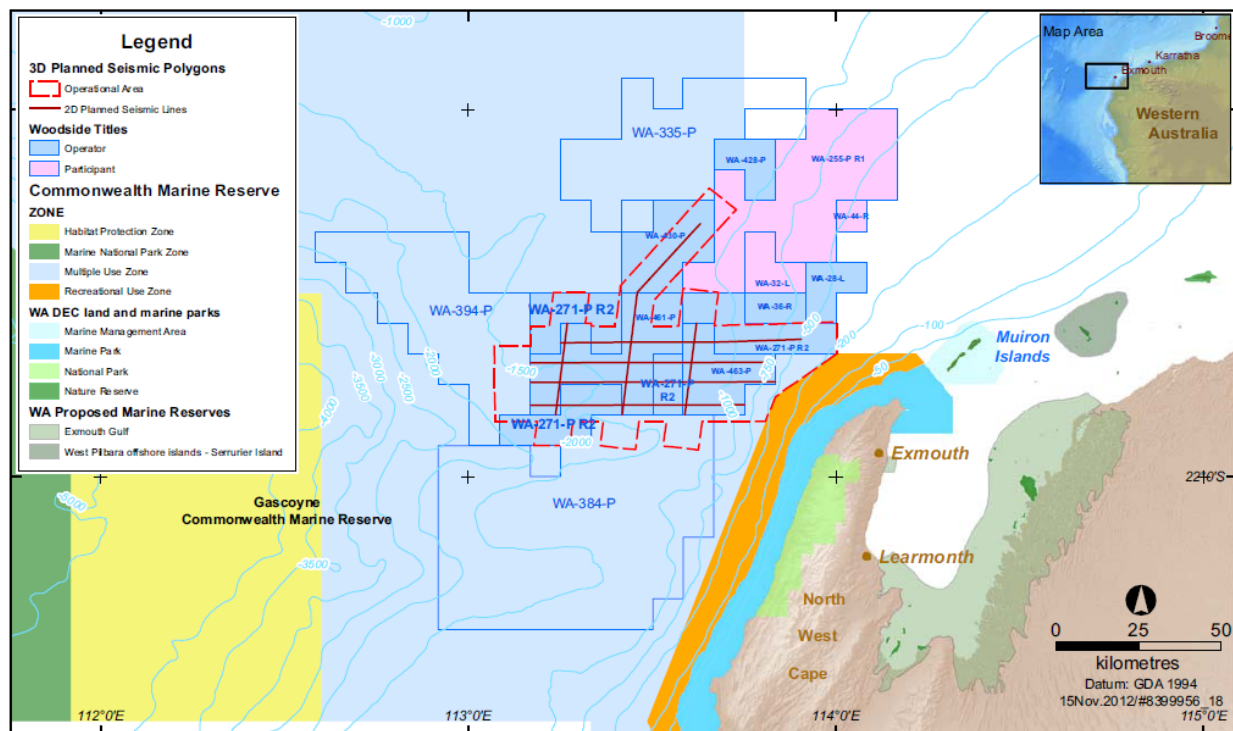


Figure 2-1: Location of the Pivot 2D MSS operational area.

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3. DESCRIPTION OF ENVIRONMENT

3.1 Physical Environment

The Pivot 2D MSS operational area is entirely in Commonwealth waters, primarily located in the Northwest Shelf (NWS) province of the North-West Marine Region (NWMR).

The closest point of the operational area boundary is approximately 19 km to the north-west of North West Cape and 40 km to west of the Muiron Islands. Water depths of the NWS range from approximately 400 m in the east to 2,000 m deep in the west.

The seabed in the bioregion consists predominantly of muddy sediments, and there are several geomorphic features of note, including the Exmouth Plateau, subsea terraces and canyons (DEWHA 2008a). The region contains the steepest shelf break in the NWMR, which occurs on the western side of North West Cape, where the continental shelf narrows considerably.

The nearest significant feature to the survey area is the Ningaloo Coast World Heritage Area (WHA). The region has a high diversity of marine habitats including coastal mangrove systems, lagoons, coral reef, open ocean, continental slope and the continental shelf (MPRA 2005). The dominant feature of the Ningaloo Coast WHA is Ningaloo Reef, the largest fringing reef in Australia. Ningaloo Reef supports both tropical and temperate species of marine fauna and flora and more than 300 species of coral (MPRA 2005).

3.2 Biological Environment

Benthic community assessment has been carried out for the permit area WA-28L approximately 10 km to the north of the survey area but encompassing similar depths (greater than 1000 m). The survey comprised ROV deployment and the video footage of the Vincent field (within Permit Area WA-28L) by the Australian Institute of Marine Science (AIMS) and revealed four main invertebrate groups representing deepwater benthos: crustaceans, sponges, echinoderms and cnidarians (octocorals), and species diversity decreased with depth across the surveyed areas (Woodside 2005).

Mass coral spawning takes place on Ningaloo Reef annually. Synchronous, multi-specific spawning of tropical reef corals occurs during a brief predictable period in late summer/early autumn on the west coast of Australia and coincides with seasonal changes in wind patterns and the associated periods of relatively calm weather. Coral spawning is observed on Western Australian reefs after the full moon in March and generally 7-9 nights after a full moon on neap, nocturnal ebb tides each year and is predicted to occur in early April 2013 beyond the planned timing of the Pivot 2D MSS survey.

A review of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) database (Protected Matters Search Tool) (September 2012) held by SEWPaC, identified a total of 95 listed species (SEWPaC, 2012) comprising 24 threatened marine species and 21 migratory species, that may occur within, or traverse the operational area. Of those listed species, 21 were whales and other cetaceans including the Humpback whale, (*Megaptera novaengaliae*) listed as Vulnerable, with the Blue whale (*Balaenoptera musculus*) listed as Endangered, the southern right whale (*Eubalaena australis*) is listed as Endangered, The Antarctic minke whale (*Balaenoptera bonaerensis*), Brydes whale (*Balaenoptera edeni*), Killer whale (*Orcinus orca*), and Sperm whale (*Physeter macrocephalus*).

There are no EPBC Act listed threatened ecological communities in the vicinity of the Pivot 2D MSS operational area and the area does not contain habitat that is critical to the survival of any listed species. In addition, there are no known breeding, calving or feeding grounds for any listed threatened or migratory cetacean species within, or in the immediate vicinity of the Pivot 2D MSS operational area.

Whales

The Humpback whale is the most commonly sighted whale in north Western Australian waters. The species has been observed seasonally completing their northern migration in the Camden Sound area of

the west Kimberley, after feeding in Antarctic waters during the summer months. It is likely that the whales follow a predictable migratory path and migrate both north and south within the continental shelf boundary (200 m bathymetry). However, on the southbound migration it is likely that most individuals, and particularly cow/calf pairs, will stay closer to the coast than the northern migratory path. Given the timing and duration of the Pivot 2D MSS (planned for February / March 2013), it is unlikely that many Humpbacks will be encountered as the survey is not taking place in migration season.

With respect to Blue whales, although tracking has shown that pygmy Blue whales do pass through the Pivot 2D MSS operational area, the survey is planned for February or March 2013 which is outside the northbound (April to August) and southbound (October to January) migratory periods.

The Pivot 2D MSS is also taking place outside of the recognised migration season for the Southern Right whale and Antarctic Minke whale.

Although there is no evidence of large-scale movements of the inshore form of Bryde's whales, with strandings recorded throughout the year (DEWHA 2007) it appears that the offshore form of Bryde's whale may migrate seasonally, heading towards warmer tropical waters during the winter. Bryde's whales may therefore be present in the Pivot 2D MSS operational area. However, their presence would be limited to a few individuals transiting the area and is unlikely during the period of the survey in February or March 2013.

Whale sharks

Whale sharks occur annually in the waters around Ningaloo Reef, from March to June with the largest numbers being recorded in the beginning of April to the beginning of May (Sleeman et al. 2010). However, the season is variable with individual whale sharks recorded at other times of the year. Timing of the whale sharks' migration and mass aggregation coincides with the coral mass spawning period when there is an abundance of food (krill, planktonic larvae and schools of small fish) in the waters adjacent to Ningaloo Reef. At Ningaloo Reef, whale sharks stay within a few kilometres of the shore and in waters less than 50 m depth (Woodside 2002). Whale sharks may traverse the Pivot 2D MSS operational area during their migrations to and from Ningaloo Reef. It is expected however, that whale shark presence within the operational area would be infrequent, of a relatively short duration given they would be transiting at these depths and not of significant numbers given the main aggregations are recorded in coastal waters, and particularly, Ningaloo Reef edge.

Marine turtles

Five marine turtle species may occur in the operational area and adjacent waters - the green turtle (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), and the flatback turtle (*Natator depressus*). Three of the turtle species (green, loggerhead, and hawksbill) have significant nesting beaches along the mainland coast and islands in the region including the North West Cape, Ningaloo Reef, Muiron Islands, Serrurier Island, Barrow Island, Montebello Islands and the Dampier Archipelago. Leatherback turtles migrate through the region and feed there but there are no known nesting sites within WA (DEC 2012).

Marine turtles of the five species described are generally distributed in coastal waters when foraging and transiting between feeding or breeding grounds. Extensive aerial surveys of Ningaloo Reef conducted in 2001-2002 revealed that the majority of turtle observations were made on the Ningaloo Reef front with less than 1 % of turtles observed in water depths >150 m. Only occasional sightings of turtles have been made further offshore (Woodside 2005).

With consideration of the distance offshore (approximately 19 km from North West Cape and 40km from the Muiron Islands), deep water depth in the Pivot 2D MSS operational area (400 m – 2,000 m), and the absence of potential nesting or foraging sites, (i.e. no emergent islands, reef habitat or shallow shoals), the operational area of the Pivot 2D MSS is not considered an important habitat for marine turtles.

3.3 Socio-economic Environment

The Pivot 2D MSS operational area is located within five Commonwealth (beyond 200 m isobath) and two State (within 200 m isobath) managed fisheries which occur in the region.

One AMSA shipping fairway passes through the western end of the Pivot 2D MSS operational area in a north-south direction. The fairway is not mandatory, but AMSA strongly recommends commercial vessels remain within the fairway when transiting the region.

Tourism is one of the major industries of the region and contributes significantly to the local economy in terms of both income and employment. The main marine nature-based tourist activities are snorkelling and scuba diving, whale shark encounters and whale watching. Most diving takes place relatively close to shore, e.g. Ningaloo and Bundegi Reefs, and around the reefs fringing the offshore islands. E.g. Muiron Islands. Whale watching and whale shark encounters take place during the seasonal migration/aggregation periods and these activities generally occur within the Ningaloo Marine Park, approximately 10 km from the Pivot 2D MSS operational area (based on the nearest park boundary).

The warm, dry winter climate of the North West Cape area along with accessible fish stocks have made it a focal point for winter recreation by the Western Australian community and it is a popular area for recreational fishers (Smallwood et al. 2011). Recreational fishers predominantly target tropical species such as emperors, snappers, groupers, mackerels, trevallies and other game fish (DoF 2011). Recreational angling activities include shore-based fishing, private boat and charter boat fishing, with the peak in activity between April and October (DoF 2011; Smallwood et al. 2011).

3.3.1 Marine Conservation Reserves

The State and Commonwealth government has established a comprehensive and representative network of marine protected areas (MPAs) in the State and Commonwealth waters off Western Australia. The network includes a number of MPAs that comprise environmental assets of high value or sensitivity, from a regional, State or national perspective. These values and sensitivities include habitats or species that are particularly vulnerable or that provide valuable ecological services such as coral reefs, mangroves, seagrass meadows and macroalgae. There are two State MPAs, three gazetted Commonwealth MPAs and the Ningaloo Coast World Heritage Area (WHA) within the region. The operational area is within the Gascoyne Commonwealth Marine Reserve (Multiple Use Zone), immediately adjacent to the Ningaloo Coast WHA, and approximately 10 km away from the State waters component of Ningaloo Marine Park.

4. DESCRIPTION OF THE ACTION

Seismic data will be collected using a purpose built seismic vessel towing dual air-powered acoustic source arrays (airguns) and a hydrophone cable (also known as streamers). The acoustic emissions from the airguns will be detected by the streamer and then recorded onboard the seismic vessel. The reflected sound is then processed to provide information about the structure and composition of geological formations below the seabed to aim to identify any hydrocarbon reservoirs.

During the proposed Pivot 2D MSS activities, the seismic vessel will traverse a series of pre-determined sail lines (approximately 6 km apart) within the operational area, generally at a speed of less than 8 knots, unless in an emergency. The survey is planned so that each line only has to be travelled once. In the unlikely event that there are some survey specifications which have not been met the survey vessel may have to re-acquire part of a line.

As the seismic vessel travels along the survey lines a series of noise pulses (approximately every 15 – 30 seconds depending on shot point interval) will be directed down through the water column and seabed. The released sound is attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive microphones arranged along a single hydrophone cable (streamer up to 10.5 km long) towed behind the seismic survey vessel.

The seismic survey vessel will tow an acoustic source array at a depth of up to 15 m. The acoustic source uses compressed air, with an operating pressure of approximately 2,000psi and a volume of up to approximately 5040 cubic inches (cui). The source produces sound pulses (sound pressure level – SPL) within a few meters in the order of approximately 265 dB re 1uP at 1m at dominant frequencies extending up to approximately 100Hz due to sound absorption in the water column as it travels away from the source. These sound pulses decrease to levels in the order 205 db re 1uP (SPL) within 1km of the source and approximately 185 db re 1uP (SPL) within 10km, dependent on the sound propagation characteristics of the area (results are calculated using the software program NUCLEUS¹)

4.1.1 Survey Vessels

The contract for the Pivot 2D MSS is yet to be awarded therefore the exact seismic and support vessels cannot be defined. However, maximum approximate parameters can be provided and are outlined in **Table 4-1**. The successful survey vessels will have passed a Woodside Marine Assurance Inspection Audit (to audit compliance with safety management requirements and marine compliance laws) and will continue to operate in accordance with Woodside’s Health, Safety and Environment (HSE) policies.

Table 4-1: Indicative Vessel Specifications

	Seismic Vessel (To be confirmed)	Primary Support Vessel (To be confirmed)
Engines	2 x MAK up to 1800KW	To be confirmed
Registered tonnage	Up to 3500 gross tonnage	Up to 1900 gross tonnage
Length overall (LOA)	Up to 75 m	Up to 65 m
Beam	Up to 20 m	Up to 18 m
Draft	Up to 6.5 m	Up to 6.5 m
Crew	40 +	10+
Passengers	5 +	32 +

The survey support vessel will generally accompany the seismic survey vessel to manage interactions with shipping and fishing activities and acting in a chase capacity if required. Due to the short duration of

¹ NUCLEUS is an advanced survey design, seismic modelling and analysis package. Woodside use NUCLEUS to model seismic airgun source arrays and provide information on source signatures including pressure, directionality, frequency and other attributes

the survey, no at sea bunkering, re-supply, or crew changes of the seismic vessel are planned, with the exception of an emergency or unforeseen circumstances.

5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

Woodside undertook an environmental risk assessment to understand the potential environmental risks associated with the Pivot 2D MSS to ensure they are reduced to As Low As Reasonably Practicable (ALARP) and will be of an acceptable level using a method consistent with Woodside standards.

The key environmental hazards and control measures to be applied to the Pivot 2D MSS activities are shown in **Appendix A**. These are consistent with Woodside corporate and project-specific objectives, standards and criteria. All control measures associated with the hazards will be used to reduce environmental risk to ALARP and will be of an acceptable level.

6. MANAGEMENT APPROACH

The Pivot 2D MSS will be managed in compliance with the *Pivot 2D MSS Environment Plan* accepted by NOPSEMA under the Environment Regulations, other relevant environmental legislation and Woodside's Management System (e.g. Woodside Environment Policy).

The objective of the EP is to ensure that potential adverse impacts on the environment associated with the Pivot 2D MSS, during both routine and non-routine operations, are identified, and will be reduced to ALARP and will be of an acceptable level.

The Pivot 2D MSS EP details for each environmental aspect (identified and assessed in the Environmental Risk Assessment – *Section 5 of the Environment Plan*) specific performance objectives and standards, and identifies the range of controls (controls available in **Appendix A** of this summary) to be implemented (consistent with the standards) to achieve the performance objectives and identifies the specific measurement criteria used to demonstrate that these performance objectives are achieved.

The implementation strategy detailed in the Pivot 2D MSS EP identifies the roles/responsibilities and training/competency requirements for all personnel (Woodside and its contractors) in relation to implementing controls, managing non-conformance, emergency response and meeting monitoring, auditing, and reporting requirements during the activity. The Pivot 2D MSS EP details the types of monitoring and auditing that will be undertaken, the reporting requirements for environmental incidents and reporting on overall compliance of the survey with the EP.

7. CONSULTATION

Woodside conducted a stakeholder assessment for the proposed activity to identify relevant and interested stakeholders based on the well location, proposed activities and timing.

A consultation fact sheet was sent electronically to all identified stakeholders prior to lodgement of the EP with NOPSEMA for assessment and acceptance. This advice was supported by engagement with potentially affected stakeholders.

Woodside received feedback on the proposed activity from a range of stakeholders, including government agencies, recreational fishing organisations and conservation groups. Issues of interest or concern included the location of the proposed survey across shipping fairways and commercial fishing areas, as well as potential impacts on marine mammals.

Woodside considered this feedback in its development of management measures specific to the seismic survey.

Woodside will continue to accept feedback from stakeholders during the survey.

8. CONTACT DETAILS

For further information about this activity, please contact:

Tony Johnson
Senior Corporate Affairs Advisor
Woodside Energy Ltd
Woodside Plaza, 240 St Georges Terrace, Perth WA 6000
T: +61 8 9348 4000
E: tony.johnson@woodside.com.au

Toll free: 1800 442 977

9. REFERENCES

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Sleeman et al, 2010, *To go or not to go with the flow: Environmental influences on whale shark movement patterns*. *Journal of Experimental Marine Biology and Ecology* 390, 84-98 (2010).

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APPENDIX A: Summary of Major Environmental Hazards and Control Measures to be applied to the Pivot 2D Marine Seismic Survey

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
Planned (Routine and Non-routine Activities)		
Physical Presence of Survey Vessels		
Noise emissions during normal survey operations (Vessels and Helicopters, excluding seismic source noise)	Disturbance to marine fauna, particularly whales and marine turtles, potentially as direct physical damage or as a behavioural effect	<ul style="list-style-type: none"> Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.04) – Interacting with cetaceans <ul style="list-style-type: none"> survey vessels will not travel at greater than 6 knots within 300 m of a cetacean (caution zone) and minimise noise; Survey vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding); <p><i>Exception: The above requirement does not apply to survey vessels operating under limited/constrained manoeuvrability including but not limited to seismic vessels towing equipment and acquiring data, vessels undertaking operations such as vessel to vessel bunkering and in the event of an emergency.</i></p>
Collision between survey vessels and marine fauna	Injury or fatality to protected fauna	<ul style="list-style-type: none"> Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.04) – Interacting with cetaceans <ul style="list-style-type: none"> survey vessels will not travel at greater than 6 knots within 300 m of a cetacean (caution zone) and minimise noise; Survey vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding); <p><i>Exception: The above requirement does not apply to survey vessels operating under limited/constrained manoeuvrability including but not limited to seismic vessels towing equipment and acquiring data, vessels undertaking operations such as vessel to vessel bunkering and in the event of an emergency.</i></p> <ul style="list-style-type: none"> Compliance with required Notifications of activities affecting cetaceans under the EPBC Regulations
Interference with/exclusion of commercial fishing and shipping	Interference with/exclusion of commercial fishing and shipping	<ul style="list-style-type: none"> Survey vessels compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, (Issue 7), specifically: <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) is notified of the seismic survey vessel movements during the survey so that AMSA RCC ensures that navigation Auscoast warnings can be issued and kept up to date. The Australian Hydrographic Office (AHO) is advised of the survey details (survey details, location, timing) within three weeks of mobilisation so that AHO can then issue a notice to mariners.
Interference with/exclusion of recreational fishing and tourism operations.	Interference with/exclusion of recreational fishing and tourism operations.	<ul style="list-style-type: none"> Survey vessels compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, (Issue 7), specifically: <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) is notified of the seismic survey vessel movements during the survey so that AMSA RCC ensures that navigation Auscoast warnings can be issued and kept up to date. The Australian Hydrographic Office (AHO) is advised of the survey details (survey details, location, timing) within three weeks of mobilisation so that AHO can then issue a notice to mariners.

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Page 17 of 17

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<ul style="list-style-type: none"> • Notification to Exmouth Game Fishing Club, three weeks prior to mobilisation with additional survey and communication information. • Daily coordinates of completed survey lines provided to Exmouth Game Fishing Club if survey timing overlaps with GAMEX 2013 tournament.
Interference with the heritage values associated with the Ningaloo Marine Park.	Interference with the heritage and cultural values associated with the Ningaloo Marine Park, World Heritage Area	<ul style="list-style-type: none"> • The survey vessels or personnel will not enter the Ningaloo Marine Park, unless in the case of an emergency.
Introduction of Invasive Marine Species associated with ballast water	Introduction and establishment of invasive marine species leading to disturbance to, damage to, or alteration of the natural ecosystem.	<ul style="list-style-type: none"> • Adherence the Australian Ballast Water Management Requirements (AQIS 2008); <ul style="list-style-type: none"> ○ As a minimum, all vessels mobilised from outside of Australia must undertake ballast water exchange > 50 nm from land and >200m water depth ○ Ballast water exchange records maintained
Introduction of invasive marine species (IMS) from transportation of on vessel hull, internal niches and in-water equipment	Introduction and establishment of invasive marine species leading to disturbance to, damage to, or alteration of the natural ecosystem.	<ul style="list-style-type: none"> • Adherence to the Woodside Energy Limited Invasive Marine Species Management Plan (WEL Doc No. A3000AH4345570). <ul style="list-style-type: none"> ○ Woodside's IMS risk assessment process will be applied to all vessels and submersible equipment planning to enter and operate within nearshore waters around Australia. Nearshore areas include all waters within 12 nautical miles of land and in all waters less than 50 m deep at LAT. ○ Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk will be implemented to minimise the likelihood of new IMS being introduced, or established IMS being spread within Australian waters. • Notification to Department of Fisheries within 24 hours of any known or suspected introduced marine species detected in Western Australian State waters, as a result of following Woodside IMS procedures. • Streamer deployment during transit to and from the survey area will not occur in water closer than 12 nm to shore, or in waters less than 50 m deep.
Interference with existing operational oil and gas infrastructure	Minor disturbance to, damage to operating infrastructure	<ul style="list-style-type: none"> • Survey vessels will comply with the relevant exclusion zone as it applies to the specific existing operational oil and gas facility.
Acoustic Source Emissions		
Underwater noise emissions from operation of seismic source	Disturbance to marine fauna, particularly whales and marine turtles, potentially as physical damage or as a behavioural effect.	<ul style="list-style-type: none"> • Operation of the seismic source within the operational area will be compliant with EPBC Act Policy Statement 2.1- Interactions between offshore seismic exploration and whales (DEWHA 2008) – Procedures: Precaution Zones (measured in horizontal radius from acoustic source) <ul style="list-style-type: none"> • Observation zone: 3 km+; • Low power zone: 2 km; and • Shut-down zone: 500 m

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<p>Observation and Compliance Reporting</p> <ul style="list-style-type: none"> • Use of vessel crew to supplement dedicated marine fauna observer in whale observations and monitoring compliance of Policy Statement 2.1. • Record kept of whale observations <p>Pre-Survey Planning</p> <ul style="list-style-type: none"> • Planning to avoid overlap with critical habitat used by EPBC Act listed whale species (critical habitat defined as breeding, calving, resting and feeding areas) • Planning to avoid peak migratory pathways (particularly constricted pathways) <p>During Survey</p> <ul style="list-style-type: none"> • Pre start-up Visual Observation • Soft start Procedure • Start-up Delay Procedure • Operations Procedure • Stop Work Procedure • Night-time and Low Visibility Procedure <ul style="list-style-type: none"> • Additional procedures to manage the operation of the seismic source in relation to whale sharks and marine turtles will be implemented as outlined below: Precaution zone (measured in horizontal radius from acoustic source) <ul style="list-style-type: none"> • Observation and shutdown zone 500 m. During Survey <ul style="list-style-type: none"> • Pre start-up Visual Observation (final 10 minutes of the cetacean pre-start up observation period)) • Soft start Observations(final 10 minutes of the cetacean soft start period) • Start-up Delay Procedure (applied if whale shark or turtle is sighted within the 500m shutdown zone, recommence soft start if animal/ s observed to move outside of the 500 m shut down zone or a period of 10 minutes has passed since last sighting) • Operations Procedure (continuous observations focusing on 500 m zone) • Stop Work Procedure (applied to whale shark and turtle sightings in 500m shutdown zone) <p>Observation and Compliance Reporting</p> <ul style="list-style-type: none"> • Use of vessel crew to supplement dedicated marine fauna observer in whale shark and turtle observations and monitoring compliance. • Record kept of whale shark and turtle sightings • Record kept of observation effort, observation conditions, source operations and procedures implemented <ul style="list-style-type: none"> • No discharge of the seismic source outside of the operational area. <p>Additional procedures to manage the operation of the seismic source in relation to whale sharks and marine turtles will be implemented as outlined below: Precaution zone (measured in horizontal radius from acoustic source)</p>

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<ul style="list-style-type: none"> • Observation and shutdown zone 500 m. <p>During Survey</p> <ul style="list-style-type: none"> • Pre start-up Visual Observation (final 10 minutes of the cetacean pre-start up observation period)) • Soft start Observations(final 10 minutes of the cetacean soft start period) • Start-up Delay Procedure (applied if whale shark or turtle is sighted within the 500m shutdown zone, recommence soft start if animal/ s observed to move outside of the 500 m shut down zone or a period of 10 minutes has passed since last sighting) • Operations Procedure (continuous observations focusing on 500 m zone) • Stop Work Procedure (applied to whale shark and turtle sightings in 500m shutdown zone) <p>Observation and Compliance Reporting</p> <ul style="list-style-type: none"> • Use of vessel crew to supplement dedicated marine fauna observer in whale shark and turtle observations and monitoring compliance. • Record kept of whale shark and turtle sightings <p>Record kept of observation effort, observation conditions, source operations and procedures implemented</p>
Routine Atmospheric Emissions		
Emissions from fuel and waste combustion	Contribution to global greenhouse gas emissions; and Consumption of non-renewable natural resources	<ul style="list-style-type: none"> • Compliance with MARPOL 73/78 Annex VI - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Regulations for the Prevention of Air Pollution from Ships - Marine Orders – Part 97 (Part IIID Marine Pollution Prevention – Air Pollution) – where applicable to vessel class including: <ul style="list-style-type: none"> • Vessel has a valid International Air Pollution Prevention Certificate (IAPP), • Use of low sulphur fuel when it is available
Routine Discharges		
Discharges of Bilge water, grey water, sewage and Putrescible wastes	Localised eutrophication of the water column; and localised adverse effect to marine biota.	<p>Sewage, Grey water and Putrescible Waste:</p> <ul style="list-style-type: none"> • Compliance with MARPOL 73/78 - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983); AMSA Marine Orders - Part 96: Marine Pollution Prevention – Sewage, - as required by vessel class including: <ul style="list-style-type: none"> • all sewage, grey water and putrescible waste holding tanks are to be fully operational prior to survey commencement. • operational onboard sewage treatment plant approved by the International Maritime Organisation (IMO). • a valid International Sewage Pollution Prevention Certificate (ISPP). • All MARPOL discharge boundaries requirements are met <p>Bilge Water:</p> <ul style="list-style-type: none"> • Compliance with MARPOL 73/78 - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983; AMSA Marine Orders - Part 91 Marine Pollution Prevention – Oil, as required by vessel class; <ul style="list-style-type: none"> • Bilge water contaminated with hydrocarbons must be contained and disposed of onshore, except if the oil content of the effluent without dilution does not exceed 15 ppm or an IMO approved oil/water separator (as required by vessel class) is used to treat the bilge water.

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
<ul style="list-style-type: none"> No discharges will be made within the Ningaloo Marine Park. 		
Unplanned (Accidents/Incidents) Activities		
Waste Management and Chemical Use		
Hazardous and non-hazardous waste handling and disposal	Pollution and contamination of the environment and secondary impacts on marine fauna (e.g. ingestion, entanglement).	<ul style="list-style-type: none"> Current Vessel Waste Management Plan (or equivalent) in place detailing wastes generated and disposal requirements. Must contain as a minimum: <ul style="list-style-type: none"> All waste storage facilities in good working order and designed in such a way as to prevent or contain any discharges. All hazardous wastes will be segregated prior to onshore disposal. No incidents of significant releases of waste materials to the marine environment Any accidental release of significant wastes to the marine environment will be recovered where safe and practicable to do so.
Loss of Equipment		
Loss of towed equipment	Damage to deepwater benthic communities	<ul style="list-style-type: none"> Operational procedures will be in-place on board the seismic vessels for deployment and retrieval of towed equipment. Streamers equipped with pressure-activated, self-inflating buoys designed to bring the equipment to the surface if lost accidentally. Lost towed equipment will be relocated and recovered where safe and practicable to do so.
Non-routine Accidental Hydrocarbon release		
Streamer fluid release caused by loss of integrity of streamer	Pollution of the marine environment adverse effects on marine life (shoreline or open water)	<ul style="list-style-type: none"> Operational procedures will be in-place on board the seismic vessels for deployment and retrieval of towed equipment. Streamers equipped with pressure-activated, self-inflating buoys designed to bring the equipment to the surface if lost accidentally. Solid streamers will be used for the Pivot 2D MSS. Lost towed equipment will be relocated and recovered where safe and practicable to do so.
Hydrocarbon release caused by topsides (vessel) loss of containment	Biological and ecological impacts to megafauna, plankton, deepwater benthic communities, offshore fish species, and fisheries.	<ul style="list-style-type: none"> Compliance with MARPOL 73/78 as applied in Australia under the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil), –as applicable to vessel class: <ul style="list-style-type: none"> Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. Survey vessels hold a valid IOPP Certificate, as applicable to vessel class. <p>Storage:</p> <ul style="list-style-type: none"> Any hydrocarbon storage on deck must be designed and maintained to have at least one barrier (i.e. form of bunding) to contain and prevent deck spills entering the marine environment. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. <p>Equipment:</p> <ul style="list-style-type: none"> Equipment located on deck utilising hydrocarbons (e.g cranes, winches or other hydraulic equipment) will have as a minimum primary bunding (i.e. deck edge lips or up-stands) to prevent loss of hydrocarbons to the marine environment. <p>Exceptions: <i>The above requirement does not apply to hydraulic hoses that are located on crane knuckles that protrude outside of the deck boundary and additionally, the Gun Deck where wash ports on the ship's side, which are designed to allow excess sea water to drain quickly from the deck to prevent the sea water free surface effect compromising the stability</i></p>

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<p><i>of the vessel - these ports will be secured closed in fine weather conditions when safe to do so.</i></p> <ul style="list-style-type: none"> Equipment located on deck utilising hydrocarbons (e.g. cranes, winches or other hydraulic equipment) will be maintained to reduce risk of loss of hydrocarbon containment to the marine environment. <p>Spill Response:</p> <ul style="list-style-type: none"> Spill response bins/kits are maintained and located in close proximity to hydrocarbon storage areas and deck equipment / bunkering areas for use to contain and recover deck spills.
<p>Hydrocarbon release caused by loss of structural integrity</p>	<p>Biological and ecological impacts to megafauna, plankton, deepwater benthic communities, offshore fish species, and fisheries</p>	<ul style="list-style-type: none"> Compliance with MARPOL 73/78 as applied in Australia under the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil), –as applicable to vessel class: <ul style="list-style-type: none"> Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. Survey vessels hold a valid IOPP Certificate, as applicable to vessel class. Survey vessels compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 7, specifically; <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). Procedure (or equivalent) relating to seismic and support vessel working in close proximity (e.g. transfer of supplies) including: <ul style="list-style-type: none"> Resupply and crew transfers will commence during daylight hours only and when sea conditions are appropriate (calm) as determined by the vessel master; and radio communication will be maintained between the seismic and support vessel. Implementation of the Pivot 2D MSS Oil Spill Action Plan and Shipboard Oil Pollution Emergency Plans (SOPEP) when a hydrocarbon spill has occurred.

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