



Upstream

BG15 Site Survey Environment Plan - Summary

Review record

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THE THREE WHATS

What can go wrong?
What could cause it to go wrong?
What can I do to prevent it?

BG15 Site Survey Environmental Plan

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1. Introduction

Origin Energy Resources Limited (Origin) is proposing to undertake a site survey in the Joseph Bonaparte Gulf (JBG) in 2015 (herein referred to as the BG15 site survey). The survey is being undertaken to provide safety, environmental and insurance planning for a future exploration well that may be drilled with either a jack-up or a semi-submersible drilling rig.

The survey location is proposed to be 4km x 4km square centred on the proposed well location located in exploration permit WA-454-P in the offshore JBG, Western Australia. It is approximately 60 km northeast of the West Australian coast and 345 km to the northeast of the city of Darwin in the Northern Territory is. (Refer to Figure 1-1)

The survey location will give adequate data coverage for geohazard analysis and will also cover the extent of a semi-submersible drilling rig anchor pattern and potential locations for relief wells.

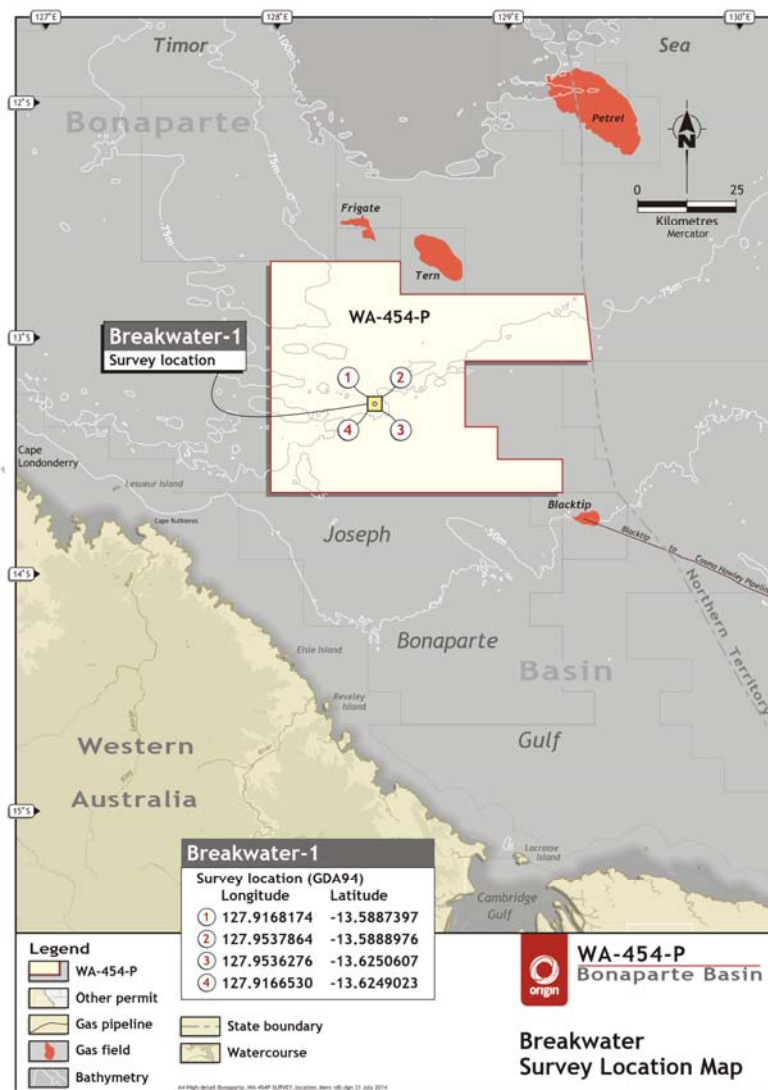


Figure 1-1: Location of the activity

2. Description of the activity

The survey vessel or vessels is yet to be selected. A single specialist all purpose vessel may be utilised for the survey. Alternatively, depending on vessel availability, it may be necessary to undertake the geophysical survey and geotechnical survey with two separate vessels. It is anticipated that the vessel would be between 35-75m in length. A summary of the survey activities is provided in Table 2-1. In the event that two vessels are required to undertake the scope of works these vessels will not be operating simultaneously as the geophysical works will be captured prior to a geotechnical vessel being mobilised.

The vessel undertaking geotechnical work may be required to position itself via a mooring system utilising anchors while obtaining bore hole samples.

Table 2-1 summary of activities

Title of Activity:	BG15 Site Survey
Activity Timing:	Depending on weather windows and vessel availability the site survey is scheduled to be undertaken between January and March 2015 for total activity duration of between 5 and 10 days.
Purpose:	<p>To obtain geophysical data prior to mobilisation of a drilling rig to location, in particular:</p> <ul style="list-style-type: none"> • Accurately measure water depths and map seabed topography across the survey areas. • Identify and map the nature and distribution of seabed types within the survey areas. • Characterise and map the thickness, distribution and nature of unconsolidated surficial sediments across the survey areas. • Identify and report on potential seabed obstructions/hazards which could interfere with positioning of semi-submersible drilling rigs. • Confirm the presence, or lack thereof, of shallow gas prior to the commencement of drilling. • Reduce potential risks/hazards for future proposed drilling at the locations. <p>In support of the above geophysical survey, to obtain geotechnical soil data for shallow seabed classification and rig emplacement foundation analysis, in particular:</p> <ul style="list-style-type: none"> • Soil sampling down to 30m below seabed (dependent on rig selection) to ascertain shallow soil properties and types • Cone penetrometers tests (CPT) to ascertain soil strengths and shallow sub seabed foundation study.

The site survey will utilise a number of geophysical and geotechnical techniques to capture the data required to assess the site. Activities that are captured under the EP are;

- Geophysical surveys (e.g. magnetometer, side scan sonar, sub bottom profiling (SBP), multibeam echo sounder);
- Geotechnical surveys (e.g. rotary boring, hydraulic piston tube coring, sediment sampling, drop coring);
- Environmental surveys (e.g. sediment samples, camera surveys);

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- Vessel anchoring; and
- Vessel movements.

The details of the nominated liaison person for this Environmental Plan are;

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3. Description of the environment

3.1 Physical environment

The Bonaparte Basin, which dominates the western portion of the JBG system, was formed between 15,000 to 13,000 years ago after rapid sea level rise inundated most of the Sahul Shelf creating fully open marine conditions within the area known as the Bonaparte Depression. During the Late Quaternary, the environment of the Bonaparte Depression varied with fluctuating sea levels and climatic conditions, from an estuarine embayment to a shallow, freshwater lake. Extensive palaeo-river channels, some up to 150 km long, 5 km wide and 240 m deep, connect the present day basin to the old shoreline at the edge of the shelf (Pinceratto, 1997).

The permit area falls within the Northwest Shelf Transition zone (Commonwealth of Australia (2006)). This is divided into the commonwealth planning areas of the North West Marine Region planning area and the North Marine Planning area.

The JBG is situated in a tropical region that experiences a monsoonal climate with two predominant seasons. A hot and wet summer is experienced from October to March, the high humidity and thunderstorm activity is caused by steady west to nor-westerly winds that bring moisture from the Timor Sea. From April to September the weather is dry and warm, influenced by the easterly winds generated from inland Australia.

The JBG is subject to cyclones during the wet season and has the highest tidal range in Northern Australia. High energy tidal currents along much of the region's coastline stimulate mixing and sediment movement throughout the year, contributing to the highly turbid and relatively productive inshore environment. Terrestrial inputs of freshwater, sediments and detritus are generally compartmentalised within a fairly distinct coastal boundary layer, which is particularly well-developed within the JBG. There is no evidence to suggest that terrestrial inputs influence offshore productivity as there is little transfer of nutrients from coastal waters to oceanic waters. Sea surface temperature obtained from the National Oceanographic Data Centre (NODC) for the BG15 survey area were 27.9 to 29.1°C in winter and summer respectively.

The bathymetry of the permit area ranges from approximately 57 to 85 m, with the survey area sitting in around 80m depth. The regional bathymetry of the Bonaparte Basin and surrounds is displayed in Figure 3-1.

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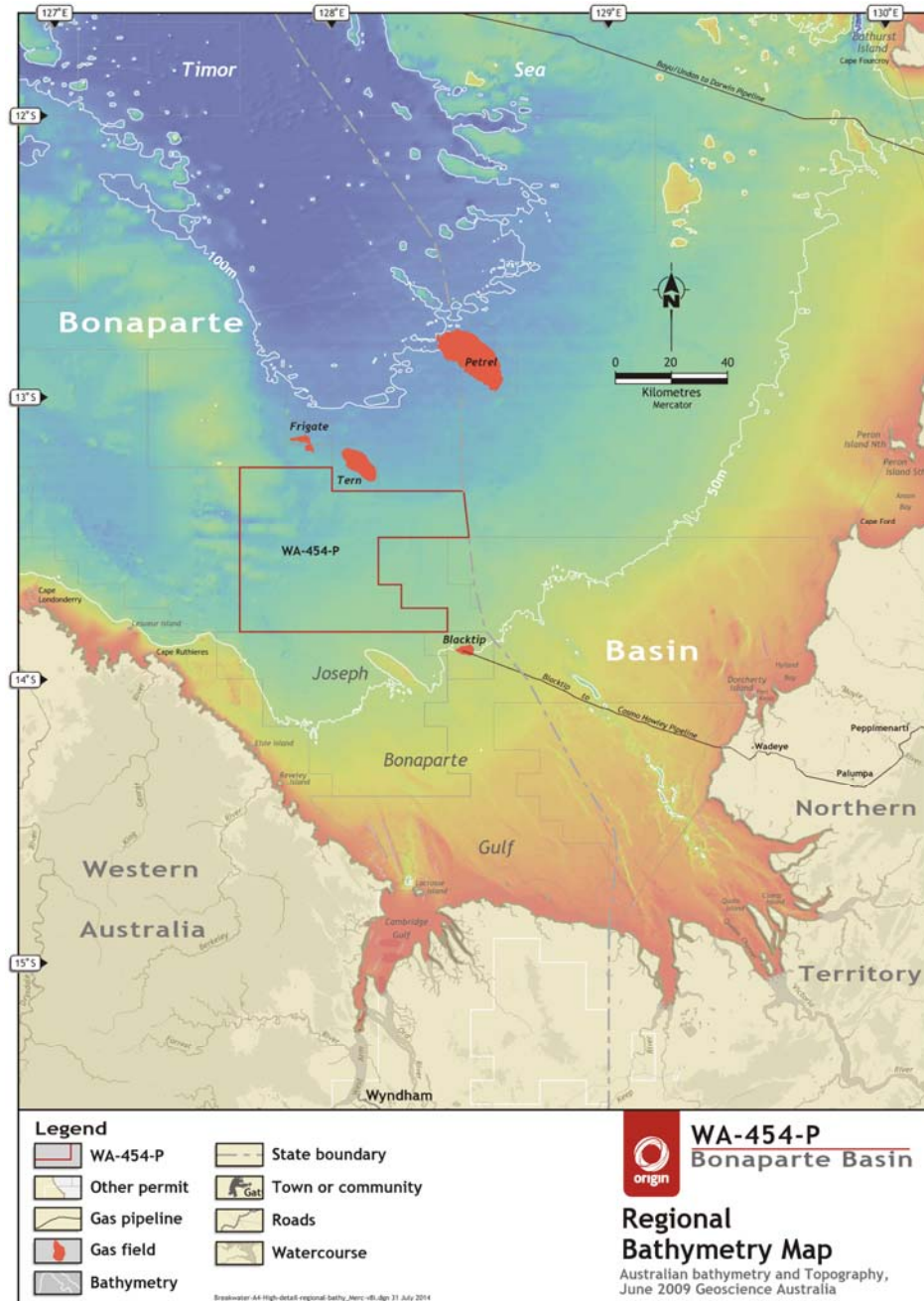


Figure 3-1 regional bathymetry

3.2 Biological environment

Most of the seabed of the lower JBG is flat and is comprised of soft sediments with occasional rock outcrops and scattered epifauna. Biota is likely characterised by infaunal plains with some localised reefs and outcrops supporting sponge gardens. Large expanses of barren sand banks are likely to occur in near shore areas of the JBG extending out from the Victoria river and the extensive sand shoals on either side of the entrances to the Cambridge Gulf, known as the King Shoals and Medusa Banks (Przeslawski *et al* 2011). Depth increases gradually out to the continental shelf which is dissected by numerous paleo-channels. Habitat complexity and species richness are variable in offshore areas of the JBG.

In the area that bounds the survey the marine habitats that could be affected by the survey from routine activities include soft sediments and associated benthic flora and fauna. The Floyd 3D seismic survey was undertaken over the survey area during 2012 and initial analysis indicates that the survey area is defined by soft /muddy and some

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coarser sediment. There is no evidence of fluid venting at the sea bed and no evidence of mound-forms or high amplitudes that might indicate carbonate reefs.

Marine and coastal fauna that could potentially be affected by routine and non routine activities associated with the site survey include plankton, fish, mammals, reptiles, and birds. The EPBC Act protected matters database was consulted to identify threatened and migratory species that may reside in and/or utilise the waters in and around the BG15 site survey location. These species are summarised in Table 3-1.

Table 3-1 listed threatened and migratory species

Scientific Name	Common Name	EPBC Status	Presence
Mammals			
<i>Balaenoptera musculus</i>	Blue whale	E, M	SHM
<i>Megaptera novaeangliae</i>	Humpback whale	V, M	SHL
<i>Balaenoptera edeni</i>	Bryde's whale	M	SHM
<i>Orcinus orca</i>	Killer whale, orca	M	SHM
<i>Tursiops aduncus</i>	Spotted bottlenose dolphin	M	SHM
Sharks			
<i>Carcharodon carcharias</i>	Great White Shark	V, M	SHM
<i>Pristis zijsron</i>	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V, M	SHM
<i>Rhincodon typus</i>	Whale Shark	V, M	SHM
<i>Isurus oxyrinchus</i>	Shortfin Mako	M	SHL
<i>Isurus paucus</i>	Longfin Mako	M	SHL
<i>Manta birostris</i>	Giant Manta ray	M	SHL
Reptiles			
<i>Caretta caretta</i>	Loggerhead turtle	E, M	SHL
<i>Chelonia mydas</i>	Green turtle	V, M	SHK
<i>Dermochelys coriacea</i>	Leatherback turtle	E, M	SHL
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	V-M	SHL
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	E, M	SHK
<i>Natator depressus</i>	Flatback Turtle	V, M	SHK
<i>Crocodylylus porosus</i>	Salt-water crocodile	M	SHL
Avifauna			
<i>Calonectris leucomelas</i> - <i>Puffinus leucomelas</i>	Streaked Shearwater	M	SHM
<i>Pandion haliaetus</i>	Osprey	M	SHM
<i>Sterna bengalensis</i>	Lesser crested tern	M	SHK

The protected matters search is an online publically available search tool supplied by the Australian government and is available at the following location.

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<http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected>

Any marine fauna observed in the site survey area are likely to be transient as the site survey is located 60km from the nearest shoreline and the infaunal plains surrounding the survey area are not conducive to supporting large aggregations of marine fauna. There is no known cetacean or turtle aggregation sites for breeding, nesting or foraging in the vicinity of the survey site. Also no known cetacean migratory paths are located in the vicinity of the site survey area.

3.3 Cultural and Socio-Economic Environment

Socio-economic activities that may occur in the region around the permit area include commercial fishing, oil and gas exploration and production and to a lesser extent recreation and tourism ventures.

Along the north-western coastline of Australia, traditional and subsistence fishing is generally limited to shorelines, creeks and near shore reefs. Traditional Indonesian fishing for shark occurs along the edge of the continental shelf.

A number of State, Territory and Commonwealth commercial fisheries have management boundaries that overlap the JBG. From the consultation undertaken the only fishery activity identified as potentially occurring in the vicinity of the survey area was the Northern Prawn Fishery. The fishery has a short season with the banana prawn season taking a maximum of 10 weeks and the tiger prawn season taking less than 4 months (DEWHA 2008A).

The permit area is located within this fishery where red legged banana prawns are targeted by otter trawl over soft substrates. The fishery has two defined seasons; March to June, and August to December (Larcombe and Perks 2009).

The North Marine Region is a highly prospective petroleum region and contains a number of known oil and gas fields. ENIs Blacktip field is located approximately 63 km to the south east of the survey site.

Shipping activities in the North Marine Region are linked to mining exports (Including bauxite, manganese and lead/zinc) and live-stock export. The most significant port in terms of visitation, volume and value of freight is the Darwin Port which is approximately 277 km north-east from the Permit Area. Darwin Port is important for trading ships, fishing vessels, cruise ships, Navy ships and Timor Sea oil and gas developments.

There are no major commercial shipping lanes through the permit area. The major commercial shipping routes are through the Timor Sea, well north of the permit area. Traffic in the permit area is limited to infrequent visits by Northern Prawn Fishery and other fisheries. Analysis of Australian Maritime Safety Authority (AMSA) shipping data indicates that 23 ships passed through the permit area during 2011.

4. Management and monitoring

Origins overall environmental objective for the BG15 site survey is to avoid or reduce environmental risks to as low as reasonably practicable (ALARP).

Management of the BG15 site survey is undertaken in accordance with the Origin Health, Safety and Environment Management System (HSEMS). The HSEMS includes the Origin HSE Policy and 20 HSEMS Standards which provide performance requirements for all Origin operations that are aligned with commitments made in the HSE Policy. The HSEMS provides a management framework to achieve HSE objectives systematically while allowing flexibility to effectively target impacts and risks.

The Origin HSE Policy can be accessed at:

<http://www.originenergy.com.au/files/HSEPolicy.pdf>

The Origin HSEMS can be accessed at:

<http://www.originenergy.com.au/1780/files/HSEManagementsystem.pdf>

The BG15 site survey is also managed to comply with the relevant State and Commonwealth Acts and Regulations.

The organisation structure for the BG15 site survey consists of onshore and offshore Origin and Survey Contractor representatives. Day-to-day implementation of the environment plan will occur on the survey vessel under the leadership of the Party Chief and the Origin Offshore Representatives. The Origin Project Manager will have oversight of the performance of the project against the Environment Plan and will initiate reviews and audits as required. In the event of a vessel incident, the Origin Group Emergency Response Team will work together with HSE and technical advisors and government combat agencies as required to respond.

Audits will be undertaken to determine compliance with the requirements of the EP as part of Origins HSE auditing program under the HSEMS. Audits will assess and report Environmental performance for the BG15 site survey.

If any new or increased risks are identified before or during the BG site survey, an assessment of the risk and review of the EP will be undertaken. If it is determined that any new or increased risks are significant the revised EP will be submitted to NOPSEMA for approval prior to the commencement of the activity causing the risk.

All environmental incidents and non-conformances are managed in accordance with Origin incident management processes including reporting, classification, investigation and close out. Reporting of incidents and non-conformances to the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA) will be undertaken in accordance with the OPGGS (E) Regulations 2009.

Due to the short duration of the survey a single post survey closeout report will be prepared for Origin and submitted to NOPSEMA within three months of the completing the survey. This report will detail environmental performance as required by the *OPGGS (E) Regulations 2009*.

Origin will notify NOPSEMA that the survey is about to commence at least 10 days before the activity commences and will notify the regulator the activity has been completed within 10 days of the completion of the survey.

Origin will notify the W.A. Department of Mines and Petroleum and the N.T. Department of Mines and Energy of the proposed date of the survey once this has been confirmed. Origin will not commence activities until these notifications are made.

Origin will also store and maintain environmental documents and records from the BG15 site survey for the period of 5 years, as required by the OPGGS (E) Regulations 2009.

Origin has developed an oil pollution emergency plan (OPEP) to support the BG15 site survey activity. The aim of this OPEP is to detail the activities and arrangements and provide a framework for vessel based response actions to protect life, the environment

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and property in the event of an accidental discharge of any oil product from the BG15 site survey vessel during the site survey. A summary of the OPEP is provided in Appendix A.

5. Environmental risks and controls

The environmental risk assessment of activities involved in the BG15 site survey are divided into risks arising from routine activities (those impacts that are considered to be unavoidable and part of the undertaking of the activity) and risks arising from non routine activities (those impacts that are introduced as a result of the activity). These are based on the scale of the activity and the perceived impacts involved;

Routine hazards identified are;

- Underwater noise from the survey equipment;
- Operational discharges to the marine environment (Putrescibles, sewage, grey water);
- Light emissions from artificial lighting;
- Atmospheric emissions; and
- Physical disturbance to the seabed.

Non-routine hazards identified are;

- Minor Operational Spill <80 L due to Unplanned Discharge or Release.
- Loss of containment (diesel) from vessel fuel tank rupture;
- Accidental hazardous or non-hazardous waste discharges;
- Interactions with marine fauna;
- Interactions with other marine users; and
- Introduction of invasive marine species.

The risk assessment methodology utilised for the BG15 site survey is consistent with the Australian Standard for Risk Management: AS/NZS ISO 31000:2000, Origin risk management policies, procedures and tool kits and NOPSEMA's guidance notes regarding environment plans. The methodology provides a systematic approach to;

- Identifying each project activity and its associated environmental hazards.
- Identifying the environmental values within and adjacent to the area.
- Defining the potential environmental impacts of activities on environmental values identified above.
- Identifying the environmental consequences of the impact.
- Identifying the likelihood of the impact occurring.
- Evaluating overall environmental risk levels using the Origin risk toolkit matrix.
- Identifying mitigation measures.

The risk assessment process undertaken for the BG15 site survey is an ongoing process and risks are continually assessed and if necessary new controls implemented to reduce potential risks to As Low as Reasonably Possible (ALARP). This process of continual assessment is integral to Origin's risk management process.

After taking into consideration the control measures proposed, the likelihood of the event occurring and the environmental conditions at the site all residual risks were considered to be reduced to ALARP and acceptable levels. A summary of risks and controls for the site survey is presented in Appendix B.

6. Consultation

Origin has consulted extensively for the BG15 site survey activity with identified relevant stakeholders. Origin undertook a two month (August to September 2014) initial consultation program with known relevant and interested authorities and persons to ensure the proposed BG15 site survey in the Bonaparte Basin was known about and discussed by those who may be impacted by the activity. The following stake holders were consulted;

- Commonwealth Fisheries Association.
- Northern Prawn Industry Association.
- Australian Council of Prawn Fisheries.
- Australian Fisheries Management Authority (AFMA).
- Australian Hydrographic service.
- Australian Marine Safety Authority (AMSA).
- Department of Defence (DoD).
- Department of mines and Petroleum W.A.
- Western Australian Department of Fisheries.
- Department of Transport W.A.
- Department of Transport N.T.
- Parks and Wildlife Commission of the NT.
- Department of mines and energy N.T.
- Pearl Producers Association.
- Tourism NT.
- NT Environment Centre.
- WA Fishing Industry Council (WAFIC).
- Northern Territory Seafood Council (NTSC).
- Australian Marine Oil Spill Centre (AMOSOC).
- AdaGold (flight consultants).
- Relevant Individual commercial fishermen.
- Paspaley Pearls.
- Recfishwest.
- WA Seafoods.
- NT Fisheries.
- Australia Bay Seafoods.

Following this initial contact Origin sought to meet with each relevant authority face to face in meetings held in Perth, Broome and Darwin. Origin met with:

- Western Australia Department of Fisheries (Perth and Broome);
- WA Fishing Industry Council;
- Paspaley Pearls;

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- Northern Territory Seafood Council; and
- Northern Prawn Industry Association & WA Seafoods.

As part of these meetings Origin were provided with further information regarding stakeholders (fishermen, pearlers) to consult with regarding the potential impact of the proposed site survey. Fishermen and pearlers were forthcoming about their activities and only prawn fishermen were identified as potentially directly impacted as they occasionally fish in the area.

Any concerns raised by the fishermen related to future drilling programs and any potential development of the region. Ongoing consultation will address these future issues as and if they become apparent and Origin will continue to liaise with potentially affected fishermen closer to the survey date.

Origin is committed to establishing and maintaining long term relationships with all of its stakeholders and ensuring regular engagement prior to, during and after petroleum activities. Origin will continue to liaise with all relevant and interested stakeholders regarding this site survey and any further activities in WA 454-P and an email will be sent to identified stakeholders on completion of the survey.

7. References

Commonwealth of Australia (2006). A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0. Department of the Environment and Heritage, Canberra, Australia. Available at; <http://laptop.deh.gov.au/coasts/mbp/imcra/>

Department of the Environment, Water, Heritage and the Arts DEWHA (2008a) - The North Marine Bioregional Plan. Bioregional profile. a description of the ecosystems, conservation values and uses of the North Marine Region. Australian Government, Canberra.

Larcombe, J and Perks, C 2009, 'Northern Prawn Fishery', in Wilson, DT, Curtotti, R, Begg, GA, Phillips, KL (eds) 2009, Fishery Status Reports 2008: status of fish stocks managed by the Australian Government, Bureau of Rural Sciences and ABARE, Canberra

Pinceratto, E., 1997, 'Physical Environment', in Heyward A., Pinceratto, E. and Smith, L., (eds), Big Bank Shoals of the Timor Sea: An environmental resource atlas, BHP Petroleum, Melbourne, pp. 7-12

Przeslawski, R., Daniell, J., Anderson, T., Barrie, J.V., Battershill, C., Heap, A., Hughes, M., Li, J., Potter, A., Radke, R., Siwabessy, J., Tran, M., Whiteway, T., Nichol, S. (2011). Seabed habitats and hazards of the Joseph Bonaparte Gulf and Timor sea, Northern Australia. Geoscience Australia, record 2011/40

Appendix A Summary of response strategies in the oil pollution emergency plan

Origin has developed an oil pollution emergency plan to support the BG15 site survey activity. The aim of this OPEP is to detail the activities and arrangements and to provide a framework for vessel based response actions to protect life, the environment and property in the event of an accidental discharge of any oil product from the BG15 site survey vessel during the site survey. The actions outlined within the OPEP are integrated within Origin's overall emergency response framework and sets out Origin and Contractor responsibilities and response actions in the unlikely event of an oil spill during the survey activities.

The National Plan for Maritime Environmental Emergencies sets out the divisions of responsibility for an oil spill at sea. For offshore petroleum exploration and production Origin is the control agency for spills emanating from its offshore facilities and AMSA is the control agency for spills emanating from vessels in Commonwealth waters, including the vessel/s utilised for this survey.

The Origin OPEP defines:

- Priorities for protection in the event of a spill;
- The response incident management structure;
- Protocols for notifications to NOPSEMA, AMSA and State government agencies as appropriate;
- Response strategies and Response Action Plans based on feasible worst case scenario spills of fuel oil and other hydrocarbons from the survey vessel;
- Roles responsibilities and training of personnel within the Response Action Plans;
- Spill equipment and resources, including responsibilities for audit and maintenance;
- Procedures and responsibilities for review and maintenance of the OPEP.

In the unlikely event of a spill the specific actions Origin would undertake in response to any oil spill relating to the BG15 survey are outlined below:

- Follow the Vessels procedures (including the Shipboard Oil Pollution Emergency Plan - SOPEP) to protect human life and prevent fire or explosion.
- Prevent any further discharge of oil from the vessel i.e. by containing the spilled oil on board the vessel if safe to do so;
- Gain situational awareness; i.e. identify the substance, the volume, the location and trajectory of the spill, weathering processes and define the worst credible scenario; and
- Ensure rapid notification of relevant Government agencies of any spill or potential spill in accordance with regulatory requirements and to facilitate any escalation of the response beyond Tier 1.
- Activate the Origin Group Emergency Management Team in the event of a Tier 2 spill

In the event of discharge overboard which is outside of the response capabilities of the vessel crew, it is expected that the spill would be escalated to a higher tier (Tier 2) at the discretion of the responsible combat agency, depending on the location and severity of the incident.

Given the open ocean conditions, remote location, short duration of activities, limited volumes of fuel involved and high evaporation rates of marine diesel it has been determined through a net environmental process (NEBA) that the monitor and evaluate strategy is appropriate to manage potential spill scenarios.

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The available options for the monitor and evaluate strategy include;

- Observation from vessel;
- Modelling (with real time met ocean data); and
- Aerial surveillance.

The practicality of this response action would be revisited and informed and revised via a NEBA assessment if required based on the actual characteristics of a spill at hand.

Appendix B Risk assessment tables

Hazards / Risks	Potential environmental impact	Activity / Environmental Context	Controls / Mitigation measures
Underwater noise from vessel and survey equipment.	Noise from site survey geophysical activities disturb or injure marine fauna.	The acoustic sources utilised in the site survey are of significantly lower power than deep exploration seismic sources. The survey location is remote location and is not known to contain any biologically sensitive environments. The duration of the survey, and therefore noise impacts, is of short duration,	<p>The following measures will be undertaken during acquisition of the geotechnical, sea floor imaging and bathymetry surveys;</p> <ul style="list-style-type: none"> Vessel will observe measures outlined in EPBC Regulations 2000 - Part 8 Division 8.1, A Marine Fauna Interaction Induction will be provided to all vessel crew and survey personnel prior to mobilisation of the survey. <p>The following measures will be undertaken during acquisition of shallow hazard seismic profiling using the SBP;</p> <ul style="list-style-type: none"> The vessel will operate in compliance with measures under Part A of the EPBC act policy statement 2.1, interactions between offshore seismic exploration and whales. A trained MMO will be used during acquisition of the SBP shallow seismic lines.
Operational discharges from vessel to the Marine Environment	Localized reduction in water quality Localized nutrient enrichment of the receiving environment	The survey area is a highly dispersive, deepwater environment and there is limited potential for increased nutrient levels to have a negative influence on the existing environment.	<ul style="list-style-type: none"> Sewage will be treated through an IMO approved sewage treatment plant prior to discharge; All operational waste discharge will be in Compliance with MARPOL 73/79 Annex IV and V; Compliance with MARPOL Annex I Vessel has a Maintenance Management System; and Vessel induction includes waste management practices.
Light emissions from artificial lighting	Altered marine fauna behaviour.	Being 60 km from the nearest shore the proposed BG15 site survey is not located in proximity to any turtle nesting beaches, foraging area or bird rookery that could be impacted by lighting from the site survey.	<ul style="list-style-type: none"> Lighting on the vessel will only be as required for navigational and operational safety. Origin vessel induction includes requirements to report wildlife interactions.
Atmospheric emissions	Localized effect on air quality Contribution of green house gas to the global concentrations	The impacts on air quality will be localised to the emission point, and can be expected to be reduced to background levels close to the source. The volumes of fuel expected to be consumed are comparable with other shipping activities in the region.	<ul style="list-style-type: none"> Engines maintained in accordance with vessel preventative maintenance system Comply with MARPOL 73/78 Annex VI Hold a current International Air Pollution Prevention (IAPP) certificate.

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Hazards / Risks	Potential environmental impact	Activity / Environmental Context	Controls / Mitigation measures
Physical disturbance to sea floor	Localised disturbance to benthic flora and fauna.	The predominant benthic receiving environment within, and adjacent to, the operational area is primarily a soft sediment benthic environment comprising of sandy/silt substrate. The area of direct disturbance to the sea floor will be very small and localised and any impact to benthic communities is considered very minor compared to the natural process of sedimentation and bioturbation.	<ul style="list-style-type: none"> No anchoring of the vessel will take place under normal operating conditions unless required in an emergency situation or potentially if boring is required; The geophysical survey will inform the final placement of the geotechnical samples and anchors (if required for boring operations). Only seawater will be used as a lubricating fluid if boring operations are required.
Minor release of lubricating fluids to hydraulic, fuel or cooling fluids to the marine environment	Localized reduction in water quality Localized toxic effects to marine biota	The potential impact associated with this non-routine event is the localised and temporary reduction in water quality and localised toxic impacts to marine biota. Any spill would be rapidly diluted in the open ocean environment.	<ul style="list-style-type: none"> Preventative maintenance and testing system and schedule. Vessels have SOPEP and spill equipment in place. The vessel has designated containment areas for oil, grease and chemical storage.
Loss of containment (Diesel) from vessel fuel tank rupture.	Toxic effects to marine biota Disruption to other marine activities Decline in water and sediment quality	AMOSC (2011) categorises marine diesel as a light group II hydrocarbon. In the marine environment, a 5% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering. Diesel oil is readily and completely degraded by naturally occurring microbes, under time frames of one to two months.	<p>Adherence to standard maritime safety and navigation requirements:</p> <ul style="list-style-type: none"> IMO International Regulations for Preventing Collisions at Sea (COLREGS); Issue of Notice to Mariners via AMSA; Vessels are equipped with navigation aids and competent crew maintaining 24 hour visual, radio and radar watch for other vessels; and Radio warnings to shipping as required. <p>Also;</p> <ul style="list-style-type: none"> Vessel will have approved SOPEP in place and accepted Origin OPEP in place.
Accidental hazardous or non-hazardous waste discharges.	Toxicity effects on marine fauna through ingestion or physical contact. Physical effects on fauna through entanglement or ingestion. Adverse effects on water quality.	The survey location and nature (e.g. distance from potentially sensitive environments such as coral reefs, water depths, open ocean) mean that the potential risk of environmental impact from accidental releases of hazardous or non-hazardous wastes from the survey vessel into the marine environment is low.	<ul style="list-style-type: none"> Wastes designated as hazardous or dangerous goods will be identified, packaged, segregated, handled, stored, transported and tracked in accordance with MARPOL 73/78 and applicable International Maritime Dangerous Goods (IMDG) requirements. Inductions provided to all personnel shall include information on waste management procedures, housekeeping procedures and requirements to segregate wastes. Vessel waste management plan for managing the production, storage, transportation and disposal of waste.

Hazards / Risks	Potential environmental impact	Activity / Environmental Context	Controls / Mitigation measures
Vessel interaction with marine fauna.	Collision resulting in injury or death to turtles or cetaceans.	No critical or protected habitats, fauna or restricted migration routes are known at the Permit Area and therefore there is a low likelihood of encountering protected species, including cetaceans and turtles	<ul style="list-style-type: none"> • Crew suitably inducted in marine mammal observation on vessel. • Adherence with EPBC, Policy Statement 2.1 Part A. during acquisition of shallow hazard seismic profiling using the SBP. • Survey compliant with EPBC regulations 2000 -Part 8 Division 8.1.
Interaction with other marine users	Disturbance to commercial shipping vessel routes. Disruption to commercial and recreational fishing vessel activities.	The survey area is not within any regular shipping routes and consultation outcomes indicate that there is unlikely to be a high level of fishing activity in the immediate area during the survey period. In addition, the survey is of a short duration (approximately 10 days total) and extent (16 km ²) and as such there is not expected to be any significant inconvenience to other seafarers in the region.	Adherence to standard maritime safety and navigation requirements: <ul style="list-style-type: none"> • IMO International Regulations for Preventing Collisions at Sea (COLREGS); • Issue of Notice to Mariners via AMSA; • Vessels are equipped with navigation aids and competent crew maintaining 24 hour visual, radio and radar watch for other vessels; and • Radio warnings to shipping as required. • Relevant stakeholders notified prior to survey
Introduction of invasive marine species.	Establishment of invasive marine species causing displacement and/or loss of native species and reduction in biodiversity.	The survey vessel will be compliant with AQIS ballast water and anti-fouling system requirements, and will obtain clearance if mobilising from outside of Australian waters.	<ul style="list-style-type: none"> • Vessel Quarantine Pre-Arrival Report (QPAR), if arriving from outside Australia. • Vessel anti-fouling coating / system