East Spar NCC Buoy Removal Environment Plan

Environment Plan Summary

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1. INTRODUCTION

Quadrant Energy Australia Pty Ltd (Quadrant) is the registered operator for Petroleum Production Licence WA-13-L on behalf of registered Titleholders Quadrant Energy East Spar Pty Ltd, Quadrant Oil Australia Pty Ltd, Quadrant Kersail Pty Ltd and Santos (BOL) Pty Ltd.

Quadrant proposes to remove the NCC Buoy (gravity base, clump weight and iron ore ballast will remain on the sea bed as part of the East Spar field, and be part of the infrastructure considered for decommissioning with the East Spar field itself) from the East Spar field. The field is located in 96 m water depth, approximately 36 km west of Barrow Island and 63 km west of Varanus Island. Gas and condensate production commenced in 1996 from the East Spar field via Varanus Island and was suspended in 2006 upon exhaustion of the field reserves and the NCC Buoy ceased operation. The Halyard field was connected to the East Spar manifold and export pipeline to Varanus Island in 2011 and control of the Halyard well provided via an electro-hydraulic umbilical from the John Brookes platform. The Halyard field remains in production, with gas produced through the East Spar manifold, but all East Spar wells (i.e. ES-1, ES-3 and ES-6) are shut in. As the NCC Buoy is no longer required, Quadrant intends to remove the NCC Buoy from the East Spar field.

1.1 Compliance

The overall purpose of the *East Spar NCC Buoy Removal Environment Plan (EA-34-RI-10001.01)* (the EP) is to comply with statutory requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E) Regulations) and to ensure that the Activity is planned and conducted in line with Quadrant environmental policies and standards, including the corporate Environmental Policy. The EP was assessed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 28th August 2015. This EP summary has been prepared in accordance with the requirements of regulation 11 (7) and (8) of the OPGGS (E) Regulations.

1.2 Schedule

During the activity, operations will be 24 hours per day, carried out over a period of approximately 2 weeks. Activity is scheduled to commence and be completed in quarter four 2015. The latest date for completion of the activity is 31 December 2015.

1.3 Ministerial Statement

Ministerial Statement 395 (East Spar Off-shore Gas Field Development) was published on 8 September 1995 and granted the proponent (Quadrant Oil Australia) under the Environment Protection Act 1986 to implement the proposal to develop the East Spar Off-shore Gas Field with a number of operational conditions. One of these conditions includes for decommissioning of the East Spar field whereby a separate decommissioning plan must be prepared at least 6 months prior to decommissioning. This will include an assessment of the removal/ abandonment of the gravity base, clump weight and iron ore ballast. This EP is only for activity involving the removal of topsides equipment and not for the subsea infrastructure or field decommissioning, as the field is still being operated.

2. ACTIVITY LOCATION

The NCC Buoy is located in the East Spar (ES) Field. The ES Field consists of subsea wells and production facilities connected to a subsea manifold via 62 km of 350 mm production pipeline to Varanus Island. The operational area is defined as the 500 m exclusion zone surrounding the Buoy location at the co-ordinates provided in **Table 2-1**. The Buoy location is in 96 m water depth, 36 km from the nearest land at Barrow Island, 95 km from the nearest mainland and 101 km north of the nearest town at Onslow. The East Spar manifold is located 173 m to the northwest of the NCC Buoy and the East Spar pipeline is located 170 m to the north.

Table 2-1: Coordinates of the NCC Buoy

Parameter	Coordinates (Datum/Projection: GDA 94 Zone 50S)			
	Latitude	Longitude	Easting	Northing
NCC Buoy	-20°43'23.216" (-20.72312)	114°59'08.879" (114.9858)	290228	7707196

Existing facilities within the operational area at the time of activity commencement will include:

- East Spar Manifold which joins the Halyard flowline to the ES Pipeline;
- ES 14" pipeline;
- 3 6" flexible flowlines from the ES wells to the PLEM;
- East Spar Pipeline End Manifold (PLEM); and
- Halyard Flowline;

All other facilities in the field have been shut in.

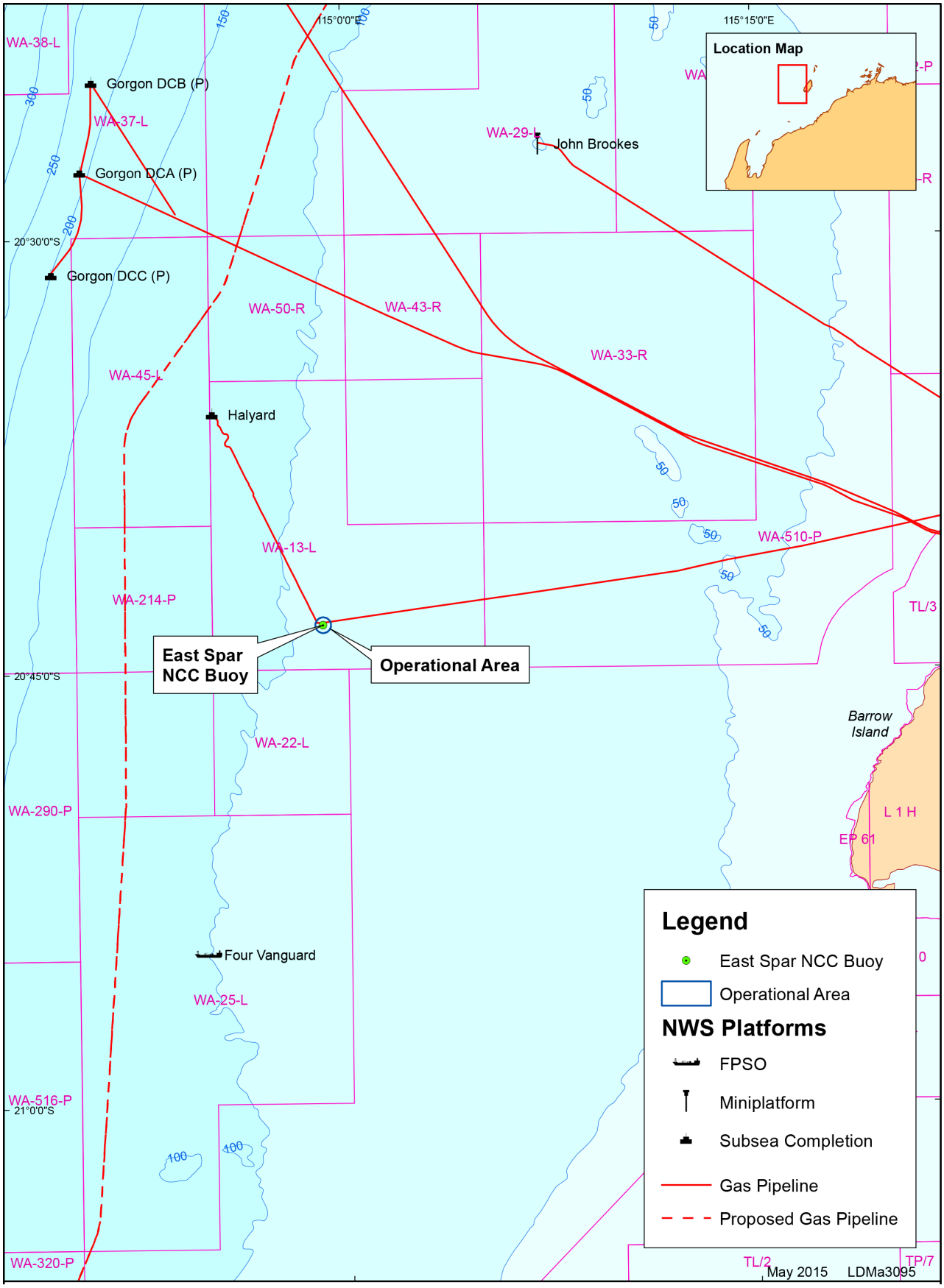

Figure 2-1: Location of NCC Buoy and Operational Area

3. DESCRIPTION OF THE ACTIVITY

3.1 Activity Duration and Timing

The activity will be carried out 24 hours per day over a period of approximately 2 weeks during the fourth quarter of 2015.

3.2 Surveys

Prior to commencing the activity, a detailed as-found survey will be conducted of the NCC Buoy and associated equipment (including the umbilical and manifold), as well as the surrounding seabed. Following completion of the activity, an as-left survey will be conducted. Both of these surveys will be conducted using a Remotely Operated Vehicle (ROV).

3.3 Preparatory Works

Prior to commencing the removal of the NCC buoy, several preparatory tasks are required to be undertaken to ensure the efficient and safe completion of the NCC buoy removal works, including localised marine growth cleaning (e.g. around padeyes), preparation of the buoy for towing to disposal location and inspection of padeye integrity.

3.4 Umbilical Recovery

Once isolations have been confirmed, the umbilical will be removed. Clamps or similar will be installed on the umbilical by ROV/divers to minimise leaks from the umbilical. Caps will also be installed on cut ends before finalising recovery onto the vessel. A final cap will be installed once umbilical is fully recovered onto deck. An ROV will monitor recovery of the umbilical to ensure slack is provided at all times.

3.5 Buoy Recovery

A chain puller will be used to perform a controlled Buoy recovery. The device will be connected by divers at the padeyes once they have been cleaned and their integrity checked. The buoyancy of the NCC Buoy will be supported by the chain puller and associated rigging, the NCC Buoy tethers will be slackened to allow for ROV cut. A clump weight may be attached to control the direction of the Buoy laying when recovered to the surface until it is floating horizontally.

3.6 Buoy Recovery and Disposal

Once the NCC Buoy is floating on the surface, the tow vessel will commence Buoy tow to disposal location outside of Australian Commonwealth Waters (to be determined, likely onshore in SE Asia). The construction vessel will commence removal and recovery of all tethers and pull down rigging from seabed using ROV and crane on the vessel.

3.7 Vessels

The activity will be carried out by a construction vessel and at least one support vessel. The construction vessel will be the *SapuraKencana Constructor* (SKC). The SKC is a dynamic positioning (DP) Class 2 vessel with 250 tonne crane, modular built-in saturation diving system on deck, two (2) work class ROVs and accommodation for up to 120 persons. The vessel will have all necessary certification/registration and will be fully compliant with all relevant MARPOL and SOLAS convention requirements for a vessel of this size and purpose.

Two to three support vessels will provide logistical, safety and equipment management support in the case of an emergency. This will include a hyperbaric rescue vessel for diver support. Another vessel will be selected that is suitable for the wet-tow of the NCC Buoy to its final disposal location. These vessels are yet to be confirmed. All vessels will be fuelled using marine gas oil.

4. DESCRIPTION OF ENVIRONMENT

4.1 Operational Area

The NCC buoy operational area is situated within Commonwealth waters of the North-west Marine Region. Water depths within the bioregion range from 0-200 m, with more than 45% of the bioregion having a depth of 50-100 m; water depth in the operational area is approximately 96 m.

4.2 Environment that May Be Affected (EMBA)

Although most planned and unplanned events associated with the activity would affect the environment only within a few hundred metres around the buoy or vessel, the worst case potential environment impact is linked to unplanned hydrocarbon spills and may extend up to 16 km from the operational area.

4.3 Operational Area – NWS Province Bioregion

The NCC buoy operational area is situated within Commonwealth waters of the North-west Marine Region, which is further divided into eight provincial bioregions. The EMBA is located within the Northwest Shelf (NWS) Province. If, for example, a fuel tank rupture were to occur, the only bioregion that could be contacted by the spill is the NWS Province.

The NWS Province is located almost entirely on the continental shelf, except for a small area to the north of Cape Leveque that extends onto the continental slope. The shelf gradually slopes from the coast to the shelf break, but displays a number of seafloor features such as banks/shoals and holes/valleys. The dynamic oceanic environment influences sediment distribution throughout the bioregion. The seafloor of this bioregion is particularly strongly affected by cyclonic storms, long-period swells and large internal tides, which can resuspend sediments within the water column as well as move sediment across the shelf.

Low density benthic communities of bryozoans, molluscs and echinoids are supported within the bioregion. Sponge communities are also sparsely distributed on the shelf and are found only in areas of hard substrate. Benthic and pelagic fish communities are also highly diverse and strongly depth-related with a number of hotspots identified between Port Hedland and North West Cape. Numerous migratory species including humpback whales and whale sharks travel through the bioregion. The bioregion also supports bottlenose and indo-pacific humpback dolphins, turtle nesting sites, and several seabird breeding populations.

4.4 Habitats and Protected Significant Areas

Within the NCC Buoy EMBA a number of habitats and protected areas occur. Within the operational area, only benthic habitats of soft sediment and cemented sediments occur and the Key Ecological Features (KEF) Ancient coastline at the 125 m depth contour.

Table 4-1: Habitats and Protected Significant Areas within the NCC Buoy EMBA

Category	Receptor within EMBA
Benthic Habitats	Soft sediments and associated epifauna; and Fine silt and muddy sediments;
World Heritage Areas	Not present within the NCC buoy operational area or EMBA
National Heritage Places	
Commonwealth Marine Reserves	
Ramsar Wetlands	
Key Ecological Features	Ancient coastline at 125 m depth contour – northwest.

4.5 Marine Fauna

An EPBC search was conducted on the EMBA to indicate the potential receptors that may transit through or reside within the EMBA. Species listed as threatened (Endangered or vulnerable) and migratory are provided in **Table 4-2**.

Table 4-2: Environmental Values and Sensitivities – Threatened and Migratory Marine Fauna in the NCC Buoy EMBA

Category	Receptor	EPBC Protection Status
Marine mammals	Blue whale (*Balaenoptera musculus*)	Endangered; migratory
	Humpback whale (*Megaptera novaeangliae*)	Vulnerable; migratory
	Antarctic minke whale (*Balaenoptera bonaerensis*)	Migratory
	Bryde's whale (*Balaenoptera edeni*)	Migratory
	Killer whale (*Orcinus orca*)	Migratory
	Sperm whale (*Physeter macrocephalus*)	Migratory
	Spotted bottlenose dolphin (Arafura/Timor Sea populations) (*Tursiops aduncus*)	Migratory
Marine reptiles	Loggerhead turtle (*Caretta caretta*)	Endangered; migratory
	Green turtle (*Chelonia mydas*)	Vulnerable; migratory
	Leatherback turtle (*Dermochelys coriacea*)	Endangered; migratory
	Hawksbill turtle (*Eretmochelys imbricata*)	Vulnerable; migratory
	Flatback turtle (*Natator depressus*)	Vulnerable; migratory
	Short-nosed seasnake (*Aipysurus apraefrontalis*)	Critically endangered
Seabirds	Southern giant-petrel (*Macronectes giganteus*)	Endangered; migratory
	Australian fairy tern (*Sternula nereis nereis*)	Vulnerable
Sharks & Fish	Great white shark (*Carcharodon carcharias*)	Vulnerable; migratory
	Grey nurse shark (*Carcharius taurus)*	Vulnerable
	Whale shark (*Rhincodon typus*)	Vulnerable; migratory
	Shortfin mako (*Isurus oxyrinchus*)	Migratory
	Longfin mako (*Isurus paucus*)	Migratory
	Giant manta ray (*Manta birostris*)	Migratory

4.6 Socio-economic Environment

Socio-economic activities that may occur within the NCC buoy EMBA include commercial fishing, shipping and oil and gas exploration and production (**Table 4-3**).

Table 4-3: Environmental (Socioeconomic) Values and Sensitivities in the NCC Buoy EMBA

Category	Receptor within EMBA	Present in Operational area	Present in EMBA
Commonwealth Commercial fisheries	North West Slope Trawl Fishery	×	✓
	Western Tuna and Billfish Fishery	✓	✓
	Skipjack Tuna (Western) Fishery	✓	✓
	Western Deepwater Fishery	✓	✓
	Southern Bluefin Tuna Fishery	✓	✓
State Commercial Fisheries	Onslow Prawn Managed Fishery	✓	✓
	Pilbara Fish Trawl Managed Fishery	✓	✓
	Pearl Oyster Managed Fishery	✓	✓
	Pilbara Trap Managed Fishery	✓	✓
	Marine Aquarium Fish Managed Fishery	✓	✓
	Specimen Shell Managed Fishery	✓	✓
	Beche-de-mer Fishery	✓	✓
	Mackerel Managed Fishery (Area 2 – Pilbara and Area 3 - Gascoyne/West Coast)	✓	✓
	Octopus	✓	✓
	West Coast Deep Sea Crab (Interim) Managed Fishery	✓	✓
Shipping	The NCC buoy is located ~5 km east of a moderately active shipping route along the Montebello-Tryal Rocks route. NWS shipping includes iron ore carriers, oil tankers and other vessels proceeding to or from the ports of Dampier, Port Walcott and Port Hedland. As the Buoy is surrounded by a 500 m exclusion zone which is marked on navigational charts, shipping is not expected to be encountered within the operational area	×	✓
Recreational fishing	Tourism and charter boats. Recreational fishers should not be encountered within the 500 m exclusion zone encompassing the operational area.	×	✓
Oil and Gas	Quadrant's East Spar Infrastructure is located within the operational area. The East Spar manifold is located 173 m north west of the NCC buoy and the East Spar pipeline is located 170 m north.	×	✓
Tourism	Aquatic recreational activities such as boating, diving and fishing occur near the coast and islands off of the Pilbara and Ningaloo coasts. In the waters immediately surrounding the operational area, tourism activities are limited due to its distance from the mainland and island shorelines. Tourism should not be encountered within the 500 m exclusion zone encompassing the operational area.	×	✓

Category	Receptor within EMBA	Present in Operational area	Present in EMBA
Cultural Heritage	No known sites of Cultural Heritage significance within the operational area or wider environment.	×	✓

5. STAKEHOLDER CONSULTATION

Quadrant recognises that its development activities have the potential to impact the community and the environment, particularly in locations which feature or are near sensitive receptors, or that overlap with other economic, cultural or community uses.

To facilitate informed assessment by stakeholders of the likely potential impact of Quadrant activities, Quadrant seeks to establish long-term and meaningful dialogue with those stakeholders who have an interest in its present and planned future activities in Australia.

Quadrant clearly articulates engagement and consultation standards, goals, and mechanisms, seeks to effectively manage change during the life of its projects and activities, and strives to continuously improve all aspects of its stakeholder engagement processes. The key stakeholders identified for the activity are based on the operational area and provided in **Table 5-1**.

Table 5-1: Summary of Key Stakeholders Consulted for the Activity

Group	Stakeholder
Marine conservation	• Department of Fisheries (DoF) • Department of Parks and Wildlife (DPaW)
Shipping safety and security	• Australian Maritime Safety Authority (AMSA) • Department of Defence • Department of Transport (DoT) • Dampier Port Authority
Adjacent Regulator	• Department of Mines and Petroleum (DMP).
Fishing groups	• A Raptis and Sons • Austral Fisheries • Australian Fisheries Management Authority (AFMA) • Australian South Bluefin Tuna Industry Association (ASBTIA) • Commonwealth Fisheries Association (CFA) • MG Kailis • Pearl Producers Association • Shark Bay Seafoods • Western Australian Fishing Industry Council (WAFIC) • WestMore Seafoods

Quadrant maintains a comprehensive stakeholder database, which is overseen by a dedicated Stakeholder Coordinator. The purpose of the database is enable the identification, initial and ongoing contact with an appropriate group of stakeholders for any given project, and to facilitate the building of long-term and meaningful dialogue with those stakeholders with whom Quadrant has regular contact.

Prior to preparing the East Spar NCC Buoy Removal EP, a stakeholder notification was distributed to stakeholders on 22 April 2015, outlining the planned activity including location and vessel details. Key stakeholders including DPaW and DMP responded citing no concern with the project.

Given the removal of the NCC Buoy will be conducted in petroleum pipeline licence WA-13-L, well within the operational area as defined in the *Varanus Island Hub Operations EP (EA-60-RI-186)*, stakeholders are considered to be aware of activities in the area and are not expected to have any concerns regarding the activity defined in this EP.

Stakeholders are regularly updated on Quadrant activities through Quadrant *Quarterly Project Updates*. These regular updates detail Quadrant's operational, project and exploration activities on the NWS, over the following three to six months. The Varanus Island Hub is listed every quarter as an operational activity. The removal of the East Spar NCC Buoy was listed in the edition circulated in June 2015, as an upcoming activity.

Quadrant has detailed communications procedures for the life of the project and will maintain communications with stakeholders regarding the Varanus Island and all current or proposed activities undertaken on the NWS. Many stakeholders have stated that they will contact Quadrant by exception, that

is, if upon receiving the Stakeholder Information Package they feel the activity raises concerns for them, they will contact Quadrant.

6. ENVIRONMENTAL HAZARDS AND CONTROLS

The impact and risk assessment approach is consistent with the requirements of AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines and ISO/IEC 31010 Risk management – Risk management techniques. The approach can be mapped to the requirements of the OPGGS (E) Regulations for an EP, as described by NOPSEMA (N4700-GN1074 Rev 1 2013). The key steps are illustrated in **Figure 6-1**.

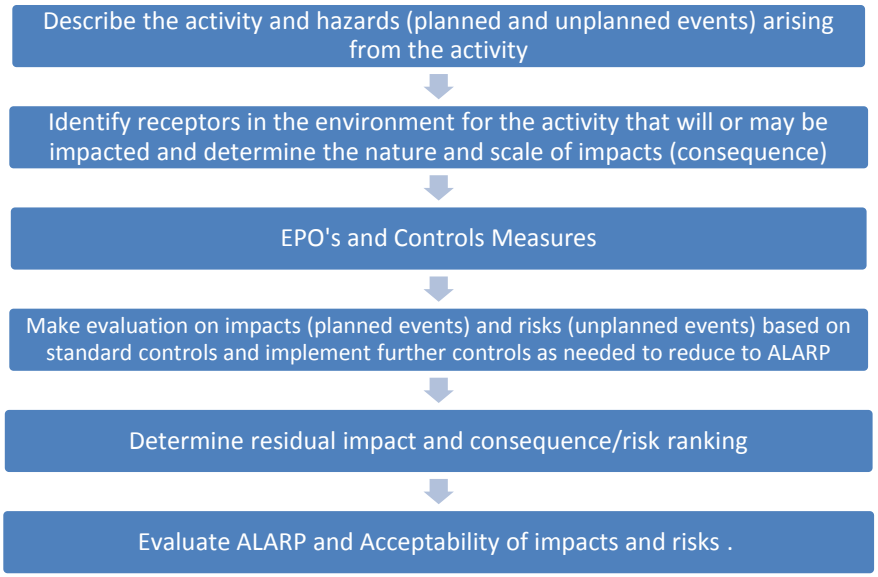

Figure 6-1: Risk and Impact Process

An assessment against the Activity was undertaken and the environmental hazards or aspects were then identified. The risk assessment identified 6 potential unplanned events and 7 planned events. Environmental aspects/hazards identified for the Activity are summarised in **Table 6-1** and **Table 6-2**.

The extent of actual or potential impacts from each planned or unplanned event is assessed using, where required, modelling (e.g. for hydrocarbon spill modelling) and scientific reports. Impact mechanisms and any thresholds for impact are determined and described, using scientific literature and modelling where required. This step looks at the causal effect between the aspect/hazard and the identified receptor. Impact thresholds for different critical life stages are also identified where relevant.

The consequence level of the impact is then determined for each planned and unplanned events based on the severity of the impact to relevant receptors. This process determines a consequence level based on set criteria for each receptor category and takes into consideration the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem or industry level.

For unplanned events, a risk ranking is also determined using an assessment of the likelihood (likelihood ranking) of the event as well as the consequence level of the potential impact should that event occur.

For each planned and unplanned event a set of Environmental Performance Outcome(s), Environmental Performance Standards and Measurement criteria are identified. The definitions of the performance outcomes, standards and measurement criteria are consistent with the OPGGS (E) Regulations. For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that the standard control measures adopted reduce the impact or risk to as low as reasonably practicable (ALARP). This process relies on demonstrating that further potential control measures would require a disproportionate level of cost/effort for the level of impact or risk reduction they would provide. If this cannot be demonstrated then further controls are implemented. The level of detail included within the ALARP assessment is based upon the nature and scale of the potential impact and risks.

Table 6-1 and **Table 6-2** summarise the identified hazards and potential impacts associated with the activity. The table also lists the controls to prevent or mitigate impacts such that impacts and risks are reduced to ALARP and are at acceptable levels.

Table 6-1: Environmental Risk Treatment Summary for Unplanned Events

Event	Potential Impacts	Residual Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Hydrocarbon release (surface) – Tier 1	Accidental loss of fuel during fuel transfer would result in localised reductions in water quality that may be harmful to marine fauna in surface waters and upper layers (~1 m) of the water column.	Low	• Fuel and oil transfers undertaken in accordance with contractor's safe work procedure and include dry break connections, constant supervision and break-away couplings. • Dynamic positioning systems on vessels are maintained and tested as per the PMS. • Sulphur content of MGO complies with Regulation 14 of MARPOL Annex VI in order to control SO_X and particulate matter emissions. • Fuel transfer connections are bunded to contain minor spills and leaks. • Vessel Safety Case accepted by NOPSEMA includes control measures to reduce risk of hydrocarbons being lost to the marine environment. • Drainage and bunding systems are subject to ongoing monitoring and maintenance to ensure integrity and capacity. • Hydrocarbon containing equipment maintenance undertaken in accordance with the Planned Maintenance System (PMS). • Project vessels have oily water filtering systems that are compliant and surveyed, as per MARPOL Annex I/ Marine Order 91. • Hydraulic fluids selected for the activity that may be discharged (e.g. from ROV valve actuation) are assessed through the *Quadrant Operations Chemical Selection, Evaluation and Approval Procedure* (EA-91-II-10001). • Pressure monitoring alarms detect loss of hydraulic pressure. • ESD can be activated in the event of loss of pressure. • Pre-dive checklist to ensure no leaks. • Hydraulic downlines are certified. • Specific engineered caps will be made for all vents which will be installed and sealed. • All access hatches and doors will be sealed to ensure they are water-tight. • Project vessels have and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), or Shipboard Marine Pollution Emergency Plan (SMPEP), as required under MARPOL Annex I. • Oil spill exercise conducted as per SOPEP or Oil Pollution Emergency Plan (OPEP).

Event	Potential Impacts	Residual Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Hydrocarbon release (surface) – Tier 2	The worst-case environmental incident resulting from a vessel collision is the rupturing of a vessel fuel tank resulting in the release of MGO to the environment and subsequent impacts to water quality, marine fauna and other sea users.	Low	• Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation, which triggers AHO to issue 'Notice to Mariners'. • AMSA RCC notified of operational area, activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning. • Vessel Safety Case accepted by NOPSEMA includes control measures to prevent vessel collision (such as navigational lighting). • Dynamic positioning systems on vessels are maintained and tested as per the PMS. • Navigation equipment and vessel procedures compliant with all marine navigation and vessel safety requirements under the *International Convention of the Safety of Life at Sea* (SOLAS) 1974 and *Navigation Act 2012* (or equivalent). • Oil spill response executed in accordance with *East Spar NCC Buoy Removal Oil Pollution Emergency Plan (EA-34-RI-10001.002).* • Oil spill response executed in accordance with the vessel SOPEP as required under MARPOL. • Oil spill exercises conducted as per the OPEP and SOPEP/SMPEP.

Event	Potential Impacts	Residual Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Non-hydrocarbon release (surface and subsurface) – Liquid	Hazardous liquids (including wastes) are used or stored on board the project vessels during the activity. Accidental loss of liquid wastes from vessels to the marine environment could occur via tank pipework failure or rupture, inadequate bunding and/or storage, insufficient fastening or inadequate handling and subsea ROV operations. This may result in impacts to water quality and hence sensitive environmental receptors.	Low	• Chemicals (environmentally hazardous) and hydrocarbons stored in bunded areas (including on the buoy when applicable). • MSDS available where the chemical is stored. • Chemicals selected for the activity that could be accidentally released in quantities greater than 80L (e.g. during grouting/sealing) are assessed through the Quadrant Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) • Chemical storage areas inspected weekly. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of chemicals and non-hydrocarbon liquids to ALARP. • Contaminated material contained onboard for onshore disposal in accordance with *Environmental Protection (controlled waste) Regulations (2004).* • All shipboard chemical spills managed in accordance with SOPEP/SMPEP. • Spill clean-up equipment located where chemicals and hydrocarbons are stored and frequently handled. • Scupper plugs or equivalent deck drainage control measures available where chemicals are stored and frequently handled. • Only non-hazardous, biodegradable detergents used for deck washing. • Secondary containment shall be available for all machinery or equipment (in use during the activity) with potential to leak chemicals to the marine environment including under the umbilical spool. • Once the umbilical is spooled, a cap will be installed on the end of the umbilical. • ROV monitoring the catenary at all times to ensure slack remains. • Vessels have dynamic positioning (DP2) to maintain position and prevent stretching of transfer (including from vessel to buoy if required) and hydraulic hoses. • Specific engineered caps will be made for all vents which will be installed and sealed. • All access hatches and doors will be sealed to ensure they are water-tight.

Event	Potential Impacts	Residual Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Non-hydrocarbon release (surface) - Solid	Non-hydrocarbon solids such as plastics have the potential to smother benthic environments and harm marine fauna through entanglement or ingestion. Release of hazardous solids (e.g. wastes) may result in the pollution of the immediate receiving environment.	Low	• Non-hazardous and hazardous wastes collected, stored, processed and disposed of in accordance with the vessel's Garbage Management Plan, as required under Regulation 9 of MARPOL Annex V. • Objects lost overboard recovered if possible. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of non-hydrocarbon solid waste and includes sea fastening plans. • Hazardous chemicals are stored in bunded areas. • Material handling and lifting equipment and equipment maintained in accordance the PMS. • Lifting equipment certified. • Compliance with equipment handling and lifting procedures demonstrated by mitigation measures being included in Job Safety Analysis (JSA). • ROV procedures followed during activity to ensure full control throughout, this may include testing of equipment at the surface. • Small quantities of equipment and tools transferred to buoy; bunding and trays in place under equipment to prevent loss. • Safety Case includes control measures for dropped objects that reduce the risk of objects entering the marine environment. • Vessel dropped objects overboard are recovered (if possible) to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequences are negligible or safety risks are disproportionate to the environmental consequences.
Marine fauna collision	The main collision risk associated with the activity is through project vessel collision with large, slow moving cetaceans or whale sharks; potentially resulting in severe injury or mortality.	Low	• Marine fauna identification posters and Marine Fauna Sighting Datasheets to be made available on board all project vessels. • In accordance with Part 8 of EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area.

Event	Potential Impacts	Residual Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Introduction of Invasive Marine Species (IMS)	IMS can be introduced by vessels carrying IMS on external biological fouling, internal systems (sea chests, seawater systems etc.), on marine equipment (ROVs etc.), or through ballast water exchange. Cross contamination between vessels can also occur. Some IMS pose a significant risk to environmental values, biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism.	Low	• Anti-foulant systems are maintained in compliance with International Convention on the Control of Harmful Anti-fouling Systems on Ships. • Australian Quarantine Inspection Service (AQIS) clearance to be in Australian waters. • A biofouling Vessel Risk Assessment (VRASS) is completed prior to mobilisation to Australia as defined within the *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Commonwealth of Australia, 2008) and ranked as "low risk". • Exchange 'high-risk' ballast water, as defined in *Australian Ballast Water Management Requirements* (AQIS, 2011) • Ballast water shall be managed in accordance with Ballast Water Management Plan.

Table 6-2: Environmental Impact Treatment Summary for Planned Events

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
Interactions with other marine users	The presence of the project vessels and the operational area could potentially inhibit commercial shipping, fishing and other oil and gas activities and the presence of vessels and infrastructure could pose a collision risk and inconvenience to fishing practices during these operations. The physical presence of subsea infrastructure left *in situ* on the seabead, i.e. gravity base, clump weight and iron ore ballast may also create potential environmental impact from disturbing shipping or fishing.	Negligible	• Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation to the operational area, which may trigger AHO to issue a 'Notice to Mariners'. • AMSA RCC notified of operational area, activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning. • Stakeholder consultation carried out prior to project commencement. • Stakeholder complaints are reported and managed.
Light Emissions	Continuous lighting in the same location for an extended period of time may result in alterations to normal marine fauna behavior.	Negligible	• No standard controls are in place other than those required for navigational and safety requirements which are detailed in each Vessel Safety Case.
Noise Emissions	Noise generated by the project vessels and pressure washing during the removal activity may result in physiological or behavioural impacts to marine fauna.	Negligible	• In accordance with Part 8 of EPBC Regulations (Vessels), all vessels must travel at less than 6 knots within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area. • Unless an action is reasonably necessary to prevent a risk to human health or to deal with an emergency, helicopters will operate in accordance with Part 8 of EPBC Regulations (Aircraft). • Binoculars and Marine Fauna Sighting Datasheet available on all vessels. • Quadrant Marine Fauna Sighting Datasheets submitted to federal Department of Environment. • Unless an action is reasonably necessary to prevent a risk to human health or to deal with an emergency, helicopters will operate in accordance with Part 8 of EPBC Regulations (Aircraft).

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
Planned Operational Discharges – Surface and subsea	Operational discharges will be small and depend on rainfall, machinery activity and the number of persons onboard. Discharges include sewage, brine (from desalination), cooling water, deck drainage, oily water and small volumes of chemicals (e.g. corrosion inhibitor and hydraulic fluid). The small volumes of non-hazardous discharges may cause localised nutrient enrichment, organic and particulate loading, thermal impacts and increased salinity primarily in surface (<5 m) waters. Discharge of non-hydrocarbon liquids from cut umbilicals is unlikely to have widespread ecological effects given the small finite volumes that will be released and the depth and exposure of the location. The umbilical contents are known to be water-based and of low toxicity.	Negligible	• Vessels to have current and valid class survey certificate indicating the vessel meets standards for operating in Australia. • Vessels to have MARPOL certification for applicable equipment including sewage system • Treated sewage will be discharged in compliance with Regulation 11 of MARPOL Annex IV. • Garbage Management Plan as required under Regulation 9 of MARPOL. • Shipboard Waste Management Plan as required under AMSA Marine Order 95: Marine Pollution Prevention - Garbage. • In accordance with MARPOL Annex V regulation 9.1, AMSA placards will be displayed on project vessels to provide guidance on garbage disposal requirements. • Only non-hazardous, biodegradable detergents used for deck washing as per MARPOL. • As required by MARPOL Annex I Regulations, while in the operational area, project vessel may discharge oily water after treatment to 15 ppm in a MARPOL compliant oily water filter system. • Oil filtering equipment (if fitted) in compliance with Regulation 14 of MARPOL 73/78 Annex I. • Oily water treatment system maintained in accordance with PMS. • Umbilical caps and crimping clamps or similar (designed as fit for purpose) are used during umbilical recovery. • Umbilical end cap (at NCC Buoy end and manifold end) in place to limit releases. • Confirmed isolations are in place prior to umbilical removal.
Atmospheric Emissions	Air emissions through the release of ozone depleting substances (ODS), and use of fuel may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point.	Negligible	• Sulphur content of fuel oil complies with Regulation 14 of MARPOL Annex VI. • Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL Annex VI. • Vessels to have valid MARPOL certification for applicable equipment including incinerator (vessels) and engines. • Machinery maintained in accordance with the PMS. • Incinerator operated in accordance with Regulation 16 of MARPOL Annex VI.

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
Seabed disturbance	Disturbance of the seabed as a result of planned activities, leading to disturbance of benthic habitat and associated marine flora and fauna. Sources of disturbance may include temporary installation of clump weights, laying down of umbilical on seabed, removal of tethers and control umbilical, ROV propeller wash and ongoing provision of artificial habitat due to subsea infrastructure remaining and left in-situ. Sedimentation and water quality impacts (i.e. increased turbidity) could be caused by removal of buried umbilical, deployment/retrieval of temporary equipment, operation of ROV propeller wash. Leaving the clump weight, gravity base and iron ore ballast in situ will continue to provide artificial habitat for marine fauna in the immediate vicinity, no additional seabed disturbance from leaving the subsea infrastructure in place is expected	Minor	• No vessel anchoring within the operational area. • Tethers and temporary equipment are recovered from the seabed.

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
Hydrocarbon spill response (refer **Section 8**)	Impacts to the environment from implementing source control, monitoring and evaluation, oiled wildlife response and scientific monitoring include those operational impacts previously specified from the operation of vessels and aircraft. Implementing oiled wildlife response may cause additional distress, physical and behavioural impacts, separation and increased predation to wildlife if not undertaken correctly.	Minor	• Oiled wildlife response strategies will be implemented in accordance with the WA Oiled Wildlife Response Plan (WAOWRP). • Quadrant maintains Master Service Agreements for Oiled Wildlife Response contractors. • Net Environmental Benefit Analysis (NEBA) undertaken every operational period to determine if response strategy is having a net environmental benefit. • Oiled wildlife response ceased when termination criteria are met, as outlined within the East Spar NCC Buoy Removal Oil Pollution Emergency Plan (EA-34-RI-10001.002). • Quadrant understands and maintains the AMSA/Quadrant MOU. • Quadrant understands the resources and requirements of the National Plan.

7. MANAGEMENT APPROACH

The East Spar NCC buoy removal activity will be managed in compliance with all measures and controls detailed within the EP accepted by NOPSEMA under the OPGGS (E) Regulations, other environmental legislation and Quadrant's Management System (e.g. Environmental Management Policy).

The objective of the EP is to ensure that potential adverse environmental impacts associated with unplanned events and planned events associated with the survey, are identified and assessed, and to stipulate mitigation measures to avoid and/or reduce any adverse impacts to the environment to ALARP.

The EP details specific performance objectives, standards and procedures, and identifies the range of controls to be implemented (consistent with the standards) to achieve the performance objectives. The controls for the activities are summarised in **Section 6**. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

As described in the EP, the implementation strategy includes the relevant details of the following:

1. Environmental management policy
2. Environmental performance standards and outcomes
3. Environmental Management System including ownership and objectives, audits, monitoring and review
4. Leadership and responsibilities
5. Workforce training and competency
6. Performance review and continuous improvement
7. Records
8. Management and review of the EP
9. Routine and incident reporting

During the period that activities described in this EP are undertaken, Quadrant will ensure environmental performance is managed through an inspection and monitoring regime undertaken by Quadrant representatives or delegates based on the vessels.

Environmental compliance of an activity with the EP (and the EPO's) is measured using planned and systematic audits or inspections to identify weaknesses and non-conformances in the system and processes so that they can be identified. Improvement opportunities identified through monitoring, audits and incident investigations are implemented in a controlled manner and communicated to all relevant workforce, contractors and relevant third parties. Audits and inspections are in place to identify possible incidents and actions taken to prevent them from happening.

Non-conformances found are addressed and resolved by a systematic corrective action process and are reported to NOPSEMA where relevant.

Senior Quadrant and vessel contractor personnel will be accountable for ensuring conformance with environmental performance outcomes and standards and all personnel will be empowered to 'stop-the-job' to ensure the activity is being implemented in an environmentally responsible manner. The EP identifies specific responsibilities for each role during the activity.

Incident notification and reporting to NOPSEMA and other regulators will be conducted as per the OPGGS (E) Regulations, as detailed within the EP. Reported HSE incidents and hazards will be communicated to personnel during daily operational meetings.

8. HYDROCARBON SPILL RESPONSE ARRANGEMENTS

Credible hydrocarbon spill scenarios are identified in the EP, including:

- **Tier 1**: Small spill from vessel such as during refuelling;
- **Tier 2**: Vessel collision resulting in a ruptured fuel tank:
    - Tier 1 and 2 Oil Spill Response executed in accordance with *East Spar NCC Buoy Removal OPEP* (EA-34-RI-10001.002); and
    - Tier 1 and 2 Oil Spill Response executed in accordance with the vessel's SOPEP, as required under MARPOL.

Regardless of the tier level, during a spill response both a Statutory Agency and a Control Agency will be assigned. Quadrant intends to remain the Control Agency for any vessel spills, until AMSA or the DoT identifies the need to assume control. This will be based on Quadrant's ability to respond effectively.

In the event of a tier 2 spill event, the first step in response is the formation of an Incident Command Team (ICT), the role of which is to directly manage the response process from Quadrant's headquarters in Perth. The ICT management structure reflects the Australian Interagency Incident Management System (AIIMS) and consists of key management roles required to effectively coordinate and execute a response under emergency conditions, including logistics, environmental and human resourcing.

Through the assessment of the expected hydrocarbon behaviour(s), modelling results of credible worst-case spill scenario, and identified environmental priorities within the predicted spill impact areas, a set of functional, achievable oil spill response strategies have been selected for a tier 2 MGO incident. Initial response strategies that may be considered include source control, monitor, oiled wildlife response and operational and scientific monitoring. The decision on whether to implement (and subsequently terminate) any response strategy is managed by the appropriate Control Agency. **Table 8-1** summarises the applicability and functionality of response strategies for a Tier 2 (or lower) MGO spill.

Table 8-1: Response Strategy Selection for Tier 1 Spill or Tier 2 MGO Spill

Oil Spill Response Strategy	MGO	Justification
Source Control	Yes	Source control is one of the first response strategies implemented when mounting a spill response. Source control minimises the volume of hydrocarbons lost to the environment by securing the source of the spill.
Monitor and Evaluate	Yes	Surveillance is used to monitor and evaluate the dispersion of the released hydrocarbon, and to identify and report on any potential contacts to environmental sensitive receptors that may occur while the spill disperses. Surveillance results are used to assist in escalating or de-escalating response strategies as required
Physical Dispersion	No	Physical dispersion is undertaken by running vessels through the hydrocarbon plume and using the turbulence developed by the propellers or hydro-blasting from vessel hydrants to break up the slick. Once dispersed in the water column in the form of smaller droplet sizes, biodegradation processes are enhanced. Considered an opportunistic strategy, it is usually used on targeted, small, breakaway areas. Physical dispersion is not applicable as a response strategy because of the nature of the MGO—preferentially relying on evaporation rather than dispersing toxic components of the fuel into the water column, and the physical environment in the spill location – wave energy able to provide the mixing that could be provided by propellers. However, its applicability will be assessed during the NEBA.
Protection and deflection	No	Protection and deflection activities involve the use of booms to protect sensitive receptors, to deflect spills away from sensitive receptors or shorelines, or to deflect spills to an area that provides increased opportunity for recovery activities. Protection and deflection is not applicable as a response strategy as no shorelines are predicted to be impacted by a tier 2 186.3 m^3 MGO spill.
Containment and recovery	No	Containment and recovery of hydrocarbons can offer a preventive form of protection to sensitive receptors. Skimmers (mechanical) and booms may be used at sea. This strategy, however, is often technically unfeasible due to weather conditions and hydrocarbon characteristics e.g. containment and recovery operations need to have a high hydrocarbon thickness, which is not compatible with MGO. Containment and recovery is not applicable as a response strategy due to the ineffectiveness of containment and recovery methods on thin surface MGO films and the rapid evaporation rate of MGO, the use of containment and recovery as a response strategy for a MGO spill is not applicable.
Shoreline clean-up	No	Shoreline clean-up is not an applicable strategy as no shorelines are predicted to be impacted by the MGO spill
Oiled Wildlife Response	Yes	Wildlife operations may be required to deter fauna from an area that has been or is likely to be oiled and if fauna is oiled. It is applicable for marine fauna that contact, or come close to the spill when on the water.
Operational and Scientific Monitoring	Yes	Extent of spill to determine the extent of operational and scientific monitoring. Resources are available to implement operational and scientific monitoring as required.
In Situ Burning	No	In-situ burning is not an applicable response strategy given several limiting factors that are likely to prevent implementation. In-situ burning cannot be undertaken in rough conditions as containment is likely to be interrupted by winds greater than approximately 20 knots and waves

Oil Spill Response Strategy	MGO	Justification
		are higher than 3 feet. Furthermore, for in-situ burning to be undertaken oil has to be thicker than 1-2 mm and as MGO tends to have high evaporation rates and spread into very thin films this strategy is not applicable for this activity. As such, this response strategy is not applicable for this activity.

9. CONTACT DETAILS

Further information about the East Spar NCC Buoy Removal Activity can be obtained from:

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