

ENVIRONMENT PLAN

Beehive Multi-Well Exploration Drilling

8.Environmental Risk Assessment - Unplanned Activities

WA-488-P

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Rev 2

8. Environmental Risk Assessment – Unplanned Events

This chapter presents the environmental risk assessment (ERA) for the environmental risks identified for the activity using the methodology described in Chapter 6, as required under Regulations 21(5)(6) of the OPGGS(E).

This chapter presents the control measures, EPO, EPS and measurement criteria required to manage (i.e., avoid, minimise or mitigate) the identified risks. The definitions for these terms as listed at the start of Chapter 7 apply here. A summary of the risk rankings for each hazard identified and assessed in this chapter is presented in Table 8.1.

Table 8.1. Summary of environmental risk rankings

Identifier	Hazard	Inherent	Residual
1	Accidental release of waste overboard	Low	Negligible
2	Vessel collision with megafauna	Low	Negligible
3	Introduction and establishment of IMS	High	Medium
4	Interference with other marine users	Medium	Low
5	Unplanned discharge of drilling muds, chemicals or hydrocarbons	Negligible	Negligible
6	MDO release	Negligible	Negligible
7	Loss of Well Control		
	- Benthic fauna	High	Medium
	- Macroalgal and seagrass	High	Medium
	- Coral	High	Medium
	- Mangroves and saltmarsh	High	Medium
	- Sandy beaches	High	Medium
	- Rocky shores	Low	Low
	- Plankton	Low	Low
	- Fish	Low	Low
	- Marine mammals	High	Medium
	- Marine reptiles	High	Medium
	- Seabirds and shorebirds	High	Medium
	- Commercial fisheries	High	Medium
	- Protected areas	High	Medium
8	Hydrocarbon spill response activities		
	- Source control; relief well	Negligible	Negligible
	- Monitor and evaluate	Negligible	Negligible
	- Dispersant application	Low	Low
	- Nearshore containment and recovery	Negligible	Negligible

Identifier	Hazard	Inherent	Residual
	- Shoreline protection and deflection	Negligible	Negligible
	- Shoreline assessment and clean up	Low	Low
	- Oiled wildlife response	Low	Low
	- Waste management	Negligible	Negligible
	Faunal receptors		
	- Fauna disturbance	Negligible	Negligible
	- Fauna injury	Negligible	Negligible
	- Fauna death	Negligible	Negligible

The following sections assess the environmental risks associated with the activity, and Figure 8.1 presents a simplified pictorial representation of these risks. In this chapter, reference to support vessels includes any vessel undertaking GVI (see Section 2.8.2).

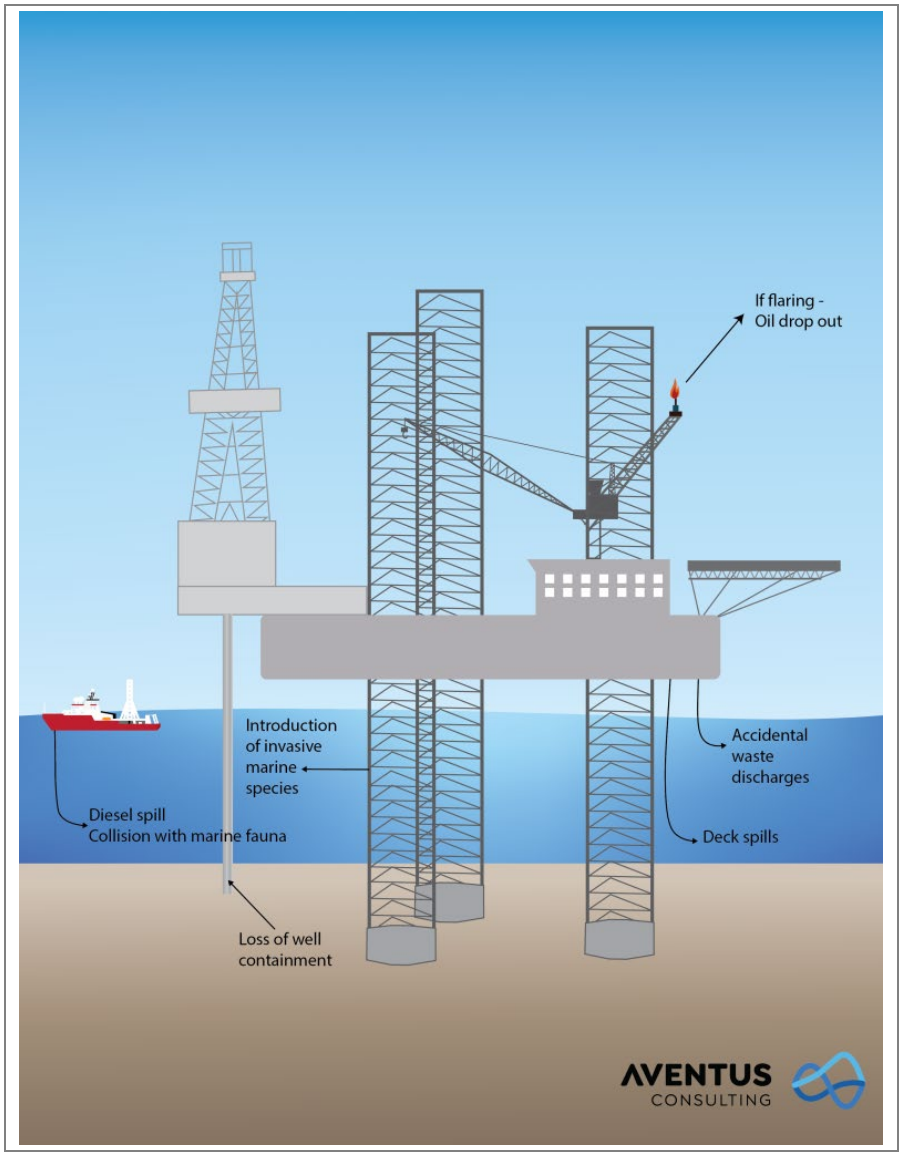


Figure 8.1. Simplified pictorial representation of the risks associated with the drilling activity

8.1 RISK 1 – Accidental Release of Waste Overboard

8.1.1 Hazard

The handling and storage of materials and waste on board the MODU and support vessels has the potential to result in accidental overboard disposal of hazardous and non-hazardous materials, waste, chemicals and fuel, creating marine debris and pollution.

Small quantities of hazardous and non-hazardous materials are used in routine operations and maintenance and waste is created, and then handled and stored on the MODU or support vessels. In the normal course of operations, solid and liquid hazardous and non-hazardous materials and wastes will be stored until it is disposed of via port facilities for disposal, reuse or recycling at licensed onshore facilities. However, accidental releases to sea are a possibility, especially in poor weather and ocean conditions when items may roll off or be blown off the deck.

The following non-hazardous materials and wastes will be disposed of to shore, but have the potential to be accidentally dropped or disposed overboard due to poor waste management (e.g., overfull bins), strong winds, high seas or crane operator error:

- Paper and cardboard;
- Wooden pallets;
- Scrap steel, metal and aluminium;
- Glass;
- Foam (e.g., ear plugs); and
- Plastics (e.g., hard hats).

The following hazardous materials (defined as a substance or object that exhibits hazardous characteristics, is no longer fit for its intended use and requires disposal, and as outlined in Annex III to the Basel Convention, may be toxic, flammable, explosive and poisonous) may be used and waste generated through the use of consumable products and will be disposed to shore, but may be accidentally dropped or disposed overboard or could be lost as a result of hose connection failure, overfilling of tanks or emergency disconnection of hoses:

- Hydrocarbons, hydraulic oils and lubricants;
- Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters);
- Batteries, empty paint cans, aerosol cans and fluorescent tubes;
- Contaminated personal protective equipment (PPE);
- Laboratory wastes (such as acids and solvents); and
- Larger dropped objects (that may be hazardous or non-hazardous) may be lost to the sea through accidents (e.g., crane operations) include:
    - Sea containers;
    - Towed equipment;
    - ROV; and
    - Entire skip bins/crates.

8.1.2 Potential Environmental Risks

The risks of the release of hazardous and non-hazardous materials and waste to the ocean are:

- Marine pollution (litter and a temporary and localised reduction in water quality);
- Acute toxicity to marine fauna through ingestion or absorption;
- Injury and entanglement of individual animals (such as seabirds and seals); and
- Localised (and normally temporary) smothering or pollution of benthic habitats.

8.1.3 EMBA

The EMBA for the accidental disposal of hazardous and non-hazardous materials and waste is likely to extend for kilometres from the release site (as buoyant waste drifts with currents) or localised for non-buoyant items that sink and settle on the seabed.

Receptors susceptible to waste that may occur within this EMBA, either as residents or migrants, are:

- Benthic fauna;
- Benthic habitat (sandy seabed);
- Pelagic fauna (fish, cetaceans and turtles); and
- Seabirds.

The EPBC Act-listed species documented as being negatively impacted by the ingestion of, or entanglement in, harmful marine debris (and known to occur in the operational area or EMBA) are:

- The six turtle species (loggerhead, green, flatback, olive ridley, leatherback and hawksbill);
- Sawfish and river sharks;
- Seabirds (Australian noddy, shearwater); and
- Cetaceans (Australian snubfin dolphin, Australian humpback dolphin, PBW).

8.1.4 Evaluation of Environmental Risks

Non-hazardous Materials and Waste

If discharged overboard, non-hazardous wastes can cause smothering of benthic habitats as well as injury or death to marine fauna or seabirds through ingestion or entanglement (e.g., plastics caught around the necks of turtles or ingested by seabirds and fish). For example, the TSSC (2015d) reports that there have been 104 records of cetaceans in Australian waters impacted by plastic debris through entanglement or ingestion since 1998 (humpback whales being the main species).

Marine fauna including cetaceans, turtles and seabirds can be severely injured or die from entanglement in marine debris, causing restricted mobility, starvation, infection, amputation, drowning and smothering (DoEE, 2018). Seabirds entangled in plastic packing straps or other marine debris may lose their ability to move quickly through the water, reducing their ability to catch prey and avoid predators, or they may suffer constricted circulation, leading to asphyxiation and death. In marine mammals and turtles, this debris may lead to infection or the amputation of flippers, tails or flukes (DoEE, 2018). Plastics have been implicated in the deaths of a number of marine species including marine mammals and turtles, due to ingestion.

The following turtles may be at risk from waste at sea:

- Green turtle – foraging BIA is overlapped by the operational area (see Figure 5.26). They generally feed in shallow waters far from the operational area, so their risk of ingesting waste (such as plastics) is low given the distance of shallow waters from the activity area.
- Flatback turtle – inter-nesting BIA is overlapped by the operational area (see Figure 5.27). Their foraging BIA is about 90 km from the operational area, but because adults consume soft-bodied invertebrates, they may be at risk of ingesting plastic wastes floating in the ocean. This risk is low given the distance of the foraging BIA from the operational area.
- Olive ridley turtle – foraging BIA is overlapped by the operational area (see Figure 5.28). Although this species forages primarily at the seabed, they also consume soft-bodied invertebrates and therefore may be at risk of ingesting plastic wastes floating in the ocean. This risk is moderate given the foraging BIA overlaps the operational area.

If dropped objects such as skip bins are not retrievable (e.g., by crane), these items may permanently smother small areas of seabed (tens of square metres), resulting in the loss of benthic habitat. However, as with most subsea infrastructure, the items themselves are likely to become colonised by benthic fauna over time (e.g., sponges and corals) and become a focal area for sea life, so the net environmental impact is likely to be neutral. The benthic habitats in this EMBA are broadly similar to those elsewhere in the region (e.g., extensive sandy seabed, see Section 5.4.1), so impacts to small areas of seabed will not result in the long-term loss of benthic habitat or species diversity or abundance. Seabed substrates can rapidly recover from temporary and localised impacts.

Hazardous Materials and Waste

Hazardous materials and wastes released to the sea cause pollution and contamination, with either direct or indirect effects on marine organisms. For example, chemical or hydrocarbon spills can (depending on the volume released) impact marine life from plankton to pelagic fish communities, causing physiological damage through ingestion or absorption through the skin. Impacts from an accidental release would be limited to the immediate area surrounding the release, prior to the dilution of the chemical with the surrounding seawater. In an open ocean environment such as the JBG, it is expected that any minor release would be rapidly diluted and dispersed, and thus temporary and localised. The absence of particularly sensitive seabed habitats and the widespread nature of the sandy seabed present in the activity area further limits the extent of potential impacts.

Solid hazardous materials, such as paint cans containing paint residue, batteries and so forth, would settle on the seabed if dropped overboard. Over time, this may result in the leaching of hazardous materials to the seabed, which is likely to result in a small area of substrate becoming toxic and unsuitable for colonisation by benthic fauna. The benthic habitats of the activity area are broadly similar to those elsewhere in the region (e.g., extensive sandy seabed), so impacts to very small areas of seabed will not result in the long-term loss of benthic habitat or species diversity or abundance.

All hazardous waste will be safely transported offshore in suitable receptables and disposed of at appropriately licensed facilities, by licenced contractors, so impacts such as illegal dumping or disposal to an unauthorised onshore landfill that is not lined are highly unlikely to result from the activity.

The conservation advice for the humpback whale (TSSC, 2015c) lists entanglement from marine debris as a threat to the species. Marine debris includes plastic garbage such as bags, bottles, ropes, derelict fishing gear and non-biodegradable floating materials list or disposed of at sea. There have been 104 records of cetaceans in Australian waters impacted by plastic debris through entanglement or ingestion since 1998. The vast majority (92.2%) of cetacean incidents relate to entanglement (TSSC, 2015c), and humpback whales dominated the available records, with around 48 entanglement incidents recorded. An assessment of the entanglement management actions against the activity is

provided in Table 8.2. Though the relevant management actions target the commercial fishing industry, the guiding principle of the management action has been applied to the activity.

Table 8.2. Assessment of the relevant management actions of the Approved Conservation Advice for the Humpback Whale

Management Action	Assessment
Reducing commercial fishing entanglement	
Commonwealth and state governments with the pot and set net fishing industries to develop and implement codes of conduct to minimise interactions between commercial fishers and humpback whales.	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with these management actions.
Investigate alternative fishing techniques and technologies to reduce the risk of entanglement.	

TSSC (2015c).

The Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018) lists specific management actions and objectives. Given that the activity has the potential (albeit low) to contribute to marine debris, an assessment of the management actions and objectives has been provided in Table 8.3.

Table 8.3. Assessment of the objectives and management actions of the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans

Objective and associated management actions	Assessment
1. *Contribute to long-term prevention of the incidence of marine debris*	
Establish a threat abatement plan (TAP) team to coordinate actions for the life of the TAP.	The activity will not have any impacts on this management action.
Limit the amount of single-use plastic material lost to the environment in Australia.	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with these management actions.
Encourage development of a circular economy in Australia.	The activity will not have any impacts on this management action.
Encourage innovation in recovery and waste treatment technologies.	The activity will not have any impacts on this management action.
Improve management of abandoned, lost and discarded fishing gear.	The activity will not have any impacts on this management action.
Improve shipping waste management.	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with these management actions.
2. *Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations*	

Objective and associated management actions	Assessment
Update the list of marine debris impacted EPBC Act-listed vertebrate species as scientific evidence is published.	The activity will not have any impacts on this management action.
Monitor relevant ecological research to determine if further EPBC Act-listed ecological communities are threatened by marine debris.	The activity will not have any impacts on this management action.
Identify locations where aggregations of debris intersect with the temporal and spatial distribution of EPBC Act-listed species, especially during vulnerable life stages (e.g., whale and turtle migrations).	The activity will not have any impacts on this management action.
Build understanding related to plastic and microplastic pollution.	The activity will not have any impacts on this management action.
Survey marine plastic pollution in the Southern Ocean, sub-Antarctic islands and other high value offshore island environments.	The activity will not have any impacts on this management action.
Determine the relevance of microplastics to the Australian Government's Science and Research Priorities and corresponding Practical Research Challenges.	The activity will not have any impacts on this management action.
3. *Remove existing marine debris*	
Support beach-based clean-up efforts.	The activity will not have any impacts on this management action.
Improve the effectiveness of Australian Government grants in relation to marine debris outcomes.	The activity will not have any impacts on this management action.
Remove derelict fishing gear from Australia's oceans and coasts.	The activity will not have any impacts on this management action.
Develop understanding of the potential for biological breakdown of plastic to prevent it entering the marine environment or aid its removal.	The activity will not have any impacts on this management action.
4. *Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris*	
Continue collection of data in long-term beach surveys.	The activity will not have any impacts on this management action.
Develop a nationally consistent monitoring system for land-based plastic pollution.	The activity will not have any impacts on this management action.
Maintain a national database for long-term marine debris beach survey data and promote standard methods for collecting and ongoing monitoring of beach clean-up debris.	The activity will not have any impacts on this management action.
Assess the effectiveness of Australia's product stewardship and waste management in reducing	The activity will not have any impacts on this management action.

Objective and associated management actions	Assessment
the levels of plastics entering the marine environment.	
Continue to monitor persistent organic pollutant contamination using plastic resin pellets from Australian beaches.	The activity will not have any impacts on this management action.
Regularly assess mean surface plastic loads and associated hazardous chemical contaminants across Australian jurisdictions and territories.	The activity will not have any impacts on this management action.
Enhance collection of data related to ghost net retrievals from Commonwealth waters across northern Australia.	The activity will not have any impacts on this management action.
Improve understanding of the impact and origins of ghost nets.	The activity will not have any impacts on this management action.
5. *Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behaviour change*.	
Raise the profile of marine debris impacts on marine vertebrate species, especially EPBC Act-listed threatened species.	The activity will not have any impacts on this management action.
Improve public communication about consumer waste and litter.	The activity will not have any impacts on this management action.

DoE (2018).

Marine debris is identified as a threat to turtles in the Recovery Plan for Marine Turtles 2017-2027 (DoEE, 2017c). As such, an assessment of relevant interim recovery objectives and targets with the activity is provided in Table 8.4.

Table 8.4. Assessment of the relevant interim recovery objectives and targets of the Recovery Plan for Marine Turtles 2017-2027 with the activity

Interim Objective or Target	Assessment
Interim Objective 3: Anthropogenic threats are demonstrably minimised.	
Target 3.1: Robust and adaptive management regimes that lead to a reduction in anthropogenic threats to marine turtles and their habitats are in place	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this recovery target.
Target 3.2: Threat mitigation strategies are supported by high quality information	The activity will not have any impacts on this recovery target.

DoEE (2017c).

Habitat degradation and modification (e.g., through the presence of marine debris following accidental discharge) are a listed threat in the Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015a). Threatened species addressed in this plan that are relevant to the activity include the largetooth sawfish, green sawfish, dwarf sawfish and the northern river shark. An assessment of the relevant objectives and management actions of the Sawfish and River Sharks Multispecies Recovery Plan (DoE, 2015a) with the activity is provided in Table 8.5.

Table 8.5. Assessment of the relevant recovery objectives and relevant actions of the Sawfish and River Sharks Multispecies Recovery Plan with the activity

Objective or management action	Assessment
Objective 5: Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this objective.
Action 5a. Ensure all future developments will not significantly impact upon sawfish and river shark habitats critical to the survival of the species or impede upon the migration of individual sawfish or river sharks.	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this management action.
Action 5b. Determine the effect of river and estuarine barriers on the movements of sawfish and river sharks and undertake an audit of barriers to establish whether removal or modification is feasible to allow for the riverine migration of sawfish and river sharks.	The activity will not have any impacts on this management action.
Action 5c. Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	The activity will not have any impacts on this management action.
Action 5d. Implement measures to reduce adverse impacts of habitat degradation and/or modification	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this management action.
Objective 6: Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species noting the linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life.	The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this objective.
Action 6a. Assess the impacts of marine debris including ghost nets, fishing gear and plastics on sawfish and river shark species.	The activity will not have any impacts on this management action.
Action 6b. Partner with marine debris organisations to support initiatives that reduce marine debris likely to impact on sawfish and river sharks.	The activity will not have any impacts on this management action. The EPS listed in Table 8.6 will reduce the likelihood of accidental discharge of wastes to the ocean to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this management action.

DoE (2015c).

The risk evaluation for the accidental release of waste overboard does not change regardless of whether one, two or three wells are drilled.

8.1.5 Risk Assessment

Table 8.6 presents the risk assessment for the accidental release of hazardous and non-hazardous materials and waste.

Table 8.6. Risk assessment for the accidental release of waste overboard

Summary		
Summary of risk	Marine pollution (litter and a temporary and localised reduction in water quality), injury and entanglement of individual animals (such as seabirds, cetaceans, turtles and sawfish) and smothering or pollution of benthic habitats.	
Extent of risks	Non-buoyant waste may sink to the seabed near where it was lost. Buoyant waste may float long distances with ocean currents and winds.	
Duration of risks	Short-term to long-term, depending on the type of waste and location.	
Level of certainty of risk	HIGH – the effects of inappropriate waste discharges are well known.	
Risk decision framework context	Decision type	A - good industry practice required.
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.
Defined acceptable level	No unplanned release of hazardous or non-hazardous solid waste or materials.	

Risk Assessment (inherent)		
Likelihood	Consequence	Risk rating
Occasional	Minor	Low

Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
Transfer wastes from the MODU and support vessels to shore-based facilities during the activity.	Eliminate	No	**EB:** Reduces likelihood of accidental waste disposal through transfer to shore-based facilities, noting that there are risks of waste overboard during the transfer process. **C:** High costs for the use of a dedicated vessel to take waste, which also results in additional routine vessel impacts and risks. **Ev:** Cost to implement is grossly disproportionate to the benefit given the low inherent risk rating.
MODU and vessel wastes are managed in accordance with the GMP **(RSK-01: EPS-01, -02, -03, -04).**	Engineering	Yes	**EB:** Reduces the likelihood of waste being discharged to sea, reducing potential impacts to marine fauna and water quality. **C:** Negligible; it is a standard MARPOL requirement. Minor administrative cost to produce documents and educate personnel.

			Ev: Benefits of ensuring responsible waste management outweighs the negligible cost.
Recover accidentally discharged solid wastes or lost equipment (if safe to do so) **(RSK-01: EPS-05)**	Administrative	Yes	**EB:** Removes debris from the environment, thereby reducing impacts to marine fauna and water quality. **C:** Medium to high costs dependent on the duration of down-time to retrieve materials. **Ev:** Environmental benefit of recovering marine debris outweighs the costs.
Handling and storage procedures **(RSK-01: EPS-06, -12, -13, -14, -15).**	Administrative	Yes	**EB:** Reduces the likelihood that materials will be accidentally lost overboard. **C:** Negligible; it is a standard maritime requirement. Minor administrative cost to produce documents and educate personnel. **Ev:** Environmental benefit outweighs the negligible costs.
Dropped object prevention procedure **(RSK-01: EPS-07, -09, -10, -11).**	Engineering	Yes	**EB:** Reduces the likelihood that materials will be accidentally lost overboard and impacts on marine fauna and water quality. **C:** Negligible; it is a standard maritime requirement. Minor administrative cost to produce documents and roll out to personnel. **Ev:** Environmental benefit outweighs the negligible costs.
PMS **(RSK-01: EPS-08)**	Engineering	Yes	**EB:** The maintenance of lifting equipment minimises the likelihood of dropped objects. **C:** Negligible; it is a standard maritime requirement. Minor administrative costs associated with maintaining the PMS. **Ev:** Environmental benefit outweighs the negligible costs.

Environmental Controls and Performance Measurement		
EPO	EPS	Measurement criteria
No unplanned release of hazardous or non-hazardous solid wastes or materials.	**(RSK-01: EPS-01)** A MARPOL Annex V-compliant GMP is in place for the vessel (if >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage.	A GMP is in place, readily available on board and kept current.
	(RSK-01: EPS-02) Waste is stored, handled and disposed of in accordance with the GMP. This includes measures including:	GMP is available and current.
		Inspections verify that waste is stored and handled according to its waste classification.

	• No discharge of general operational or maintenance wastes or plastics or plastic products of any kind. • Waste containers are covered with secure lids to prevent solid wastes from blowing overboard. • All solid wastes are stored in designated areas before being sent ashore for recycling, disposal or treatment. • Any liquid waste storage on deck must have at least one barrier to minimise the risk of spills to deck entering the ocean. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. • Correct segregation of solid and hazardous wastes.	Inspections verify that waste receptacles are properly located, sized, labelled, covered and secured for the waste they hold. A licensed shore-based waste contract is in place for the management of onshore waste transport and disposal.
	(RSK-01: EPS-03) MODU and vessel crews and visitors are inducted into waste management procedures to ensure they understand how to implement the GMP.	Induction and attendance records verify that all crew members are inducted.
	(RSK-01: EPS-04) Waste types and volumes are tracked and logged.	Waste manifest is available and current.
	(RSK-01: EPS-05) Solid waste that is accidentally discharged overboard is recovered if reasonably practicable.	Incident records are available to verify that credible and realistic attempts to retrieve the materials lost overboard were made.
	(RSK-01: EPS-06) A chemical locker is available, bunded and used for the storage of all greases and non-bulk chemicals (i.e., those not in tote tanks) so as to prevent discharge overboard.	Site inspection verifies that greases and chemicals are stored in a chemical locker.
Avoid objects being dropped overboard	**(RSK-01: EPS-07)** Large bulky items are securely fastened to or stored on the deck to prevent loss to sea.	A completed pre-departure inspection checklist verifies that bulky goods are securely sea-fastened.
	(RSK-01: EPS-08) The MODU and vessel PMS are implemented to ensure that lifting equipment remains in certification and fit for use at all times to minimise the risk of dropped objects.	PMS records verify that lifting equipment is maintained to schedule and in accordance with Original Equipment Manufacturer (OEM) requirements.
	(RSK-01: EPS-09) The crane handling and transfer procedure is in place and implemented by crane operators (and others, such as dogmen) to prevent dropped objects.	Completed handling and transfer procedure checklist, permit to work (PTW) and/or risk assessments verify that the procedure is implemented prior to each transfer.

	(RSK-01: EPS-10) Crane operators are trained to be competent in the handling and transfer procedure to prevent dropped objects.	Training records verify that crane operators are trained in the loading and unloading procedure.
	(RSK-01: EPS-11) Visual inspection of lifting gear is undertaken every quarter by a qualified competent person (e.g., maritime officer) and lifting gear is tested regularly in line with the MODU and vessel PMS.	Inspection of PMS records and Lifting Register verifies that inspections and testing have been conducted to schedule.
Chemicals and hydrocarbons are stored and transferred in a manner that prevents bulk release.	**(RSK-01: EPS-12)** All hydrocarbons and chemicals are stored within secure receptacles within bunded areas or dedicated chemical lockers that drain to bilge tanks.	Visual inspection verifies that hydrocarbons and chemicals are stored within secure receptacles within bunded areas or dedicated chemical lockers that drain to bilge tanks.
	(RSK-01: EPS-13) MODU and vessel PMS is implemented to ensure the integrity of chemical and hydrocarbon storage areas and transfer systems are maintained in good order.	Vessel PMS records verify that chemical and hydrocarbon storage areas and transfer systems (e.g., bunds, tanks, pumps and hydraulic hoses) are maintained to schedule and in accordance with OEM requirements.
	(RSK-01: EPS-14) Where hydrocarbons and chemicals are stored within open draining decks, receptacles are stored on/in temporary bunds.	Visual inspection verifies that where hydrocarbons and chemicals are stored within open draining decks, receptacles are stored on/in temporary bunds.
	(RSK-01: EPS-15) Crane transfers of bulk chemicals and hydrocarbons are undertaken in accordance with the vessel contractor lifting and loading procedure, or equivalent, and under a PTW.	PTW records verify that crane transfers of bulk chemicals and hydrocarbons are undertaken in accordance with the procedure.

Risk Assessment (residual)		
Likelihood	Consequence	Risk rating
Rare	Minor	Negligible

The risk of accidental discharge of waste to the ocean is assessed as negligible because:

- Volumes of waste generated will be small due to the nature of the activity; and
- Implementation of the control measures reduces the likelihood to accidental discharge of waste to the ocean to ALARP.

Demonstration of ALARP

A 'negligible' residual risk rating is considered to be ALARP and a 'lower order' risk. The adopted controls and associated EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.

Demonstration of Acceptability		
Policy compliance	EOG's Safety and Environmental Policy objectives are met.	
EMS compliance	Chapter 10 outlines the EP implementation strategy to be employed for this activity.	
Risk matrix standard compliance	The residual risk is negligible, which is considered acceptable.	
External context	No objections or claims have been raised by relevant persons regarding accidental release of wastes to the ocean for this activity.	

Legislative context	The EPS align with the requirements of:
	• *Navigation Act* 2012 (Cth):
	  ○ Chapter 4 (Prevention of Pollution).
	  ○ Marine Orders Part 94 (Marine pollution prevention – packaged harmful substances).
	  ○ Marine Orders Part 95 (Marine pollution prevention – garbage).
	• *Protection of the Sea (Prevention of Pollution from Ships) Act* 1983 (Cth):
	  ○ Part III (Prevention of pollution by noxious substances).
	  ○ Part IIIA (Prevention of pollution by packaged harmful substances).
	  ○ Part IIIC (Prevention of pollution by garbage).	

Industry practice	The consideration and alignment of EPS with the mitigation measures outlined in the below-listed codes of practice and guidelines demonstrates that BPEM will be implemented for this activity	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this activity are in line with the management measures listed for hazardous waste and non-hazardous waste discharges in Sections 4.6.2 and 4.6.3 of the guidelines, which include: • Segregating hazardous and non-hazardous wastes prior to disposal **(RSK-01: EPS-01)**. • Managing hazardous waste in accordance with their SDS and tracking it to final destination. • Not deliberately discharging waste overboard.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	The EPS listed in this table meet these guidelines for offshore activities with regard to: • Risk management for handling and storage of chemicals (item 19). The BAT are met for the activity with regard to implementing chemical transfer procedures and ensuring chemicals are stored in separate, labelled containers (**RSK-01: EPS-12, -14, -15**).
	Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units (IADC, 2015)	The EPS developed for this activity meet the following requirements. • Section 2.3.6.2 (management of waste) of the guideline states that regulatory requirements should be identified, waste tracking methods be developed and that waste minimisation opportunities should be identified.

		• Section 2.3.6.1 (environmental protection) states that location- and well-specific environmental protection plans should be prepared.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	Guidelines met with regard to: • Waste management (items 46). Materials should be segregated offshore and shipped to shore for reuse, recycling or disposal. A waste management plan should be developed and contain a mechanism allowing waste consignments to be tracked **(RSK-01: EPS-01)**. • Hazardous materials management (item 72). Principles relate to the selection of chemicals with the lowest environmental and health risks.
	AEP CoEP (APPEA 2008)	The EPS for this activity meet the code's following objectives for offshore drilling activities: • To reduce the risk of any unplanned release of material into the marine environment to ALARP and to an acceptable level **(All EPS for RSK-01)**.
	Waste management-specific	
	Guidelines for the Development of GMPs (IMO, 2012)	The MODU and vessels' GMPs are developed in accordance with these guidelines **(RSK-01: EPS-01)**.
	International Dangerous Goods Maritime Code (IMO, 2014)	The storage and handling of dangerous goods on the vessels is managed in accordance with this code **(RSK-01: EPS-02, -06, -12, -14)**.
Environmental context	MNES	
	AMPs	The unplanned discharge of solid or hazardous waste is highly unlikely to intersect nearby AMPs. The North Marine Parks Network Management Plan 2018 (DNP, 2018a) identifies marine debris as a threat to the AMP network. The EPS listed in this table aim to minimise the generation of marine debris and potential for accidental discharge and are aligned with the strategies outlined in the plan.
	Ramsar wetlands	The unplanned discharge of solid or hazardous waste is highly unlikely to reach Ramsar wetlands.
	TECs	The unplanned discharge of solid or hazardous waste is highly unlikely to reach any TECs.
	Nationally threatened and migratory species	The unplanned discharge of solid or hazardous waste is highly unlikely to have any impacts on threated or migratory species.

	Other matters	
	KEFs	The unplanned discharge of solid or hazardous waste will not affect any KEFs.
	NIWs	The unplanned discharge of solid or hazardous waste is highly unlikely to reach any NIWs.
	State marine parks	The unplanned discharge of solid or hazardous waste is highly unlikely to reach any state marine parks.
	Species Conservation Advice/ Recovery Plans/ Threat Abatement Plans	Assessments of the activity against the following species have been undertaken and presented earlier, and the control measures adopted ensure the activity will be conducted in a manner that is not inconsistent with each plan: • The conservation advice for humpback whales (TSSC, 2015b) - Table 8.2. • Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's coasts and oceans (DoEE, 2018) - Table 8.3. • Recovery Plan for Marine Turtles 2017-2017 (DoEE, 2017c) - Table 8.4. • The Sawfish and River Shark Multispecies Recovery Plan (DoE, 2015c) - Table 8.5.
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Statement of acceptability	EOG considers the risk of accidental discharge of waste to the ocean to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual risk rating is negligible; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the design of the activity; • Relevant legislation and industry best practice will be complied with; • Accidentally discharged wastes will not have long-term or significant impacts on MNES; • The management of wastes is not inconsistent with the aims of recovery plans/conservation plans/advice that are in force for EPBC Act-listed threatened and migratory species; • The management of wastes is not inconsistent with the aims of relevant marine reserve management plans; and • The management of wastes is not inconsistent with ESD principles.	
Environmental Monitoring		
• Waste tracking.		

Record Keeping	
• Contractor pre-qualification reports. • GMPs. • Garbage Record Books. • Crew induction and attendance records.	• Inspection records/checklists. • Shore-based waste contract. • Incident reports.

8.2 RISK 2 – Vessel Collision with Megafauna

8.2.1 Hazard

The movement of the drilling support vessels throughout the operational area on a 24-hr basis for the duration of the activity has the potential to result in collision with megafauna, this being marine mammals (whales, dolphins, dugong), whale sharks and turtles.

The MODU legs will not present a strike hazard to megafauna as they are stationary and readily detected and avoided by megafauna. In petroleum production provinces around Australia, marine mammals such as whales, dolphins and seals swim around platform jackets without any apparent risk of injury.

8.2.2 Potential Environmental Risks

The risks of vessel strike with megafauna are:

- Injury; and
- Death.

8.2.3 EMBA

The EMBA for vessel strike with megafauna is the immediate area around the support vessel.

8.2.4 Evaluation of Environmental Risks

Cetaceans

Cetaceans are naturally inquisitive marine mammals that are often attracted to offshore vessels, and dolphins commonly 'bow ride' with offshore vessels. The reaction of whales to the approach of a vessel is quite variable. Some species remain motionless when in the vicinity of a vessel while others are known to be curious and often approach ships that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster moving ships (Richardson *et al*., 1995).

Peel *et al*. (2016) reviewed vessel strike data (2000-2015) for marine species in Australian waters and identified the following:

- Whales including the humpback, pygmy blue, fin, Bryde's, pygmy, sperm, and pygmy sperm were identified as having interacted with vessels. The humpback whale exhibited the highest incidence of interaction. A number of these species may migrate through the waters of the activity area (see Section 5.4.5).
- Dolphins including the Australian humpback, common bottlenose and Risso's dolphin species were also identified as interacting with vessels. The common bottlenose dolphin exhibited the highest incidence of interaction. A number of these species may reside in or pass through the waters of the activity area (see Section 5.4.5).
- All turtle species present in Australian waters are identified as interacting with vessels. The green and loggerhead species exhibited the highest incident of interaction. The presence of turtles in the activity area and EMBA is considered likely (see Section 5.4.6).

Collisions between vessels and cetaceans occur more frequently where high vessel traffic and cetacean habitat coincide (WDCS, 2006). There have been recorded instances of cetacean deaths in Australian waters (e.g., a Bryde's whale in Bass Strait in 1992), though the data indicates this is more likely to be associated with container ships and fast ferries (WDCS, 2006). Some cetacean species, such as humpback whales, can detect and change course to avoid a vessel (WDCS, 2006). The Australian National Marine Safety Committee (NMSC) reports that during 2009, there was one Report of a vessel collision with an animal (species not defined) (NMSC, 2010).

The DoE (2015b) reports that there were two blue whale strandings in the Bonney Upwelling (western Victoria) with suspected ship strike injuries visible. When the vessels are stationary or slow moving, the risk of collision with cetaceans is extremely low, as the vessel sizes and underwater noise 'footprint' will alert cetaceans to its presence and thus elicit avoidance. Laist *et al.* (2001) identifies that larger vessels moving in excess of 10 knots may cause fatal or severe injuries to cetaceans with the most severe injuries caused by vessels travelling faster than 14 knots. When the support vessels are operating within the operational area, they will be travelling very slowly or will be stationery, so the risk associated with fast moving vessels is eliminated for this activity.

The Conservation Management Plan for the Blue Whale (DoE, 2015b) lists 'vessel disturbance in the form of collisions' to be a threat that may inhibit the recovery of the species. An assessment of the relevant management actions listed in the Conservation Management Plan against the activity is provided in Table 8.7.

Table 8.7. Assessment of relevant management actions of the Conservation Management Plan for the Blue Whale with the activity

Management Action	Assessment
Relevant Interim Recovery Objectives	
4. Anthropogenic threats are demonstrably minimised.	Vessel disturbance in the form of collision is a threat to blue whales. The EPS listed in Table 8.13 will reduce the likelihood of vessel strike with blue whales to ALARP. Therefore, the activity will be managed in a manner that is not inconsistent with this interim recovery objective.
Relevant Interim Recovery Objective Targets	
Target 4.1: robust and adaptive management regimes leading to a reduction in anthropogenic threats to Australian blue whales are in place.	The EPS listed in Table 8.13 represent a robust and adaptive management regime for the activity with regard to blue whales. This results in a significant reduction in anthropogenic threats generated by the activity on blue whales. Therefore, the activity will be managed in a manner that is not inconsistent with this interim objective target.
Target 4.2: management decisions are supported by high quality information and high priority research projects identified in this plan are achieved or underway.	The information presented throughout this section and the subsequent EIA presented in Table 8.13 is based on high quality information, scientific literature and research projects. This in turn has informed the management decisions relevant to the activity. Therefore, the activity will be managed in a manner that is not inconsistent with this interim objective target.
Relevant Action Areas	
A.4. Minimising vessel collisions	The control measures adopted and associated EPS listed in Table 8.13 will reduce the likelihood of vessel strike with blue whales to ALARP. With control measures implemented, the

Management Action	Assessment
	activity will be managed in a manner that is not inconsistent with this management action.
Relevant Actions	
2. Ensure all vessel strike incidents are reported in the National Ship Strike Database.	Reporting of vessel strike incidents has been adopted for this activity and an appropriate EPS developed in Table 8.13. Therefore, the activity will be consistent with this action.
3. Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented.	This section of the EP provides an assessment of vessel strike risk and EPS have been adopted for the activity in Table 8.13. Therefore, the activity will be consistent with this action.

DoE (2015b).

The Approved Conservation Advices for the Sei Whale (TSSC, 2015b) and the Fin Whale (TSSC, 2015c) list vessel strike as a threat with a minor consequence rating. An assessment of the listed management actions with the activity is provided in Table 8.8.

Table 8.8. Assessment of relevant management actions of the Approved Conservation Advice for the Sei Whale and Fin Whale with the activity

Management Action	Assessment
Ensure all vessel strike incidents are reported in the National Vessel Strike Database.	Reporting of vessel strike incidents has been adopted as a control measure for this activity and an appropriate EPS developed in Table 8.13. Therefore, the activity will be consistent with this action.

TSSC (2015b;c).

The Approved Conservation Advice for the Humpback Whale (TSSC, 2015a) lists vessel strike as a threat to the species. An assessment of the listed management actions with the activity is provided in Table 8.9.

Table 8.9. Assessment of relevant management actions of the Approved Conservation Advice for the Humpback Whale with the activity

Management Action	Assessment
Maximise the likelihood that all vessel strike incidents are reported in the National Ship Strike Database. All cetaceans are protected in Commonwealth waters and, the EPBC Act requires that all collisions with whales in Commonwealth waters are reported. Vessel collisions can be submitted to the National Ship Strike Database at https://data.marinemammals.gov.au/report/shipstrike	Reporting of vessel strike incidents has been adopted for this activity as a control measure with an appropriate EPS developed in Table 8.13. Therefore, the activity will be consistent with this action.
Ensure the risk of vessel strike on humpback whales is considered when assessing actions that increase vessel traffic in areas where humpback whales occur and, if required appropriate mitigation measures are implemented to reduce the risk of vessel strike.	This section of the EP provides an assessment of vessel strike risk and EPS have been adopted for the activity in Table 8.13. Therefore, the activity will be consistent with this action.

TSSC (2015a).

There is a National Recovery Plan in place for the southern right whale, but given it is unlikely to occur in the activity area, an assessment of the activity against this plan is not presented.

Table 8.10 provides an assessment of the objectives and relevant management actions of the National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna (DoEE, 2017a) with the activity.

Table 8.10. Assessment of the objectives and relevant management actions of the National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna with the activity

Relevant Objectives and Management Actions	Assessment
Relevant objectives	
Reduce the likelihood and severity of megafauna vessel collision.	The adopted EPS listed in Table 8.12 are aligned with best-practice mitigation measures, which will reduce the likelihood of vessel strike with megafauna to ALARP. Therefore, the activity will be consistent with this objective.
Identify and adopt best-practice mitigation measures and emerging technologies, and encourage the development of new mitigation measures.	
Management actions	
Develop a mitigation measures toolkit that provides guidance to stakeholders and managers on what measures are most suited to specific locations, species and vessel types.	The adopted EPS listed in Table 8.12 will reduce the likelihood of vessel strike with cetaceans to ALARP. Therefore, the activity will be consistent with these actions.
Develop and implement vessel strike management plans which identify appropriate mitigation measures in locations where the relative risk of vessel strike is higher, as determined by a risk assessment.	
Adaptive management principles, including the use of regular reviews are used during the implementation of mitigation measures.	

DoEE (2017a).

Turtles

The operational EMBA overlaps the following turtle BIAs (Figure 7.2):

- Green turtle – foraging;
- Flatback turtle – inter-nesting; and
- Olive Ridley turtle – foraging.

When these turtles are migrating through or foraging in the operational area, they may be at risk of colliding with support vessels when they surface to breathe and rest. However, only a small portion of their time is spent at the surface, as they typically spend more than 90% of their time underwater (Lutcavage and Lutz, 1997; Hochscheid *et al*., 2010).

The Recovery Plan for Marine Turtles in Australia lists vessel strike as a threat to marine turtles (DoEE, 2017c). Table 8.11 presents an assessment of the relevant objectives and targets of the Recovery Plan for Marine Turtles in Australia with the activity.

Table 8.11. Assessment of the relevant interim recovery objectives and targets of the Recovery Plan for Marine Turtles 2017-2027 with the activity

Interim Objective or Target	Assessment
Interim Objective 3: Anthropogenic threats are demonstrably minimised.	
Target 3.1: Robust and adaptive management regimes that lead to a reduction in anthropogenic threats to marine turtles and their habitats are in place	The EPS listed in Table 8.12 will reduce the likelihood of vessel strike with cetaceans to ALARP and ensure the activity is conducted in a manner that is not inconsistent with this recovery target.
Target 3.2: Threat mitigation strategies are supported by high quality information	The activity will not have any impacts on this recovery target.

DoEE (2017c).

Whale sharks

The whale shark may occur in the operational area and are known to seasonally aggregate in shallow tropical waters off the North West Cape in WA in March and April (DCCEEW, 2024b). Given there is little spatial overlap between this species' known migration routes, and it's unlikely to be a temporal overlap with the drilling window, vessel collisions with whale sharks and the support vessels has a low risk of occurring.

Nevertheless, whale sharks do spend considerable time close to the surface. Whale sharks tagged off the WA coast (Wilson *et al*., 2006; Gleiss *et al*., 2013) spent approximately 25% of their time less than 2 m from the sea surface, which increases their vulnerability to vessel strike (DoEE, 2017b).

The Approved Conservation Advice (TSSC, 2015d) notes that the threat to the recovery of the species includes strikes from vessels.

Table 8.12. Assessment of the relevant conservation actions of the Conservation Advice for whale sharks with the activity

Interim Objective or Target	Assessment
Minimise offshore developments and transit time of large vessels in areas close to marine features likely to correlate with whale shark aggregations (Ningaloo Reef, Christmas Island and the Coral Sea) and along the northward migration route that follows the northern WA coastline along the 200 m isobath.	The activity is 300 km from the whale shark BIA, 1,700 km from known aggregation areas (Ningaloo Reef) and 450 km south of the 200 m isobath. The EPS listed in Table 8.13 will reduce the likelihood of vessel strike with whale sharks to ALARP.
Assess the impacts of offshore installations and associated environmental changes (light spill, chronic noise, changed water temperature, localised nutrient levels) on whale sharks and mitigation options for these impacts.	The EIA presented in Chapter 7 of the EP indicates the emissions and discharges associated with this activity will have a negligible impact on marine fauna.
Conduct further research into the impacts of boat strike on whale sharks to determine the significance of the threat. Consider possible mitigation actions (collision avoidance systems) if required.	The activity will have no impacts on this research priority

TSSC (2015).

Despite the support vessels being within the activity area for a longer period of time if all three wells are drilled, the risk evaluation for vessel collision with megafauna does not change.

8.2.5 Risk Assessment

Table 8.13 presents the risk assessment for vessel collision or entanglement with megafauna.

Table 8.13. Risk assessment for vessel collision with megafauna

Summary		
Summary of risks	Injury or death of megafauna.	
Extent of risks	Localised – limited to individuals coming into contact with a support vessel.	
Duration of risks	Temporary (if individual animal dies or has a minor injury) to long-term (if there is a serious injury).	
Level of certainty of risk	HIGH – injury may result in the reduced ability to swim and forage. Serious injury may result in death.	
Risk decision framework context	Decision type	A – good industry practice required.
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.
Defined acceptable level	No collision with megafauna.	

Risk Assessment (inherent)		
Likelihood	Consequence	Risk rating
Occasional	Minor	Low

Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
Eliminate the use of support vessels.	Eliminate	No	**EB:** Eliminates the potential collision hazard. **C:** The activity could not proceed. **Ev:** The use of support vessels is the only way in which the activity can proceed. The cost of not using them is the cost of not fulfilling exploration obligations associated with the exploration permit and potential future lost hydrocarbon production.
No night-time/low visibility operations.	Eliminate	No	**EB:** Reduces the likelihood of collision with megafauna. **C:** Doubles the length of time required to complete the activity and subsequent costs, resulting in increased impacts and risks in other areas such as routine discharges, greater collision risk due to additional time spent on-water, etc). **Ev:** Cost outweighs the environmental benefit given the low residual risk to marine megafauna populations.

Restrict support vessel speed to no greater than 6 knots in the activity area.	Administrative	No	**EB:** Reduces the risk of collision with megafauna. **C:** In the event of an emergency, the support vessels may need to travel at speeds >6 knots. There may be a human health or safety cost of not being able to do so. **Ev:** Preventing vessels from travelling at speed in the event of an emergency is not commensurate with the negligible risk rating for this hazard.
Dedicated marine fauna observer (MFO) onboard the support vessels.	Administrative	No	**EB:** Improves the ability to spot megafauna by allowing Vessel Masters to focus on navigation duties, thereby reducing the risk of collision. **C:** Tens of thousands of dollars over the duration of the drilling program, increasing if sourcing MFOs and/or logistics issues means that MFOs cannot be sourced in time for the scheduled start date. **Ev:** The cost of dedicated MFOs on the support vessels is grossly disproportionate to the negligible residual risk associated with this hazard and in light of the low likelihood of high numbers of megafauna in the operational area.
Australian National Guidelines for Whale and Dolphin Watching (2017) (giving effect to the 'interacting with cetaceans and whale watching' in EPBC Regulations Part 8) **(RSK-02: EPS-01).**	Administrative	Yes	**EB:** Observation for megafauna reduces likelihood for potential collision or entanglement through directing the Vessel Master to slow down or move away to avoid megafauna. **C:** No additional cost for vessel crew to implement this control measure. **Ev:** Environmental benefits outweigh the costs.
Environmental induction **(RSK-02: EPS-02).**	Administrative	Yes	**EB:** Ensures vessel personnel are aware of obligations, which in turn reduces the risk of interactions with megafauna. **C:** Negligible; it is a standard on-water requirement. Minor administrative cost to prepare induction and present to crew. **E:** Environmental benefit outweighs cost.
Notification and reporting of collisions with megafauna **(RSK-02: EPS-03, -04).**	Administrative	Yes	**EB:** Reduces risk of physical impacts to cetaceans from the activity vessels. **C:** No additional costs. **Ev:** Environmental benefit can be achieved without costs.

Environmental Controls and Performance Measurement		
EPO	EPS	Measurement criteria
No collision with megafauna.	**(RSK-02: EPS-01)** Through constant bridge watch, vessels comply with the *Australian National Guidelines for Whale and Dolphin Watching for*	Daily operations reports note marine

	Vessels (DoEE, 2017b) when working within the activity area. This means: • Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. • No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod/group. • Do not encourage bow riding. • If animals are bow riding, do not change course or speed suddenly. • If there is a need to stop, reduce speed gradually. • Recording all interactions.	megafauna interactions.
	(RSK-03: EPS-02) Vessel crew has completed an environmental induction covering the above-listed requirements for vessel and megafauna interactions.	Induction and attendance records verify that all crews have completed an environmental induction.
Vessel strike is reported to regulatory authorities.	**(RSK-02: EPS-03)** Vessel strike causing injury to or death of a cetacean is reported to the DCCEEW via the online National Ship Strike Database (https://data.marinemammals.gov.au/report/shipstrike) within 72 hours of the incident.	Electronic record of report submittal is available. Incident report is available within the OMS.
	(RSK-02: EPS-04) Injured megafauna is reported to the Wildcare Helpline on (08) 9474 9055 (for cetaceans travelling west or south towards WA) or the Marine Wild Watch Hotline on 1800 453 941 (for cetaceans travelling east towards the NT) as soon as possible. No attempts to disentangle megafauna should be made by vessel crew.	Incident report verifies contact was made with the Wildcare Helpline or Marine Wild Watch Hotline.

Risk Assessment (residual)		
Likelihood	Consequence	Risk rating
Rare	Minor	Negligible

The risk of vessel strike with megafauna is assessed as negligible because:

- The activity is temporary in nature;
- The movement of the drilling support vessels throughout the operational area on a 24-hr basis; and
- Implementation of the EPS will reduce the likelihood of vessel collision or entanglement with megafauna to ALARP.

Demonstration of ALARP

A ‘negligible’ residual risk rating is considered to be ALARP and a ‘lower order’ risk. The adopted controls and associated EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.

Demonstration of Acceptability		
Policy compliance	EOG's Safety & Environmental Policy objectives are met.	
EMS compliance	Chapter 10 outlines the EP implementation strategy to be employed for this activity.	
Risk matrix standard compliance	The residual risk is negligible, which is considered acceptable.	
External context	No objections or claims have been raised by relevant persons regarding vessel strike with megafauna for this activity.	

Legislative context	The EPS align with the requirements of:
	• *EPBC Act* 1999 (Cth):
	  ○ Section 199 (failing to notify taking of listed species or listed ecological community).
	• EPBC Regulations 2000 (Cth):
	  ○ Part 8 (Interacting with cetaceans and whale watching).
	  ○ AMSA Marine Notice 2016/15 – Minimising the risk of collisions with cetaceans.	

Industry practice	The consideration and alignment of EPS with the mitigation measures outlined in the below-listed codes of practice and guidelines demonstrates that BPEM will be implemented for this activity	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this activity are in line with the management measures listed for collision with marine fauna in Section 4.7.5 of the guidelines: • Monitoring for the presence and movement of large cetaceans and pinnipeds so that avoidance can be taken when marine fauna is observed to be on a collision course with vessels **(RSK-02: EPS-01)**.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	There are no guidelines for offshore activities with regard to minimising the risk of collisions with megafauna.
	Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units (IADC, 2015)	There is no specific guidance regarding minimising the risk of megafauna collisions. Section 2.3.6.1 (environmental protection) states that location- and well-specific environmental protection plans should be prepared. The EP satisfies this requirement.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	There are no guidelines regarding minimising the risk of vessel strike or entanglement with megafauna.
	AEP CoEP (APPEA 2008)	The EPS for this activity meet the code's following objectives for offshore drilling operations:

		• To reduce the risks to the abundance, diversity, geographical spread and productivity of marine species to ALARP and to an acceptable level (all **RSK-02 EPS**).
	Megafauna collision-specific	
	The Australian Guidelines for Whale and Dolphin Watching (DoEE, 2017b)	The EPS listed in this table are aligned with the requirements of these guidelines **(RSK-02: EPS-01).**
	National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE, 2017a).	The EPS listed in this table are aligned with objective 3 of this strategy, which is to reduce the likelihood and severity of megafauna vessel collisions **(RSK-02: EPS-01)**.
Environmental context	MNES	
	AMPs	The risk of collisions with megafauna will not have any effect on nearby AMPs.
	Ramsar wetlands	The risk of collisions with megafauna will not have any effect on Ramsar wetlands.
	TECs	The risk of collisions with megafauna will not have any effect on TECs.
	Nationally threatened and migratory species	The low speed or stationary nature of the support vessels, along with the temporary nature of the activity, makes it unlikely that vessel strike with megafauna will occur. This section provides an assessment of the relevant management actions of the: • Conservation Management Plan for the Blue Whale (DoE, 2015b); • Approved Conservation Advice for the Sei Whale (TSSC, 2015b); • Approved Conservation Advice for the Fin Whale (TSSC, 2015c); • Conservation advice for the humpback whale (TSSC, 2015a); • Recovery Plan for Marine Turtles in Australia, DoEE, 2017c); and • National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna (DoEE, 2017a). The EPS adopted for the activity will reduce the likelihood of vessel collision or entanglement to ALARP, thereby enabling the activity to be conducted in a manner that is not inconsistent with these plans.
	Other matters	
	KEFs	The risk of collisions with megafauna will not have any effect on KEFs.

	NIWs	The risk of collisions with megafauna will not have any effect on NIWs.
	State marine parks	The risk of collisions with megafauna will not have any effect on state marine parks.
	Species Conservation Advice/ Recovery Plans/ Threat Abatement Plans	Vessel collisions are listed as a threat to cetaceans in the: • Conservation Management Plan for the Blue Whale (DoE, 2015b); • Conservation advice for the sei whale (TSSC, 2015b); • Conservation advice for the fin whale (TSSC, 2015c); and • Conservation advice for the humpback whale (TSSC, 2015a). The EPS listed in this table aim to minimise the risk of vessel strike with megafauna. This section provides an assessment of the activity against the management actions relevant to vessel strike and demonstrate that the activity will be managed in a manner such that it is not inconsistent with the relevant management actions of these plans.
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Defined acceptable level	EOG considers the risks of collision and entanglement with megafauna to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual risk rating is negligible; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the design of the activity; • Relevant legislation and industry best practice will be complied with; • Collisions with megafauna will not have long-term or significant impacts on MNES; • Control measures in place to prevent collisions with megafauna are not inconsistent with the aims of recovery plans/conservation plans/advice that are in force for EPBC Act-listed threatened and migratory species; • Control measures in place to prevent collisions with megafauna are not inconsistent with the aims of relevant marine reserve management plans; and • The control measures are not inconsistent with ESD principles.	
Environmental Monitoring		
• Constant bridge watch on support vessels.		
Record Keeping		
• Vessel crew induction presentation and attendance records. • Megafauna sighting records. • Incident reports.		

8.3 RISK 3 – Introduction and Establishment of Invasive Marine Species

8.3.1 Hazard

The DAWR (2018) defines marine pests (referred to in this EP as invasive marine species, IMS) as:

- Non-native marine plants or animals that harm Australia's marine environment, social amenity or industries that use the marine environment, or have the potential to do so if they were to be introduced, established (that is, forming self-sustaining populations) or spread in Australia's marine environment.

The following activities have the potential to result in the introduction of IMS in the activity area:

- Discharge of ballast water from the support vessels and MODU hull containing foreign species; and
- Translocation of foreign species through biofouling on support vessel hulls and niches (e.g., thruster tunnels, sea chests) and the MODU hull and legs.

Biofouling is the accumulation of aquatic microorganisms, algae, plants and animals on vessel hulls and submerged surfaces. More than 250 non-indigenous marine species have established in Australian waters, with research indicating that biofouling has been responsible for more foreign marine introductions than ballast water (DAWR, 2018).

Ballast water is estimated to be responsible for 30% of all marine pest incursions into Australian waters (DAWR, 2018). The DAWR declares that all saltwater from ports or coastal waters outside Australia's territorial seas presents a high risk of introducing foreign marine pests into Australia (AQIS, 2011), while DAWR (2018) notes that the movement of vessels and marine infrastructure is the primary pathway for the introduction of IMS.

The MODU

As a jack-up, the key IMS risks from the MODU come from the legs, as they are immersed in the water column for long periods, along with the spud cans that are immersed in seabed sediments. Ballast water is taken up from the jack-up MODU in the hull when it leaves a location (to assist with ballasting during the tow) and then discharged when it reaches a location.

The IMS risk for jack-up MODUs is lower when compared to semi-submersible MODUs because the legs are raised out of the water when towed between drilling locations, meaning that any biofouling generally dehydrates and dies (and may dislodge) between locations and is therefore less likely to survive in a new location once the MODU is jacked down.

Support Vessels

Support vessels ballast and de-ballast to improve stability, even out vessel stresses and adjust vessel draft, list and trim, with regard to the weight of equipment on board at any one time.

8.3.2 Potential Environmental Risks

The risks of IMS introduction (assuming their survival, colonisation and spread) include:

- Reduction in native marine species diversity and abundance;
- Displacement of native marine species;
- Depletion of commercial fish stocks (and associated socio-economic effects); and
- Changes to conservation values of protected areas.

8.3.3 EMBA

The EMBA for IMS introduction is anywhere within the operational area (wherever vessel movements occur), though if IMS survive the introduction and go on to colonise and spread, this EMBA could extend to the activity area or other parts of the JBG.

Receptors most at risk within this EMBA, either as residents or migrants, are:

- Benthic fauna (because of their limited ability to move to other suitable areas);
- Benthic habitat; and
- Pelagic fish.

8.3.4 Evaluation of Environmental Risks

Successful IMS invasion requires the following three steps:

1. Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g., home port).
2. Survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g., operational area).
3. Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population.

If successful invasion takes place, the IMS is likely to have little or no natural competition or predation, thus potentially outcompeting native species for food or space, preying on native species or changing the nature of the environment. It is estimated that approximately one in six introduced marine species becomes pests (AMSA, n.d). Because the eradication of IMS populations is innately extremely difficult, it is necessary that preventing their introduction (or failing this, early detection) is the key to managing this risk.

Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion (AMSA, n.d). For example, the introduction of the Northern Pacific seastar (*Asterias amurensis*) in Victorian and Tasmanian waters was linked to a decline in scallop fisheries. Similarly, the ability of the New Zealand screw shell (*Maoricolpus roseus*) to reach densities of thousands of shells per square metre has presented problems for commercial scallop fishers (MESA, 2022). The ABC (2000) reported that the New Zealand screw shell is likely to displace similar related species of screw shells, several of which occupy the same depth range and sediment profile.

Marine pests can also damage marine and industrial infrastructure, such as encrusting jetties and marinas or blocking industrial water intake pipes. By building up on vessel hulls, they can slow the vessels down and increase fuel consumption.

Activity-specific risk assessment

The Interactive Map for Marine Pests in Australia (DAFF, 2021) does not identify any known pests within the Port of Darwin. Given that this is the largest port in the region and the most likely port of call for the support vessels, the likelihood of IMS introduction from this port is therefore low.

The jack-up MODU(s) to be used for drilling is likely to be operating in northern Australian waters ahead of each of the multi-well drilling campaigns, with steps already taken by previous operator(s) to reduce the risk of introducing IMS. This would lower the risk of introducing IMS to the JBG compared to the MODU coming directly from non-Australian waters (because any fouling species or IMS present in ballast waters are likely to have come from the region and therefore present a lower risk of being

invasive species). In the unlikely event that activity uses a MODU which is coming from outside the Northwest Marine Region or outside Australia, EOG would take the appropriate steps outlined in the risk assessment to keep the risk of IMS introduction ALARP.

The unconsolidated sandy sediments of the activity area and surrounds (see Section 5.2.3), combined with its water depth (40 m) and distance from shore (76 km), reduce the risk of IMS establishment because IMS generally require hard substrate to attach to in the photic zone. Colonisation and spread is more likely in shallow, highly disturbed nearshore waters (such as ports and marinas) than open waters further offshore (Geiling, 2014) where the rate of dilution and the degree of dispersal are high (Paulay *et al.*, 2002).

The National Strategic Plan for Marine Pest Biosecurity (2018-2023) (DAWR, 2018) has five objectives and associated management activities. An assessment of the objectives and management activities of the National Strategic Plan for Marine Pest Biosecurity (2018-2023) against the activity is provided in Table 8.14.

Table 8.14. Assessment of the objectives and management activities of the National Strategic Plan for Marine Pest Biosecurity (2018-2023) against the activity

Objectives and Activities	Assessment
Objective 1: Minimise the risk of marine pest introductions, establishment and spread	The adopted EPS listed in Table 8.15 are aligned with best-practice mitigation measures, which will reduce the likelihood of introduction of IMS to ALARP. Therefore, the activity will be consistent with this objective.
1.1. Implement nationally consistent domestic ballast water regulations under the Biosecurity Act 2015 (Cwlth).	The adopted EPS listed in Table 8.15 are aligned with best-practice mitigation measures, which will reduce the likelihood of introduction of IMS to ALARP. Therefore, the activity will be consistent with these management activities.
1.2. Ensure the use of ballast water management systems in Australian waters meets accepted environmental standards.	
1.3. Investigate regulatory options to manage biosecurity risks associated with biofouling on vessels.	The activity will not have any impact on this management activity.
1.4. Review the National Biofouling Management Guidelines for marine sectors and update as required.	The activity will not have any impact on this management activity.
1.5. Investigate the benefits of an intelligence-gathering framework to monitor marine pest risk pathways and expand the International Biosecurity Intelligence System as appropriate.	The activity will not have any impact on this management activity.
Objective 2: Strengthen the national marine pest surveillance system	The activity will not have any impact on this objective.
2.1. Develop a national marine pest surveillance strategy.	The activity will not have any impact on this management activity.
2.2. Investigate Australia's current passive surveillance capability for marine pests and recommend possible improvements.	The activity will not have any impact on this management activity.

Objectives and Activities	Assessment
2.3. Promote tailored education and awareness materials to engage marine pest observer groups in passive surveillance activities.	The activity will not have any impact on this management activity.
2.4. Develop validation guidelines for marine pest molecular detection methods.	The activity will not have any impact on this management activity.
2.5. Validate molecular detection methods (including sampling methodology) for selected high-priority marine pest species.	The activity will not have any impact on this management activity.
2.6. Audit, maintain and share a database of marine pest identification capability.	The activity will not have any impact on this management activity.
2.7. Review surveillance information management needs and ensure an appropriate information system is in place.	The activity will not have any impact on this management activity.
2.8. Perform an audit of marine pest surveillance activities and data sets relevant to Australia.	The activity will not have any impact on this management activity.
Objective 3: Enhance Australia's preparedness and response capability for marine pest introductions	The activity will not have any impact on this objective.
3.1. Plan and implement a national program of marine pest emergency response exercises.	The activity will not have any impact on this management activity.
3.2. Develop a benefit–cost analysis framework to guide response efforts in the event of a nationally significant marine pest incursion.	The activity will not have any impact on this management activity.
3.3. Identify marine pest emergency response training needs.	The activity will not have any impact on this management activity.
3.4. Review the national Emergency Marine Pest Plan (EMP Plan) framework.	The activity will not have any impact on this management activity.
3.5. Plan and implement procedures to develop and update the EMP Plan rapid response manuals and related guidance materials.	The activity will not have any impact on this management activity.
Objective 4: Support marine pest biosecurity research and development	The activity will not have any impact on this objective.
4.1. Periodically review the national marine pest biosecurity research and development priorities.	The activity will not have any impact on this management activity.
4.2. Promote research coordination through the national marine pest research network.	The activity will not have any impact on this management activity.

Objectives and Activities	Assessment
4.3. Review the economic, environmental and social impacts of marine pests in Australia.	The activity will not have any impact on this management activity.
4.4. Conduct risk analyses of marine pest vectors and pathways, and make recommendations for improved management.	The activity will not have any impact on this management activity.
4.5. Assess the effectiveness of current management options for biofouling in niche areas.	The activity will not have any impact on this management activity.
Objective 5: Engage stakeholders to better manage marine pest biosecurity	The activity will not have any impact on this objective.
5.1. Identify and build a profile of marine pest biosecurity stakeholders.	The activity will not have any impact on this management activity.
5.2 Develop a national stakeholder engagement strategy for Marine Pest Plan 2018–2023 and the Marine Pest Sectoral Committee.	The activity will not have any impact on this management activity.
5.3. Design a targeted national campaign to improve awareness of marine pest biosecurity risks, management actions and shared responsibilities.	The activity will not have any impact on this management activity.
5.4. Review, update and maintain the www.marinepests.gov.au website.	The activity will not have any impact on this management activity.
5.5. Establish an independent national marine pest network.	The activity will not have any impact on this management activity.

The risk evaluation for the introduction of IMS does not change regardless of whether one, two or three wells are drilled. This is because the wells will be either drilled consecutively without departing the activity area in between each well, or in the event that the wells are drilled with a break of time between each, the same control measures adopted for the first well will be implemented for the second and third wells.

8.3.5 Risk Assessment

Table 8.15 presents the risk assessment for the introduction of IMS.

Table 8.15. Risk assessment for the introduction of IMS

Summary	
Summary of risks	Reduction in native marine species diversity and abundance, displacement of native marine species, socio-economic impacts on commercial fisheries and changes to conservation values of protected areas.
Extent of risk	Localised (isolated locations if there is no spread) to widespread (if colonisation and spread occurs).
Duration of risk	Short-term (IMS is detected and eradicated, or IMS does not survive long enough to colonise and spread) to long-term (IMS colonises and spreads).

Level of certainty of risk	HIGH – the impacts associated with IMS introduction are well known and the vectors of introduction are known. Regulatory guidelines controlling these vectors have been established.	
Risk decision framework context	Decision type	A - good industry practice required.
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.
Defined acceptable level	No introduction of IMS.	

Risk Assessment (inherent)		
Likelihood	Consequence	Risk rating
Occasional	Moderate	Medium

Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
Use only locally/ regionally sourced support vessels.	Elimination	Likely	**EB:** Eliminates the potential for introduction of IMS from non-Australian waters. **C:** This is not standard industry practice. This is a significant limitation on the activity, as there are very few if any drilling support vessels permanently based in Australia, so vessels must be sourced opportunistically if they are in-country when required, or else internationally (e.g., southeast Asia). There is no cost to the project in adopting this approach. However, this cannot be guaranteed. **Ev:** There are significant schedule and capability implications for the activity by restricting the choice of vessels. On balance, the cost to implement this control is disproportionate to the risk if other controls are adopted.
Do not exchange or discharge ballast water in the operational area.	Elimination	No	**EB:** Eliminates the potential for introduction of IMS. **C:** It is not feasible to implement this from a structural integrity or safety perspective, as ballast water exchange is required to ensure the stability of vessels as they load and unload goods. **Ev:** The high risk to human safety outweighs any environmental benefits.
International Anti-fouling System (IAFS) Certificate **(RSK-03: EPS-02).**	Engineering	Yes	**EB:** Ensures that the MODU and support vessels have an anti-fouling coating and associated certificate to reduce the likelihood of transfer of IMS from their hulls to the activity area. **C:** Significant cost to the contractors to have the MODU and vessels inspected and anti-fouling

			paint applied (generally every 5 years). This is a legislated requirement. **Ev:** Environmental benefit outweighs the cost.
Biofouling Management Plan and Biofouling Record Book **(RSK-03: EPS-01, -03).**	Administrative	Yes	**EB:** Provides for operational guidance to vessels for planning and actions required to manage vessel biofouling, in addition to outlining measures for the control and management of vessel biofouling in accordance with IMO Guidelines. Thereby reducing the likelihood of IMS transfer and establishment in the activity area. **C:** Small cost involved with personnel undertaking inspections and audits. **Ev:** Environmental benefit outweighs the cost.
Cleaning of immersible equipment **(RSK-03: EPS-04).**	Administrative	Yes	**EB:** Reduces the likelihood of introducing IMS. **C:** Small cost involved in cleaning and verification during inspection. **Ev:** Environmental benefit outweighs cost.
Ballast water management plan. **(RSK-03: EPS-05, -06).**	Administrative	Yes	**EB:** Reduces likelihood of introducing IMS. **C:** Small costs associated with preparing and implementing the ballast water management plan and with maintaining record books and logs. This is a legislated requirement. **Ev:** Environmental benefit outweighs cost.
Incident reporting **(RSK-04: EPS-07).**	Administrative	Yes	**EB:** Alerts authorities to the known or potential introduction of IMS, thereby allowing authorities to deal with (or remove) the threat early so as to minimise environmental impacts. **C:** No cost. **Ev:** Environmental benefit outweighs the cost.

Environmental Controls and Performance Measurement		
EPO	EPS	Measurement criteria
Biofouling		
No introduction of IMS through hull fouling.	**(RSK-03: EPS-01)** The MODU and support vessels are managed in accordance with the *National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry* (CoA, 2009) to ensure they present a low biofouling risk. This means: • Biofouling risk assessment is conducted to ensure there is a low risk of IMS introduction. • Conducting in-water inspection by divers or inspection in drydock if deemed necessary (based on risk assessment). • Cleaning of hull and internal seawater systems, if deemed necessary. • Anti-fouling coating status taken into account, with antifouling renewal undertaken if deemed necessary.	Biofouling assessment reports prior to mobilising to site confirms acceptability to enter the operational area.

	(RSK-03: EPS-02) The MODU and support vessels >400 gross tonnes carry a current IAFS Certificate that is complaint with Marine Order Part 98 (Anti-fouling Systems).	IAFS Certificates are available and current.
	(RSK-03: EPS-03) The MODU and support vessels are managed in accordance with *The Australian Biofouling Management Requirements* (Version 1, 2022), which involves submitting information to the DCCEEW in its Pre-Arrival Report (PAR) specifying whether the MODU and vessel: • Maintain an effective Biofouling Management Plan (includes the plan, biofouling record book and supporting evidence); • Have been cleaned of biofouling within 30 days of arriving in Australia; • Have an alternative biofouling management method that has been pre-approved by the DCCEEW (includes approval document); • Will be subject to in-water cleaning in Australia (if required, includes permissioning document from the relevant state or NT government). EOG will only contract a MODU and support vessels that can demonstrate they have met these requirements.	The following documentation is current: • Accepted PAR; • Biofouling Management Plan; • Biofouling Record Book; • Cleaning report and supporting photos or video; and • Pre-approved alternative biofouling management method (if required).
Immersible equipment does not introduce IMS to the activity area.	**(RSK-03: EPS-04)** Immersible equipment (e.g., VSP equipment, ROV) is cleaned (e.g., biofouling is removed) prior to initial use on the MODU.	Records are available to verify that immersible equipment was cleaned prior to use.
Ballast water		

No introduction of IMS through ballast water.	**(RSK-03: EPS-05)** Vessels fulfil the requirements of the *Australian Ballast Water Management Requirements* (DAWR, 2020, v8). This includes requirements to:
	• Carry a valid Ballast Water Management Plan (BWMP).
	• Submit a Ballast Water Report (BWR) through the Maritime Arrivals Reporting System (MARS).
	  ○ If intending to discharge internationally-sourced ballast water, submit BWR through MARS at least 12 hours prior to arrival.
	  ○ If intending to discharge Australian-sourced ballast water, seek a low-risk exemption through MARS.
	• Hold a Ballast Water Management Certificate (BWMC).
		BWMP is available and current.
		BWR (or exemption) is submitted prior to entry to the activity area.
		A valid BWMC is in place.
		An up-to-date BWRS is in place.
		An electronic Pre-Arrival Report (ePAR) is available and signed off by DAWR.

	• Ensure all ballast water exchange operations are recorded in a Ballast Water Record System (BWRS).	
	(RSK-03: EPS-06) As above, except a BWR is not required for domestic journeys (i.e., when moving between Australian ports and 200 nm of the coastline). *Note: ballast water management is not required between Australian ports if:* • *Ballast water is taken up and discharged in the same place.* • *Potable water is used as ballast.* • *Ballast water was taken up on the high seas only.* • *The vessel receives a risk-based exemption from ballast water management.*	As above, except for the BWR.
Reporting		
Known or suspected non-compliance with biosecurity measures are reported to regulatory agencies.	**(RSK-03: EPS-07)** Non-compliant discharges of domestic ballast water are to be reported to the DAWR immediately (contact details in Section 9.7.2).	Incident report notes that contact was made with the DAWR regarding non-compliant ballast water discharges.

Risk Assessment (residual)		
Likelihood	Consequence	Risk rating
Remote	Moderate	Low

The risk of the introduction and establishment of IMS is assessed as low because:

- The control measures adopted are effective in reducing the risk to ALARP.

Demonstration of ALARP
A 'low' residual risk rating is considered to be ALARP and a 'lower order' risk. The adopted EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.

Demonstration of Acceptability	
Policy compliance	EOG's Safety and Environmental Policy objectives are met.
OEMS compliance	Chapter 10 outlines the EP implementation strategy to be employed for this activity.
Risk matrix standard compliance	The residual risk is low, which is considered acceptable.
External context	No objections or claims have been raised by relevant persons regarding the introduction and establishment of IMS for this activity.

Legislative context	The EPS align with the requirements of:
	• *Biosecurity Act* 2015 (Cth):
	  ○ Chapter 4 (Managing biosecurity risk).
	  ○ Chapter 5, Part 3 (Management of discharge of ballast water).
	  ○ Biosecurity Regulations 2016.
	  ○ Biosecurity Amendment (Biofouling Management) Regulations 2021.

	• *Protection of the Sea (Harmful Anti-fouling Systems) Act* 2006 (Cth):
	  ○ Part 2 (Application or use of harmful anti-fouling systems).
	  ○ Part 3 (Anti-fouling certificates and anti-fouling declarations).
	  ○ Marine Order 98 (Marine pollution – anti-fouling systems).
	• Ballast Water Management Convention and Resolution 127 (53) (Marine Environmental Protection Committee of the IMO) 2005.
	• Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 (IMO).	

Industry practice	The consideration and alignment of EPS to the mitigation measures outlined in the below-listed codes of practice and guidelines demonstrates that BPEM is being implemented.	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this activity are in line with the management measures listed for the introduction of IMS in Section 4.7.6 of the guidelines: • Complying with the International Convention on the Control of Harmful Anti-fouling Systems on Ships **(RSK-03: EPS-02)**. • Ensuring vessels of appropriate class have IAFS certificates **(RSK-03: EPS-02)**. • Ensuring compliance with local regulatory guidelines.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	There are no guidelines for offshore activities with regard to minimising the risk of introducing IMS.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	There are no guidelines regarding preventing the introduction of IMS.
	AEP CoEP (APPEA 2008)	The EPS for this activity meet the code's following objectives for offshore drilling operations: • To reduce the risk of introduction of marine pests to ALARP and to an acceptable level (**All RSK-03 EPS**). • To reduce the impacts to benthic communities to ALARP and to an acceptable level.
	IMS-specific	
	Australian Biofouling Management Requirements (Version 1, 2022)	The EPS in this table reflect the guidance regarding biofouling management **(RSK-03: EPS-03)**.
	Australian Ballast Water Management Requirements (DAWR, 2020, v8)	The EPS in this table reflect the guidance regarding ballast water management in the DAWR guide **(RSK-03: EPS-05)**.

	Offshore Installations – Biosecurity Guide (DAWE, 2020, v1.4)	The EPS in this table reflect the guidance provided in the DAWE guide, which largely references other guidelines listed here.
	Anti-Fouling and In-Water Cleaning Guidelines (DoA/DoE, 2015).	The EPS in this table reflect the general guidance regarding managing fouling in the DoA/DoE guidelines, which have since been updated in the aforementioned DAWR (2020) quarantine guide.
	Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species (IMO, 2011)	The EPS in this table reflect the guidance regarding minimising the transfer of IMS from biofouling.
	National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAFF, 2009)	The EPS in this table reflect the guidance regarding biofouling management in the DAFF guide **(RSK-03: EPS-01)**.
Environmental context	MNES	
	AMPs	The North Marine Parks Network Management Plan 2018 (DNP, 2018) identifies invasive species introduction via ballast water in shipping, fishing vessels and other vessels as a potential biosecurity pressure to the AMP network. The implementation of the EPS makes it unlikely that IMS will be introduced to the activity area and spread to nearby AMPs.
	Ramsar wetlands	The risk of introducing IMS is highly unlikely to affect Ramsar wetlands.
	TECs	The risk of introducing IMS is highly unlikely to affect TECs.
	Nationally threatened and migratory species	The threatened and migratory species within the spill EMBA are all highly mobile species. There are no EPBC Act-listed benthic species listed as occurring in the operational area; these are generally more susceptible to the effects of IMS than mobile fauna.
	Other matters	
	KEFs	The risk of introducing IMS is highly unlikely to affect KEFs.
	NIWs	The risk of introducing IMS is highly unlikely to affect NIWs.
	State marine parks	This hazard does not intersect any state marine parks.
	Species Conservation Advice/	The National Strategic Plan for Marine Pest Biosecurity (2018-2023) (DAWR, 2018) has five

	Recovery Plans/ Threat Abatement Plans	objectives. The EPS listed in this table are aligned with the plan's objective to minimise the risk of marine pest introductions, establishment and spread (noting that the other four objectives do not apply to the activity).
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
	Is there a threat of serious or irreversible environmental damage?	Possibly, but the EPS aim to avoid this.
	Is there scientific uncertainty as to the environmental damage?	Yes. Individual species fill different ecological niches and understanding how one or more species are likely to behave outside their native habitat is generally unknown until it occurs.
Statement of acceptability	EOG considers the risks of introducing IMS to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual risk rating is low; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved; • Input from engagement with relevant persons has been considered and incorporated into the design of the activity; • Relevant legislation and industry best practice will be complied with; • The management of IMS is not inconsistent with the aims of the National Strategic Plan for Marine Pest Biosecurity; and • The management of IMS is not inconsistent with ESD principles.	
Environmental Monitoring		
• None required.		
Record Keeping		
• Vessel contractor pre-qualification reports. • Biofouling risk assessment. • Ballast water risk assessments. • BWMP. • BWR.	• BWMC. • BWRS. • IAFS Certificates. • DAWR-signed ePARs.	

8.4 RISK 4 – Interference with Other Marine Users

8.4.1 Hazard

The presence of the MODU and support vessels may result in unplanned interference with other marine users and equipment, such as commercial fishing gear and merchant shipping.

8.4.2 Known and potential environmental impacts

The known and potential impacts of interference with other marine users are:

- Collision potential with third-party vessels (and damage in the case of collision); and
- Damage to or loss of fishing equipment and/or loss of commercial fish catches.

8.4.3 EMBA

The EMBA for interference with other marine users is anywhere within the operational area (wherever vessel movements occur), and more specifically the immediate area around the two intersecting vessels or equipment.

Receptors in the EMBA include:

- Commercial fishing vessels; and
- Merchant vessels.

8.4.4 Evaluation of Environmental Risks

Collision with other marine users

Interference from the MODU and support vessels undertaking the activity with other marine users is highly unlikely because:

- There is low shipping traffic in and around the activity area (see Section 5.7.7);
- The MODU will be highly visible from long distances;
- The support vessels are highly visible and move slowly around the MODU;
- Large vessels use sophisticated navigation aids;
- Navigational warnings and a PSZ will be in place; and
- Consultation has been undertaken with relevant persons prior to the activity.

This likelihood does not increase if three wells are drilled rather than a single well, as the inherent features of the MODU (i.e., its size and visibility) and control measures do not change in this scenario.

In the event of interference with other marine users that results in a vessel-to-vessel collision, health and safety impacts are more likely than environmental impacts. Should the force of a collision be enough to breach a vessel hull (which is unlikely due to the generally low speed), an MDO spill may eventuate (the environmental consequences of which are addressed in Section 8.6).

Damage to or loss of fishing equipment

There is the remote possibility that fishing gear (e.g., NPF otter trawl nets) may get caught by the MODU legs if third-party commercial fishing vessels breach the 500-m radius PSZ with their gear deployed. This would likely result in the gear becoming detached from the fishing vessel and the loss of any associated catch. In addition to the cost of repairing or replacing this equipment, it could also result in the loss of income from caught fish during that fishing expedition. This is highly unlikely to occur because the size of the MODU ensures it is visible from long distances, meaning that fishers will not deploy trawl nets nearby.

The only fishery likely to be active in the activity area is the NPF. The NPF primarily operates from April to June and August to November. If the activity occurs commences in the first half of 2023, it will overlap with the NPF fishing season. Although there is a temporal overlap with the NPF fishing season, for the reasons outlined above, it will be unlikely to result in damage to or loss of fishing equipment.

Interference from the support vessels with commercial fishing vessels is unlikely, for the same reasons stated above.

8.4.5 Risk Assessment

Table 8.16 presents the impact assessment for interference with other marine users.

Table 8.16. Risk assessment for interference with other marine users

Summary		
Summary of risks	Presence of MODU and support vessels, resulting in the risk of vessel-to-vessel collision, damage to or loss of fishing equipment and loss of commercial fish catches.	
Extent of risks	Highly localised (within the activity area).	
Duration of risks	Short-term (minutes for a third-party vessel detour) to long-term (vessel collision).	
Level of certainty of risks	HIGH – the impacts associated with interference with other marine users is well understood.	
Risk decision framework context	Decision type	A - good industry practice required.
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.
Defined acceptable level	No interference with other marine users.	

Impact Consequence (inherent)		
Likelihood	Consequence	Risk rating
Occasional	Minor	Low

Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
PSZ **(RSK-04: EPS-01)**.	Engineering	Yes	**EB:** Minimises collision risk with the MODU, support vessels and third-party equipment through increased awareness. **C:** Minimal cost to prepare and issue notices to marine users. **Ev:** Benefits to safety for all parties outweighs the minimal costs.
Navigation equipment and procedures **(RSK-04: EPS-03, -04, -06, -09)**.	Engineering	Yes	**EB:** Reduces the risk of collisions with other marine users. **C:** While the costs of navigation equipment are significant, it is standard on vessels and the costs of maintaining it are minimal. It is a legislative requirement. **Ev:** The safety benefits of having navigation equipment and procedures outweighs the cost.
Relevant person notifications **(RSK-04: EPS-01, -02, -10)**.	Administrative	Yes	**EB:** Ensures other marine users are aware of the activity and thus reduces likelihood of collision and interference.

			C: Minimal costs associated with EOG personnel preparing and issuing notifications and responding to stakeholders. **Ev:** Benefits outweigh the minimal cost.
Continuous bridge watch **(RSK-04: EPS-04)**.	Administrative	Yes	**EB:** Reduces the risk of collisions with other marine users or their equipment (e.g., marker buoys). **C:** No additional cost. It is routine maritime practice that the Vessel Master and mates maintain bridge watch at all times. **Ev:** Environmental benefits are achieved with no additional cost.
Crew qualifications. **(RSK-04: EPS-05)**.	Administrative	Yes	**EB:** Reduces the risk of vessel collision by ensuring crew possess appropriate qualifications to operate the vessels. **C:** Negligible; it is a standard maritime requirement that crew possess such qualifications. **Ev:** Environmental benefits can be achieved with negligible additional cost.
No fishing from MODU or support vessels. **(RSK-04: EPS-07)**.	Administrative	Yes	**EB:** Keeps all fishing stock available to commercial fishers. **C:** No cost involved. MODU and vessel crews are well supplied with fresh food and there is no need for fishing. **Ev:** Environmental benefits can be achieved with no cost.
Avoid drilling between 1st August to 1st December (4-month period) in any year in line with the request from the NPF during consultation undertaken for Beehive-1.	Administrative	No	**EB:** Reduces the risk of interfering with NPF trawl fishing operations during a key fishing period. **C:** Extremely high (tens of millions of dollars), if MODU availability aligns with the requested exclusion period. The costs are associated with 'warm-stacking' the MODU, paying a termination fee to the MODU operator for breach of contract and/or lost opportunity costs. **Ev:** The cost of this control measures is grossly disproportionate to low inherent risk to third-party marine users. Trawling will not be impacted outside of the 500-m radius PSZ around the MODU.
Environmental Controls and Performance Measurement			
EPO	EPS		Measurement criteria
The EPS listed in 'displacement of other marine users' (Impact 2, Section 7.2) also apply to this risk. Additional controls are provided here.			

No incidents or complaints of spatial conflict with third-party vessels or fishing equipment.	**(RSK-04: EPS-01)** The AHO will be notified of the activity no less than three weeks prior to the activity commencing to enable the promulgation of a Notice to Mariners (NTM) that communicates the 500-m PSZ and 4.6 km (2.5 nm) cautionary area around the MODU for the duration of the activity.	NTM is issued via the AHO prior to the activity and includes details of the PSZ and cautionary area.
	(RSK-04: EPS-02) EOG notifies relevant persons ahead of the activity so that third-party marine users are aware of the MODU location and activity timing.	Stakeholder correspondence verifies that EOG contacted relevant persons about the timing and location of the activity.
	(RSK-04: EPS-03) The MODU and support vessels are readily identifiable to third-party vessels with lights, signals, AIS transponders and communication equipment.	Visual inspection and/or Offshore Vessel Inspection Database (OVID)/Common Marine Inspection Document (CMID) verify that the anti-collision monitoring equipment (e.g., 24-hour radar watch, Global Maritime Distress and Safety System (GMDSS) and Automatic Identification System [AIS]) is functional and in use.
	(RSK-04: EPS-04) The support vessels monitor the PSZ and cautionary area at all times using safe continuous watch.	Daily drilling reports/vessel bridge logbooks verify constant monitoring of the PSZ and cautionary area.
	(RSK-04: EPS-05) The support Vessel Masters and deck officers have valid SCTW certificates in accordance with AMSA Marine Order 70 (seafarer certification) (or equivalent) to operate radio equipment to warn of potential third party spatial conflicts (e.g., International Convention on Standards of Training, Certification and Watch-keeping for Sea-farers [STCW95], GDMSS proficiency).	Appropriate qualifications are available.
	(RSK-04: EPS-06) The support Vessel Masters issue warnings (e.g., radio warning, flares, lights/horns) to third-party vessels approaching the PSZ in order to prevent a collision with the MODU.	Radio operations communications log verifies that warnings to third-party vessels approaching the PSZ have been issued when necessary.
	(RSK-04: EPS-07) Fishing is prohibited from the MODU and support vessels.	Induction and attendance records verify that all crew members are aware of the commitment.
	(RSK-04: EPS-08) All incidents of spatial conflict with other marine users will be reported in the EOG incident register.	The incident register is current.

Vessel-to-vessel collisions are managed in accordance with vessel-specific emergency procedures.	**(RSK-04: EPS-09)** The support Vessel Masters will sound the general alarm, manoeuvre the vessel to minimise the effects of the collision with the MODU and implement all other measures as outlined in the vessel or structure collision procedure (or equivalent).	Incident report verifies that the relevant safety procedure was implemented.
	(RSK-04: EPS-10) Vessel collisions will be reported to AMSA if that collision has or is likely to affect the safety, operation or seaworthiness of the vessel or involves serious injury to personnel.	Incident report verifies that AMSA were notified of a vessel collision.

Impact Consequence (residual)		
Likelihood	Consequence	Risk rating
Rare	Minor	Negligible

The risk of interference with other marine users is assessed as negligible because:

- The activity will be temporary in nature;
- There is low commercial shipping and fishing activity in and around the activity area;
- Thorough consultation has been undertaken with relevant persons to understand the risks and avoid potential interference; and
- The control measures adopted significantly reduce the likelihood of an incident of interference.

Demonstration of ALARP

A 'negligible' residual risk rating is considered to be ALARP and a 'lower order' risk. The adopted controls and associated EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.

Demonstration of Acceptability	
Policy compliance	EOG's Safety and Environmental Policy objectives are met through implementation of this EP.
EMS compliance	Chapter 9 outlines the EP implementation strategy to be employed for this activity.
Risk matrix standard compliance	The residual risk is negligible, which is considered acceptable.
External context	No objections or claims have been raised by relevant persons regarding interference with other marine users for this activity.

Legislative context	The EPS outlined in this table align with the requirements of:
	• *OPGGS Act* 2006 (Cth).
	  ○ Section 280 – requires that a person carrying on activities in an offshore area under the permit, lease, licence, authority or consent must carry on those activities in a manner that does not interfere with navigation or fishing (among others).
	• *Navigation Act* 2012 (Cth).
	  ○ Chapter 6 (Safety of navigation), particularly Part 3 (Prevention of collisions).

	○ AMSA Marine Orders Part 21 (Safety of Navigation and Emergency Procedures). ○ AMSA Marine Orders Part 27 (Safety of Navigation and Radio Equipment). ○ AMSA Marine Order Part 30 (Prevention of Collisions).	
Industry practice	The consideration and alignment of EPS with the mitigation measures outlined in the below-listed guidelines and codes of practice demonstrates that BPEM will be implemented for this activity	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this hazard are in line with the management measures listed for offshore physical presence in Section 4.3.1 of the guidelines, which include: • Develop exclusion zones in consultation with key stakeholders, including local fishing communities; raise awareness of exclusion zones with all stakeholders **(RSK-04: EPS-01, -07)**. • Issue a NTM through the relevant government agencies, detailing the area of operations **(RSK-04: EPS-01)**. • Ensure all vessels adhere to International Regulations for Preventing Collisions at Sea (COLREGS), which set out the navigation rules to be followed to prevent collisions between two or more vessels **(RSK-04: EPS-02, 04, -05)**. • Optimise vessel use to ensure the number of vessels required and length of time that vessels are on site is as low as practicable.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	There is no specific guidance regarding collision avoidance and navigational lighting.
	Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units (IADC, 2015)	There is no specific guidance regarding collision avoidance and navigational lighting. Section 2.3.6.1 (environmental protection) states that location- and well-specific environmental protection plans should be prepared. The EP satisfies this requirement.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	There is no specific guidance regarding collision avoidance and navigational lighting.
	AEP CoEP (APPEA 2008)	The EPS for this activity meets the code's following objectives for offshore drilling operations: • To reduce the impact on other marine resource users to ALARP and to an acceptable level **(RSK-04: All EPS)**. • To reduce risks to public safety to ALARP and an acceptable level **(RSK-04: All EPS)**.

Environmental context	MNES	
	AMPs	This hazard will not affect nearby AMPs.
	Ramsar wetlands	This hazard will not affect any Ramsar wetlands.
	TECs	This hazard will not affect any TECs.
	Nationally threatened and migratory species	This hazard will not affect threatened or migratory species.
	Other matters	
	KEFs	This hazard will not affect any KEFs.
	NIWs	This hazard will not affect any NIWs.
	State marine parks	This hazard will not affect any state marine parks.
	Species Conservation Advice/ Recovery Plans/ Threat Abatement Plans	None triggered by this hazard.
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Statement of acceptability	EOG considers the risk of interference with other marine users to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual consequence rating is negligible; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the design of the activity; and • Relevant legislation and industry best practice will be complied with.	
Environmental Monitoring		
• Continuous bridge and radar monitoring.		
Record Keeping		
• Stakeholder communication records. • NTM. • PSZ gazettal. • Crew qualifications.	• Radio communication logs. • Crew qualifications. • Incident reports. • Daily drilling reports.	

8.5 RISK 5 – Unplanned Discharge of Drilling Fluids, Chemicals or Hydrocarbons

8.5.1 Hazard

The following activities have the potential to result in unplanned discharges of small volumes (typically no greater than 5-10 m^3) of drilling fluids, chemicals and hydrocarbons per well:

- MODU operations – crane transfers and bunkering operations;
- Well testing – liquid drop-out from incomplete combustion or discharge of oily water;

- Support vessel operations – cane transfers and bunkering operations; and
- Aviation operations – refuelling of the helicopter on the MODU.

Crane transfers or bunkering operations between support vessels and the MODU may result in accidental discharges of various products overboard or to deck, such as:

- Drilling muds;
- Bulk drilling chemicals (e.g., barite, bentonite);
- Bulk chemicals (e.g., pipe dope, BOP hydraulic fluids);
- Hydraulic oil from the cranes' electric prime movers;
- Helicopter aviation fuel (avgas [aviation gasoline] or diesel [Jet-A1]); and
- Assorted pumps, winches, power packs and generators.

Spills overboard may be caused by:

- Hose or connection failure (due to equipment condition or failure of a support vessel to keep station);
- Failure to align valves correctly during transfer to tanks;
- Overfilling of tanks on MODU or support vessel;
- Overfilling of aviation fuel tank on fuel unit or bulk storage tank of the MODU;
- Overfilling of helicopter on the MODU helideck;
- Dropped objects from crane transfers; and
- Accidental or emergency disconnection of the riser.

Fluids stored in tanks (or pits) are pumped between tanks or to mixing equipment using transport pumps. The pipes through which they are pumped are under pressure. Possible causes of spills during these transfers include:

- Leaks due to the condition of pipes, connections, flanges and valves;
- Leaks from pump packers;
- Leaks from blocked mixing hoppers;
- Loss of storage tank integrity; and
- Failure to align valves correctly during transfer to tanks.

Jet A1 fuel used for helicopter refuelling has been excluded from spill modelling and this assessment as only small volumes will be stored on the MODU (~6 m^3), and spills of this fuel evaporate quickly due to the very high levels of light ends.

8.5.2 Potential Environmental Risks

The known and potential environmental risks of the unplanned discharge of small volumes of drilling muds, chemicals and hydrocarbons are:

- Temporary and localised reduction of water quality; and
- Acute toxicity to marine fauna through ingestion or absorption.

8.5.3 EMBA

The EMBA for the risk of discharge of drilling muds, chemicals and fuel is likely to range from tens to hundreds of metres depending on the product and volume spilled, so a precise EMBA cannot be calculated.

Receptors most at risk within this EMBA are:

- Water quality;
- Plankton;
- Pelagic fish;
- Seabirds;
- Marine mammals; and
- Marine reptiles.

8.5.4 Evaluation of Environmental Risks

The impact of the discharge of drilling muds is addressed in Section 7.6.2. The impacts of a small unplanned discharge of drilling muds will not vary significantly from the EIA presented in Section 7.6.5.

The risks associated with the discharge of chemicals in drilling muds is addressed in Section 7.6.4. The risks of an unplanned discharge of chemicals will not vary significantly, though the increased release volume means it will take longer to dilute and disperse through the water column.

The risks associated with the discharge of MDO is addressed in Section 8.6.2. The risks of a discharge of aviation fuel will be less than that resulting from a vessel collision due to the much smaller volumes involved, so the extent of spread will be less, and the high volatility of aviation fuel means a greater proportion of fuel will evaporate much faster than MDO.

Flaring associated with well testing may be interrupted by pressure drops, incomplete combustion, or higher than anticipated drilling fluid content in the flaring system. Efficient combustion in the flame depends on achieving good mixing between the fuel gas and air and on the absence of liquids. Where liquids are present (i.e., formation fluids) and not completely 'knocked out' upstream of the flare boom, minor quantities (in the order of litres) of formation fluids may accidentally reach the ocean. Hydrocarbon volumes released due to drop out from flaring are difficult to estimate. Given the automatic and manual systems in place during flaring, the accidental release of hydrocarbon is expected to be low for each well (less than 2 m^3) in the event of flare dropout. The risks from flaring of oil, gas or condensate are considered so minor that the OSPAR Commission concluded that there is no need to develop a background document (i.e., guideline) on the flaring of oil, gas or condensate (OSPAR, 2005).

Near the sea surface, fish are able to detect and avoid contact with surface slicks and as a result, fish mortalities rarely occur in open waters from surface spills (Volkman *et al*., 2004). This, combined with their high mobility (that allows them to avoid exposure to toxic components for long periods), means that pelagic fish are generally not susceptible to impacts from hydrocarbon spills (Volkman *et al*., 2004).

The WCP for seabirds (2020) identifies chronic pollution as an existing threat to seabirds. Chemical contamination has been described within the WCP as contributing to the decline of many seabirds by impairing their ability to reproduce successfully. Eggshell thinning, embryo viability and offspring deformities are noted as reproductive issues caused by chemical contamination (Commonwealth of Australia, 20202). The WCP also notes that organochlorines and heavy metals degrade very slowly in the environment and therefore, is retained by organisms, and passed throughout the food chain.

In general, the small potential release volumes mean that such releases would be confined to a small area around the drill site and result in rapid dilution in the open ocean environment, meaning that the risk of toxic effects to marine fauna are low. The low commercial fishing activity and absence of fish BIAs and sensitive habitats in the operational area means the risks to the biological and socio-economic environments are low.

The risk evaluation for the unplanned discharge of drilling muds, chemicals and hydrocarbons does not change regardless of whether one, two or three wells are drilled.

8.5.5 Risk Assessment

Table 8.17 presents the impact assessment for the unplanned discharge of small volumes of drilling muds, chemicals and hydrocarbons.

Table 8.17. Risk assessment for the unplanned discharge of drilling muds, chemicals and hydrocarbons

Summary			
Summary of risks	Temporary and localised reduction of water quality and acute toxicity to marine fauna through ingestion or absorption of small volumes of drilling muds, chemicals and hydrocarbons.		
Extent of risks	Highly localised – small mixing zone around the MODU		
Duration of risks	Temporary and short-term (several minutes for small deck spills or longer for larger spill)		
Level of certainty of risks	HIGH – the impacts associated with drilling fluid, chemical and hydrocarbon spills at sea are well known and documented.		
Risk decision framework context	Decision type	A - good industry practice required.	
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.	
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.	
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.	
Defined acceptable level	No unplanned release of drilling muds, chemicals and hydrocarbons.		
Impact Consequence (inherent)			
Likelihood	Consequence	Risk rating	
Occasional	Minor	Low	
Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
Pre-acceptance inspection of MODU **(RSK-05: EPS-01).**	Administrative	Yes	**EB:** Ensures the storage tanks, equipment and bunding are in good working condition prior to the activity commencing, thereby reducing the likelihood of drilling fluid, chemical and hydrocarbon spills.

			C: Negligible; it is a standard maritime requirement. Minor administrative cost to produce documents and educate personnel. **Ev:** Benefits outweighs the low costs.
Hydrocarbon and chemical storage and loading **(RSK-05: EPS-02, 03 & 04).**	Engineering	Yes	**EB:** Reduces the likelihood that hydrocarbon and chemical storage will be accidentally lost overboard. **C:** Negligible; it is a standard maritime requirement. Minor administrative cost to produce documents and educate personnel. **Ev:** Environmental benefit outweighs the negligible costs.
PTW system **(RSK-05: EPS-05)**.	Administrative	Yes	**EB:** Reduces the likelihood that hydrocarbon and chemical storage will be accidentally lost overboard by ensuring operations is undertaken via a PTW. **C:** Negligible; it is a standard maritime requirement. Minor administrative costs associated with maintaining the PTW. **Ev:** Environmental benefit outweighs the negligible costs.
PMS **(RSK-05: EPS-06)**.	Administrative	Yes	**EB:** The maintenance of MODU storage systems and associated fittings minimises the likelihood of chemical and hydrocarbon lost overboard. **C:** Negligible; it is a standard maritime requirement. Minor administrative costs associated with maintaining the PMS. **Ev:** Environmental benefit outweighs the negligible costs.
SMPEP **(RSK-05: EPS-07, 08, 10 & 11)**.	Administrative	Yes	**EB:** Ensures crew are well prepared to quickly respond to a spill, thereby minimising the volume spilled and the extent of sea affected. **C:** SMPEP should already be in place. Low costs to stock vessel with equipment and maintain it. This is standard maritime practice. **Ev:** Environmental benefit outweighs the low costs.
Well Test Plan **(RSK-05: EPS-09)**	Administrative Engineering	Yes	**EB:** Ensures well test crew follow set procedures, thereby minimising the likelihood of liquid dropouts. **C:** The preparation of a Well Test Plan is standard practice for well testing contractors, whereby the cost is factored into the contract and not an extra cost per se. **Ev:** Environmental benefits outweigh the low costs.
Environmental Controls and Performance Measurement			

EPO	EPS	Measurement criteria
A pre-acceptance inspection of the MODU takes place.	**(RSK-05: EPS-01)** EOG's pre-acceptance inspection of the MODU confirms that storage tanks, equipment, bunding and machinery spaces are free of defects.	MODU pre-acceptance inspection records verify good condition of all equipment.
Hydrocarbons and chemicals stored on the MODU are stored in a manner that prevents bulk release.	**(RSK-05: EPS-02)** All hydrocarbons and chemicals are stored within secure receptacles within bunded areas or dedicated chemical lockers that drain to bilge tanks.	Visual inspection verifies that hydrocarbons and chemicals are stored within secure receptacles within bunded areas or dedicated chemical lockers that drain to bilge tanks.
	(RSK-05: EPS-03) Where hydrocarbons and chemicals are stored within open draining decks, receptacles are stored on/in temporary bunds.	Visual inspection verifies that where hydrocarbons and chemicals are stored within open draining decks, receptacles are stored on/in temporary bunds.
Hydrocarbons and chemicals are transferred to and from the MODU in a manner that prevents bulk release.	**(RSK-05: EPS-04)** Bulk dry and liquid transfers are undertaken in accordance with the MODU procedures for bulk transfers and lifting to reduce the risk of an unintentional release to the sea. The procedure typically includes the following (which also links to checklists that need to be completed as part of the procedure): • Approval for the supply vessel involved in the bulk transfer operations to enter the PSZ. • Ensuring that no other vessels are within the PSZ during the transfer operations. • Reviewing work instructions prior to undertaking the transfer, including the issue of a Permit to Work (PTW) (if required). • Visual contact and proper communication will be maintained with the vessel performing the transfer to the MODU at all times. • Checks on wind direction, transfer volume, tank and line contents, tank sounding, hose type and condition, status of vent valves and valve	MODU bulk transfer/lifting procedure is available. Completed Job Safety Analysis, PTW and transfer checklists will be in place prior to the commencement of bulk transfers.

	alignments will be undertaken ahead of the transfer. • Personnel will remain at both ends of the transfer to monitor pressure, transfer volumes and so forth, and they will remain in radio contact with each other. • At completion of transfer, the volume of bulk material transferred will be recorded and all equipment and tools will be returned to a dedicated storage area.	
The operation of the dump valve/s for the mud tanks will be managed under a Permit to Work (PTW) system.	**(RSK-05: EPS-05)** The mud dump valve/s are locked, with the keys remaining secure in a key locker. A PTW will be required to unlock the dump valve/s, which involves an assessment by the OIM regarding the need for a specific operation. See also **IMP-06: EPS-13**.	Visual inspection of key locker and dump valve/s verify its integrity.
		Daily Fluids Report allow for material balance assessment to determine discharge volume of weighted brine.
		PTW records verify that a PTW was prepared prior to unlocking the dump valve/s.
Planned maintenance will be undertaken on all MODU storage systems (bunds, hoppers), hose fittings and so forth.	**(RSK-05: EPS-06)** Planned maintenance is undertaken to the PMS schedule.	PMS records verify that maintenance work (and repairs where necessary) is undertaken.
The MODU management and crew are well prepared to respond to deck spills.	**(RSK-05: EPS-07)** The MODU OIM ensures that crew undertake spill response drills every three months in accordance with the SMPEP and drills and exercises matrix.	Records show that relevant crew have conducted quarterly spill response drills.
	(RSK-05: EPS-08) In accordance with the SMPEP, oil spill response kits are available in relevant locations around the MODU, are fully stocked and are used in the event of hydrocarbon or chemical spills to deck.	Inspection/audit confirms that SMPEP kits are readily available on deck.
		Incident reports for MDO spills to deck record that the spill is cleaned up using SMPEP resources.
Release of oil and oily water during well testing is avoided.	**(RSK-05: EPS-09)** A Well Testing Plan will be in place and implemented so the following is achieved:	
	• Separator tanks are installed upstream of the flare boom in order to remove liquids (formation water, completion fluids and/or oil) prior to flaring and thus reduce the chance of liquid dropouts.	Well test daily report verifies the presence of separator tanks.

	• A high-efficiency burner (e.g., 'Evergreen' burner) is installed on the flare boom to reduce the likelihood of liquid dropout.	Well test daily report verifies that a high-efficiency burner was in use during well testing.
	• Burner pilots remain ignited during the well test to minimise the likelihood of liquid dropouts.	Well test daily report verifies that burner pilot remained ignited during the well test.
	• Dedicated MODU deck crew are in place to watch for liquid dropouts, who then notify the Well Test Supervisor as soon as liquid dropout is observed so that the well test process can be quickly shut down and corrected before re-commencing.	Well test daily report includes details of flare watch for liquid dropouts.
	• Liquids stored in the separator tanks are treated through an oily water filtration system (to <30 ppm) prior to overboard discharge or shipped to shore for disposal.	Well test daily report verifies that discharged fluids were treated to <30 ppm or shipped to shore for disposal.
	• Oily water filtration equipment will be calibrated prior to use.	Calibration results verify that the system is calibrated to <30 ppm.
	• In the event of a flare drop-out or hydrocarbons being observed on the sea surface, then flaring (and if applicable, the well test), will cease and the event will be investigated and corrected before re-commencing.	Incident report of flare drop-out or unplanned hydrocarbon release.
Reporting		
A bulk spill of chemicals or hydrocarbons at surface will be promptly reported internally and externally, and appropriately managed.	**(RSK-05: EPS-10)** The MODU OIM will report a bulk spill to the DSV and lead the onboard response in line with the SMPEP.	Incident reports and logs confirm that internal notifications were made in a timely fashion.
A bulk spill of chemicals or hydrocarbons at surface will be promptly reported to external regulatory agencies.	**(RSK-05: EPS-11)** The Drilling Incident Management Team (DIMT) Incident Controller will report to AMSA and NOPSEMA within 2 hours of EOG becoming aware of the spill (see Section 9.7.2).	Incident reports and logs confirm that regulatory authorities were notified within 2 hours of EOG becoming aware of the spill.

Impact Consequence (residual)		
Likelihood	Consequence	Risk rating
Rare	Minor	Negligible

The risk of the unplanned discharge of bulk drilling muds, chemicals and hydrocarbons is assessed as negligible because: • The volumes of chemicals and hydrocarbons on the MODU will be small; • Helicopter refuelling is unlikely to take place on the MODU; and • The control measures adopted significantly reduce the likelihood of an unplanned discharge of bulk drilling fluids, chemicals and hydrocarbons.		
Demonstration of ALARP		
A 'negligible' residual risk rating is considered to be ALARP and a 'lower order' risk. The adopted controls and associated EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.		
Demonstration of Acceptability		
Policy compliance	EOG's Safety and Environmental Policy objectives are met through implementation of this EP.	
EMS compliance	Chapter 10 outlines the EP implementation strategy to be employed for this activity.	
Risk matrix standard compliance	The residual risk is negligible, which is considered acceptable.	
External context	No objections or claims have been raised by relevant persons regarding accidental discharge of drilling fluids, chemicals and hydrocarbons for this activity.	
Legislative context	The performance standards outlined in this EP align with the requirements of: • Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth): ○ Section 9 (Prohibition of discharge of oil or oily mixture to sea).	
Industry practice	The consideration and adoption of the controls outlined in the below-listed codes of practice and guidelines demonstrates that BPEM is being implemented for this activity.	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	As per the impact assessment table in Section 7.6 and Section 7.11.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	As per the impact assessment table in Section 7.6 and Section 7.11.
	Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units (IADC, 2015)	As per the impact assessment table in Section 7.6 and Section 7.11.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas	As per the impact assessment table in Section 7.6 and Section 7.11.

	Development (World Bank Group, 2015)	
	AEP CoEP (APPEA 2008)	As per the impact assessment table in Section 7.6 and Section 7.11.
Environmental context	MNES	
	AMPs	This hazard will not affect nearby AMPs.
	Ramsar wetlands	This hazard will not affect any Ramsar wetlands.
	TECs	This hazard will not affect any TECs.
	Nationally threatened and migratory species	This hazard is unlikely to have acute or chronic toxicity effects on threatened or migratory species.
	Other matters	
	KEFs	This hazard will not affect any KEFs.
	NIWs	This hazard will not affect any NIWs.
	State marine parks	This hazard will not affect any state marine parks.
	Species Conservation Advice/ Recovery Plans/ Threat Abatement Plans	The EPS outlined within this table assist in mitigating the threat of chemical pollution on seabirds identified by the WCP for seabirds (2020).
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Statement of acceptability	EOG considers the risk of unplanned small discharges of drilling fluids, chemicals and hydrocarbons to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual consequence rating is negligible; • An Implementation Strategy (described in Chapter 9) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the design of the activity; and • Relevant legislation and industry best practice will be complied with.	
Environmental Monitoring		
• Not applicable.		
Record Keeping		
• Pre-acceptance MODU inspection records. • Inspection records. • Drill records. • Daily fluids reports. • PMS records. • PTWs and Job safety analysis (JSAs). • Incident reports.		

8.6 RISK 6 - Marine Diesel Oil Release

8.6.1 Hazard

A release of MDO may occur from the support vessels as a result of refuelling, a vessel-to-vessel collision or a support vessel colliding with the MODU legs. The waters of the activity area and its surrounds are deep, and bathymetry mapping indicates there are no sub-surface features (such as reefs or shoals) that present a risk of vessel grounding (see Figure 5.9), so this risk has been discounted for this risk assessment.

Only the vessel-to-vessel collision scenario has been taken forward for Oil Spill Trajectory Modelling (OSTM). The other scenarios are dismissed as having negligible risks or as non-credible, as discussed herein.

MODU refuelling

MODU refuelling is a closely supervised activity on board a MODU with strict controls on the transfer of fuel from support vessels to the MODU. The fuel transfer hoses are supplied by the MODU and generally have a capacity of 47 m^3 (based on a re-fuelling hose 10 cm in diameter and 60 m long). The fuel transfer pump for jack-up MODUs is typically capable of supplying up to 33 m^3/hr.

AMSA's guidance (AMSA, 2015) of using the fuel transfer rate multiplied by 15 minutes of flow (for supervised operations) to estimate the volume of MDO for spill modelling significantly over-estimates how long it would take to shut down re-fuelling operations and it is more likely to be around 5 minutes maximum based on industry experience. Fifteen minutes of flow from the pumps represents a potential loss of 8.25 m^3 based on the maximum transfer pump rate. A spill of this volume in the operational area would rapidly evaporate and dilute with seawater, and would not reach shorelines, causing negligible environmental impacts (NOAA, 2006). Therefore, spill modelling for this scenario has not been undertaken.

Vessel collision with MODU

An errant vessel collision with the MODU is not a credible scenario for the loss of MDO from the MODU for the following reasons, and is therefore not modelled and assessed:

- A temporary PSZ will be gazetted around the MODU at each drill site;
- One support vessel is present on location at all times to maintain guard and intercept any errant vessel;
- Jack-up MODU hulls are raised high above the water line (generally with an air gap of about 20 m), meaning that the tanks would not be pierced in the event of a collision with a large vessel; and
- The MDO tanks are located inboard and double-skinned (with mud, pre-load and potable tanks typically located on the outer edge of the hull), further ensuring that piercing of the MDO tanks (and fuel loss) is even more unlikely.

8.6.2 Potential Environmental Risks, EMBA and Evaluation of Environmental Risks

In line with OPGGS(E) Regulation 56 and Section 2.6 of NOPSEMA's *Environment Plan content requirement guidance note*, EOG refers the reader to Sections 7.16.2, 7.16.3 and 7.16.4 of its PDSA EP (996161-2022-Beehive#1_PDSA-EP-Rev2, available here) that describes the environmental risks, EMBA and evaluation of environmental risks for an MDO spill. The volume chosen for that spill scenario took into account the typical fuel tank sizes on drilling support vessels (as well as vessels used to undertake geophysical and geotechnical investigations).

The risk evaluation for the MDO spill does not change regardless of whether one, two or three wells are drilled because there is no cumulative change to the likelihood of occurrence or impact consequence when multiple wells are drilled.

8.6.3 Risk Assessment

The risk assessment for an MDO release during the activity is provided in Table 8.19. The key difference with the PDSA activity is that refuelling of the MODU is likely to be required, so refuelling controls are included in this risk assessment.

Table 8.19. Risk assessment for an MDO spill

Summary		
Summary of risks	Temporary reduction in water quality. Potential toxicity impacts to marine life. Temporary fisheries closures.	
Extent of risks	EMBA is defined in Figure 7.10 to Figure 7.26 of the PDSA EP.	
Duration of risks	Short-term (several days, depending on level of contact, location and receptor).	
Level of certainty of risks	HIGH – the environmental impacts of spilled hydrocarbons are well understood.	
Risk decision framework context	Decision type	A - good industry practice required.
	Activity	Nothing new or unusual, represents business as usual, well understood activity, good practice is well defined.
	Risk & uncertainty	Risks are well understood, uncertainty is minimal.
	Stakeholder influence	No conflict with company values, no partner interest, no significant media interest.
Defined acceptable level	No release of MDO to sea.	

Risk Assessment (inherent)			
Receptor	Consequence	Likelihood	Risk rating
Benthic fauna	Negligible	Rare	Negligible
Macroalgal communities	Negligible	Rare	Negligible
Plankton	Negligible	Rare	Negligible
Pelagic fish	Negligible	Rare	Negligible
Cetaceans	Negligible	Rare	Negligible
Marine reptiles	Minor	Rare	Negligible
Seabirds	Negligible	Rare	Negligible
Shorebirds	Negligible	Rare	Negligible
Sandy beaches	Negligible	Rare	Negligible
Rocky shores	Negligible	Rare	Negligible

Commercial fisheries	Negligible	Rare	Negligible

Assessment of Proposed Control Measures			
Control measures listed in 'displacement of other marine users' (Impact 2, Section 7.2), 'Interference with other marine users' (Risk 4, Section 8.4) and 'Routine emissions – light' (Impact 3, Section 7.3) are not repeated here. *Only additional control measures are provided here.*			
Control measure	Control type	Adopt	Justification
No fuel bunkering	Elimination	No	**EB**: Avoids the potential for a spill. **C:** The MODU has a finite storage volume that must be topped up in order to continue functioning. Without refuelling, the activity cannot continue, and the objectives of the campaign cannot be met. At-sea bunkering of MODUs is a routine industry activity. **Ev**: The negligible environmental risk posed by this hazard does not justify banning bunkering at sea. This measure cannot be adopted.
Support vessels refuel in port only **(RSK-06:EPS-01)**	Substitution	Yes	**EB**: Reduces the risk of an at-sea spill. **C:** No additional cost. Vessels return to port regularly throughout the activity and therefore have the ability to refuel outside the operational area. **Ev**: Environmental benefits can be achieved without additional cost.
MODU refuels in port only	Substitution	No	**EB**: Reduces the risk of an at-sea spill. **C:** Significant additional cost (and air emissions) associated with towing the MODU back to port for each bunkering event. Increases the duration of the campaign. **Ev**: The negligible environmental risk posed by at-sea bunkering does not justify this very expensive control measure.
Refuelling procedure **(RSK-06:EPS-02)**	Engineering	Yes	**EB:** Reduces the risk of hydrocarbon release to the sea. **C:** The costs of installing and maintaining the equipment, systems and processes for refuelling on the MODU and support vessels is factored into day hire rates. Developing and implementing a refuelling procedure is routine industry practice. **Ev:** The benefits of having the procedure outweigh the costs.
SMPEP **(RSK-06:EPS-08)**	Administrative	Yes	**EB:** Ensures crew are well prepared to quickly respond to a spill, thereby minimising the volume spilled and the extent of sea affected.

			C: SMPEP should already be in place. Low costs to stock vessel with equipment and maintain it. This is standard maritime practice. **Ev:** Benefits outweighs the low costs.
OPEP **(RSK-06:EPS-03, -05, -06)**	Administrative	Yes	**EB:** Ensures EOG is well prepared to quickly respond to a spill, thereby minimising the extent of sea affected. **C:** Minimal cost to prepare OPEP and roll out training. This is standard industry practice. Significant costs for implementing response strategies and arranging call-off (standby) contracts for response resources. **Ev:** Environmental benefits outweigh the significant costs.
OSMP **(RSK-06:EPS-07)**	Administrative	Yes	**EB:** Ensures EOG is well prepared to quickly undertake operational and scientific studies, thereby supporting the future assessment of impacts resulting from the spill. **C:** High cost to prepare OSMP, detailed implementation plans and roll out training. This is standard industry practice. Low cost for putting call-off contracts in place and significant costs to implement the OSMP. **Ev:** Environmental benefits outweigh the significant costs.

Environmental Controls and Performance Measurement		
EPO	EPS	Measurement criteria
The EPS listed in 'displacement of other marine users' (Impact 2, Section 7.2), Interference with other marine users' (Risk 4, Section 8.4) and 'Routine emissions – light.' (Impact 3, Section 7.3) also apply here. *Only Additional controls are provided here.*		
Preparedness (additional preparedness EPS are provided in **Appendix B** of the OPEP)		
No MDO is spilled at sea.	**(RSK-06:EPS-01)** No support vessel refuelling is undertaken at sea (this will be done in port).	Bunker log verifies that support vessel refuelling was undertaken in port.
	(RSK-06:EPS-02) The MODU bunkering Procedure will be implemented in order to prevent an MDO spill during MODU refuelling on location. This will include (but is not limited to): • A JSA and/or PTW is signed off for each bunkering event, taking into account spill response considerations. • Ensuring that the dry-break refuelling hose couplings assembly is in order to minimise the risk of a spill and hose floats are installed on the refuelling	JSA and/or PTW records verify that spill response was taken into consideration. Completed refuelling checklist verifies that dry-break hose couplings and floats are installed on the refuelling hose assembly.

	hose so that a hose leak is easily visible.	
	• Ensuring that communications (visual and/or radio) between the MODU and the vessel will be tested by the MODU Chief Mate and Vessel Master prior to the commencement of bunkering.	PTW indicates that communications were tested between the MODU and vessel.
	• Ensuring that fuel transfer hoses are replaced in accordance with the PMS or when they are visibly degraded.	Hose register and PMS indicates regular replacement of fuel hoses.
	• The bunkering operation is supervised at all times.	Completed bunkering checklist verifies that bunkering was supervised.
	• Ensuring that bunkering only commences during daylight hours and in calm sea conditions.	Completed bunkering checklist verifies that bunkering commenced in daylight hours and in calm sea conditions.
	• Ensuring that tank level indicators and level alarms are provided in the control room for the bunkering tanks.	Completed bunkering checklist verifies that the tank level alarms are functional.
Emergency response		
MODU and/or support vessel crews promptly respond to a spill.	**(RSK-06:EPS-03)** A Beehive drilling OPEP and ERP are in place and tested in a desktop exercise by nominated Drilling Incident Management Team (DIMT) members.	The OPEP and ERP are current.
		OPEP and ERP training schedule is available and remains live.
		The training matrix is maintained as a live document and verifies that DIMT members are up to date with their training.
		OPEP and ERP exercise reports verify that exercises have been undertaken.
	(RSK-06:EPS-04) The MODU OIM and/or Vessel Master will authorise actions in accordance with the SMPEP (or equivalent according to class).	Incident reports verify that the SMPEP was implemented.
	(RSK-06:EPS-05) The Beehive drilling OPEP is implemented to limit the release of a Level 2 or 3 MDO spill.	Daily operations reports verify that the OPEP was implemented.
Recording & reporting		
Compensation		
Compensate for economic loss due to an MDO spill.	As per **IMP-02:EPS-04** and **IMP-02:EPS-05.**	As per **IMP-02:EPS-04** and **IMP-02:EPS-05.**

EOG and regulatory authorities are promptly made of aware of near-misses and spills.	**(RSK-06:EPS-06)** EOG will report the MDO spill to regulatory authorities within 2 hours of the spill or becoming aware of the spill.	Incident report verifies that contact with regulatory agencies was made within 2 hours.
Monitoring		
Characterise environmental impacts of a Level 2 or 3 spill.	**(RSK-06:EPS-07)** EOG will undertake operational and scientific monitoring in accordance with the OSMP.	Daily operations reports and overall study reports verify that the OSMP was implemented.

Risk Assessment (residual)			
Receptor	Consequence	Likelihood	Risk rating
Benthic fauna	Negligible	Remote	Negligible
Macroalgal communities	Moderate	Remote	Negligible
Plankton	Moderate	Remote	Negligible
Pelagic fish	Moderate	Remote	Negligible
Cetaceans	Moderate	Remote	Negligible
Marine reptiles	Moderate	Remote	Negligible
Seabirds	Moderate	Remote	Negligible
Shorebirds	Moderate	Remote	Negligible
Sandy beaches	Moderate	Remote	Negligible
Commercial fisheries	Moderate	Remote	Negligible

The risk of an unplanned MDO release is assessed as negligible for all receptors because:

- The control measures adopted are effective at reducing the likelihood of an unplanned MDO release to remote.

Demonstration of ALARP
A ‘negligible’ residual risk rating is considered to be ALARP and a ‘lower order’ impact. The adopted controls and associated EPS have lowered the risk to the point that any additional or alternative control measures either fail to lower the residual risk rating any further or are grossly disproportionate to the residual risk rating.

Demonstration of Acceptability	
Policy compliance	EOG’s Safety and Environmental Policy objectives are met.
EMS compliance	Chapter 8 outlines the EP implementation strategy to be employed for this activity.
Risk matrix standard compliance	The residual risk for each receptor is negligible, which is considered acceptable.
Engagement	No objections or claims have been raised by relevant persons regarding MDO spills for this activity.

Legislative context	The EPS align with the requirements of:
	• *Navigation Act* 2012 (Cth):
	  ○ Chapter 4 (Prevention of Pollution).
	• OPGGS Act 2006 (Cth):
	  ○ Section 572A-F (Polluter pays for escape of petroleum).
	• OPGGS(E):
	  ○ Part 5 (Incidents, reports and records).
	• *Protection of the Sea (Prevention of Pollution by Ships) Act* 1983 (Cth):
	  ○ Section 11A (SOPEP).	

Industry practice	The consideration and alignment of EPS with the mitigation measures in the below-listed codes of practice and guidelines demonstrates that BPEM will be implemented in this activity	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this activity are in line with the management measures listed for spills from vessels in Section 4.7.2 of the guidelines: • Vessels having a SMPEP. • Vessels having radar fitted and maintaining appropriate lighting and navigation systems • Having safety exclusion zones around facilities.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	No guidance is provided regarding preventing or managing an offshore MDO spill, other than having a spill contingency plan in place. An OPEP is in place for the activity.
	Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys (Nowacek & Southall, 2016)	The four practices outlined in this document have been considered (and adopted where practicable) in the development of performance standards for this EP and the survey design in general.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	Guidelines met with regard to: • Section 75 (Spills): Conducting a spill risk assessment, implementing personnel training and field exercises, ensuring spill response equipment is available **(OPEP)**. • Sections 76-79 (Spill response planning): A spill response plan should be prepared **(OPEP)**.
	Environmental Manual for Worldwide Geophysical Operations (IAGC, 2013)	Guidelines met with regard to: • Section 8.6 (Hazardous materials): Ensuring that vessels carry a SMPEP, that spills are reported to local authorities and that oil spill response drills

		are conducted at regular intervals **(OPEP)**. • Section 8.8 (Vessel operations): Vessels must have oil absorbent materials available to respond to spills, and oil spills must be reported to local authorities **(OPEP)**.
	AEP CoEP (APPEA 2008)	The EPS for this activity meet the code's following objectives for offshore geophysical surveys: • To reduce the risk of any unplanned release of material into the marine environment to ALARP and an acceptable level.
Environmental context	MNES	
	AMPs	The MDO EMBA intersects the JBG AMP. The AMP has the following relevant conservation value: - Carbonate banks and shoals. As addressed in Table 7.54 to Table 7.63 of the PDSA EP (here), the consequence of an MDO spill on these conservation values is negligible and unlikely to result in long-term ecological impacts.
	Ramsar wetlands	There are no Ramsar wetlands intersected by the spill EMBA.
	TECs	There are no TECs identified in the spill EMBA.
	Nationally threatened and migratory species	Some nationally threatened species and migratory species have the potential to be present in the MDO spill EMBA, however as evaluated in the previous tables in this section, the consequence to individuals or populations of threatened and migratory species are considered negligible.
	Other matters	
	KEFs	The MDO EMBA intersects the Carbonate bank and terrace system of the Sahul Shelf KEF. The conservation values of this KEF are related to its benthic environment (diverse corals, sponges and demersal fish), and as such are unlikely to be affected by MDO because MDO is unlikely to occur at anything other than low thresholds near the seabed.
	NIWs	There are no NIWs that are intersected by the activity area or the spill EMBA.
	State marine parks	The MDO EMBA intersects the North Kimberley MP, which has the following environmental values: • River estuaries; • Turtle nesting beaches; • Fringing reefs; • Seabird and shorebird breeding sites; • Marine mammal foraging habitat;

		• Presence of pelagic finfish; and • Mangrove and intertidal mudflats. Given that these values and sensitivities will not be exposed to hydrocarbon concentration that are likely to cause ecological impact, it is anticipated that the impact to these values will be negligible.
	Species Conservation Advice / Recovery Plans / Threat Abatement Plans	Marine pollution is a threat identified for the Australian lesser noddy, Abbott's booby, red knot, curlew sandpiper, great knot, greater sand plover, lessor sand plover, Nunivak bar-tailed godwit, Northern Siberian bar-tailed godwit and eastern curlew. In general, population monitoring is the suggested action to deal with marine pollution. Table 7.60 of the PDSA EP (here) outlines the potential risks of an MDO spill to these species. The conservation advice and management plans for blue, humpback, sei and fin whales identify hydrocarbon spill as threats, though there are no specific aims to address this. Table 7.58 outlines the potential risks of an MDO spill to these species. The WCP for seabirds (2020) identifies acute pollution (oil spills) as a moderate threat to seabirds. The EPS outlined within this table mitigate the chance of an oil spill, and therefore, reduce the probability of acute pollution impacts on seabirds.
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Statement of acceptability	EOG considers the risk of an MDO release to be acceptable because: • It will adhere to the company's Safety & Environmental Policy; • The residual risk ratings are negligible; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the design of the survey; • Relevant legislation and industry best practice will be complied with; • An MDO release will not have long-term or significant impacts on MNES; • The management of an MDO release is not inconsistent with the aims of recovery plans/conservation plans/advice that are in force for EPBC Act-listed threatened and migratory species; • The management of an MDO release is not inconsistent with the aims of relevant marine reserve management plans; and • The management of an MDO release is not inconsistent with ESD principles.	
Environmental Monitoring		
• As per the OPEP and OSMP.		
Record Keeping		

• Vessel assurance reports. • Notices to Mariners. • Stakeholder consultation records. • SMPEPs. • OPEP. • ERP.	• Crew training records. • Bunkering procedure. • Bunkering PTWs, JSAs, inspection checklists. • Oil spill response exercise records. • Inspection/audit reports. • Incident reports.

8.7 RISK 7 – Loss of Well Control and Major Oil Spill

8.7.1 Hazard

A LoWC may occur in the highly unlikely event of all barriers on the well failing, which could result in a large-scale oil spill. As outlined in Section 2.10, the most credible worst-case release of light crude oil (using Jabiru crude as an analogue) is for an average daily release of 10,219 m^3 over 77 days (the maximum time required to source a MODU, drill a relief well and kill the well). This would result in a maximum worst-case spill volume of approximately 786,794 m^3.

Based on data from the Gulf of Mexico, UK and Norway from 1980-2004, it was estimated that for wells with a BOP installed, including shear rams and following the two-barrier principle, the frequency of a blowout was 3.1 x 10^{-4} (0.00031, or 0.031%) per exploration well drilled (OGP, 2010 in DNV, 2011).

In this section, the risk assessment is based on a worst-case scenario assuming that the flow of oil has not stopped until day 77 and in the absence of spill response measures. Oil spill response actions that would reduce the impact in the event of a spill are discussed in Section 8.8.

8.7.2 Potential Environmental Risks, EMBA and Evaluation of Environmental Risks

In line with OPGGS(E) Regulation 56 and Section 2.6 of NOPSEMA's *Environment Plan content requirement guidance note*, EOG refers the reader to Sections 8.7.2, 8.7.3, 8.7.4 and 8.7.5 of its Beehive-1 drilling EP (996161-2022-Beehive#1-Drilling-EP-Rev6, available here) that describes the potential environmental risks, EMBA and evaluation of environmental risks for a LoWC.

This LoWC EMBA created for the Beehive-1 drilling EP, also applies to any individual well in the multi-well activity area – there is no change in the assumptions used in the OSTM, as outlined in Section 2.10 of this EP. The Beehive-1 drilling location is located within the multi-well activity area. As such, the ERA in this section remains the same as that for the Beehive-1 drilling EP.

8.7.3 Risk Assessment

Table 8.20 presents the risk assessment for a LoWC. This is the same as that presented in the Beehive-1 drilling EP, but is included here for completeness.

Table 8.20. Risk assessment for a LoWC

Summary	
Summary of risks	Widespread and temporary reduction in water quality. Sub-lethal to lethal toxicity impacts to marine life. Temporary fisheries closures.
Extent of risks	The spill EMBA is presented in Figure 11.1 in **Appendix 11**.
Duration of risks	Days, weeks or months, depending on the location, level of contact and receptor.
Level of certainty of risks	HIGH – the environmental impacts of spilled hydrocarbons are well understood.

Risk decision framework context	Decision type	B – new to the organisation or geographical area.
	Activity	Infrequent activity.
	Risk & uncertainty	Risks amenable to assessment using well-established data and methods. Some uncertainty.
	Stakeholder influence	Pressure groups likely to object, significant media interest.
Defined acceptable level	No LoWC that results in a crude oil spill.	

Risk Assessment (inherent)			
Receptor	Consequence	Likelihood	Risk rating
Benthic fauna	Severe	Rare	High
Macroalgae & seagrass	Severe	Rare	High
Coral	Severe	Rare	High
Mangroves & saltmarshes	Severe	Rare	High
Sandy beaches	Severe	Rare	High
Rocky shores	Moderate	Rare	Low
Tidal flats	Moderate	Rare	Low
Plankton	Moderate	Rare	Low
Fish	Moderate	Rare	Low
Marine mammals	Severe	Rare	High
Marine reptiles	Severe	Rare	High
Seabirds & shorebirds	Severe	Rare	High
Commercial fisheries	Minor to Severe	Rare	Negligible to High
Protected areas	Negligible to Severe	Rare	Negligible to High
Aboriginal cultural heritage values and sensitivities	Moderate	Rare	Low

Assessment of Proposed Control Measures			
Control measure	Control type	Adopt	Justification
PDSA investigation results are used to inform MODU positioning to avoid shallow gas hazards **(RSK-07: EPS-01)**.	Engineering	Yes	**EB:** Avoiding gas pockets and ensuring the stability of the MODU while drilling minimises the risk of an unplanned hydrocarbon release. **C:** Significant cost (millions of dollars). **Ev:** The significant costs are outweighed by the benefits of not drilling through a gas pocket and avoiding a significant release of gas.

BOP is fitted and tested **(RSK-07: EPS-02, -03, -04)**.	Engineering	Yes	**EB:** Fitting a BOP and ensures its correct functioning reduces the likelihood of a spill resulting from a LoWC. **C:** BOPs are available with every MODU, and the cost of their supply and maintenance is built into MODU day rates, which are significant (up to $1 million per day). **Ev:** Having a BOP fitted is best practice and required as part of the Safety Case regime. The environmental benefits outweigh the significant costs.
Pre-campaign MODU assurance inspection **(RSK-07: EPS-05)**.	Engineering & Administrative	Yes	**EB:** Ensures that the physical status of the MODU, along with the systems and processes that govern its day-to-day operations, are suitable for this drilling program, and therefore minimises the likelihood of a LoWC. **C:** Moderate costs. **Ev:** It is best practice to conduct an independent review of the physical status of the MODU and its operating systems. The cost of doing so is outweighed by the environmental benefits.
WCMP **(RSK-07: EPS-06, -07, -08)**.	Engineering & Administrative	Yes	**EB:** Considering all engineering and safety risks when drilling a well through the development of, continuous updates and training in detailed plans available for each stage of well design ensures best practice engineering design is achieved and minimises the risk of a LoWC. **C:** High cost of developing and continuously refining this system. **Ev:** It is best practice to have in place a management system to consider and plan for risks. The high costs are outweighed by environmental benefits.
Maintain a second MODU on standby for the purpose of drilling a relief well.	Engineering & Administrative	No	**EB:** Would reduce the mobilisation time for drilling a relief well, thereby minimising the volume of crude spilled to the sea. **C:** Significant, likely up to $1 million per day. Would also require an in-force Safety Case/SCR, which could cost several hundred thousand dollars more to prepare. **Ev:** With all other control measures in place, the significant cost of this measure is grossly disproportionate to the low risk of a LoWC.
Maintain support vessels on standby for the	Engineering & Administrative	No	**EB:** Would reduce the mobilisation time for deploying spill response equipment, thereby

purpose of responding to a LoWC.			potentially minimising the impacts of spilled crude oil. **C:** Significant, likely several hundred thousand dollars per day. **Ev:** With all other control measures in place, the significant cost of this measure is grossly disproportionate to the low risk of a LoWC.
Time drilling to avoid the cyclone season (start November to end April).	Administrative	No	**EB:** Avoiding the cyclone season minimises the risk of having to quickly de-man the MODU in the event of a cyclone and minimises the risk of unintentionally leaving the well in an unsafe safe (and potentially prone to a LoWC). **C:** Removes 6 months of the year from the drilling schedule, meaning that securing access to a MODU would be extremely difficult. **Ev:** Drilling throughout the cyclone season in northwest Australia has taken place for decades, with well-established and tested de-manning practices in place. The high costs associated with not being able to drill the well to schedule are not commensurate with the low risks of securing the MODU and de-manning in the event of a cyclone.
Accepted Safety Case, SCR and WOMP are in place **(RSK-07:EPS-07)**.	Administrative	Yes	**EB:** Ensures titleholder has plans in place to safely operate the MODU and drill the well, thereby minimising the risk of a LoWC. **C:** Moderate costs involved in preparing documents through to acceptance. **Ev:** It is a regulatory requirement to have these documents in place. The moderate costs are outweighed by environmental benefits in terms of minimising the risk of a LoWC.
International Alliance for Well Control (IAWC)/IADC WellCap training **(RSK-07:EPS-09)**.	Administrative	Yes	**EB:** Ensures that the Drilling Superintendent and DSV are equipped to properly respond to a well kick and LoWC, which may reduce the volume of oil lost to the sea through an efficient technical response. **C:** Moderate cost to undertake initial and refresher training. **Ev:** Moderate costs are outweighed by environmental benefits in the event of a spill.
Accepted OPEP is in place **(RSK-07:EPS-10)**.	Administrative	Yes	**EB:** Ensures titleholder has considered risks and planned for a response, which may reduce impacts to marine fauna and sensitive shoreline habitats.

			C: Significant cost to prepare plan and put in place agreements and contracts with suppliers. **Ev:** It is a regulatory requirement to have this document in place. High costs are outweighed by environmental benefits in the event of a spill.
The SCERP (including the RWP) is in place and reviewed regularly **(RSK-07:EPS-11)**	Administrative	Yes	**EB:** The pre-drilling identification of MODUs in the region suitable as drilling a relief well, and mobilisation planning, will aid in a prompt response to drilling a relief well in the event of a LoWC. This is considered industry best practice. **C:** Low cost involved in preparing RWP. **Ev:** The low cost of preparing the RWP is outweighed by the environmental benefits.
All DIMT positions have undertaken relevant spill response training (e.g., IMO II or III) **(RSK-07:EPS-12).**	Administrative	Yes	**EB:** Spill response trained ensures a response is smoother than it otherwise would be, with potential benefits in reducing the volume of oil lost and/or the volume of oil recovered. **C:** Moderate, depending on the number of personal requiring training. **Ev:** There is significant benefit in personnel being trained and practiced in their responsibilities in the event of a LoWC. The cost is outweighed by the environmental benefits.
Mutual aid agreement (MAA) is in place for access to other MODUs **(RSK-07:EPS-13)**.	Administrative	Yes	**EB:** Access to other MODUs operating in the region reduces the response time with regards to drilling a relief well, in turn potentially reducing the volume of oil released to the ocean. **C:** High costs of AEP membership and cost of time in negotiating access to the MAA. **Ev:** The high costs are outweighed by the environmental benefits.
Agreement(s) in place with well blowout engineering expertise **(RSK-07:EPS-18)**.	Administrative	Yes	**EB:** Access to well blowout expertise (e.g., WWC) reduces the response time with regards to killing the well, in turn potentially reducing the volume of oil released to the ocean. This is considered industry best practice. **C:** Moderate costs of putting agreement in place and maintaining access. **Ev:** The high costs are outweighed by the environmental benefits.
Agreement(s) are in place with spill response	Administrative	Yes	**EB:** Access to organisations such as AMOSC and OSRL ensure that there is access to

organisations **(RSK-07:EPS-17, -18)**.			expert spill response preparedness advice during the planning phase and advise and response in the event of a LoWC. This may reduce the volume of oil released to the ocean and maximise the volume of oil recovered. This is considered industry best practice **C:** Significant costs of initial membership and maintaining access (hundreds of thousands to millions of dollars). **Ev:** The significant costs are outweighed by the environmental benefits.
Agreement(s) are in place with OSMP service provider(s) **(RSK-07:EPS-20)**.	Administrative	Yes	**EB:** Access to organisations that can implement OSMP studies quickly and to a high standard allows impacts to be quantified, in turn informing spill response activities. **C:** Significant costs of initial membership and maintaining access (hundreds of thousands to millions of dollars). **Ev:** The moderate costs are outweighed by the environmental benefits and is considered industry best practice in Australia.
Accepted OSMP **(RSK-07:EPS-20)**.	Administrative	Yes	**EB:** Ensures titleholder has considered plans to monitor impacted areas, which will inform future response efforts. **C:** Significant cost to prepare plan and put in place agreements and contracts with suppliers. **Ev:** It is a regulatory requirement to have this document in place. High costs are outweighed by environmental benefits in the event of a spill.
Compensate for economic loss due to a spill associated with a LoWC **(RSK-7:EPS-21)** [same as **IMP-02:EPS-04**].	Administrative	Yes	**EB:** Affected third-party marine users are compensated for any economic loss due to a LoWC, thereby mitigating the potential socio-economic consequences. **C:** Minor costs to prepare the procedure and administer the claims process. Potentially significant costs for a claim or claims. **Ev:** The principal of the control measure is to ensure that other marine users are no worse off as a result of drilling so that all parties maintain their rights to access the ocean. The benefits outweigh the high costs of potential claims.

Environmental Controls and Performance Measurement		
EPO	EPS	Measurement criteria

Preparedness		
No LoWC will occur for the duration of the activity.	**(RSK-07:EPS-01)** The results of the PDSA investigations are used to avoid shallow gas hazards and to determine the location for a relief well.	MODU station records verify that it is pinned on location that avoid hazards identified in the PDSA reports.
	(RSK-07:EPS-02) A functional and reliable BOP is installed on top of the surface casing that meets the requirements of API Standard 53 (Blowout Prevention Equipment Systems for Drilling Wells).	DDRs confirm BOP is fitted. Survey report confirms that the BOP meets the standard.
	(RSK-07:EPS-03) The BOP is routinely function and pressure tested in accordance with the manufacturer's specification and in alignment with the MODU contractor's PMS.	BOP function and pressure tests are available.
	(RSK-07:EPS-04) The BOP is pressure tested (high and low) prior to deployment, upon initial latch-up with the wellhead and every 21 days in accordance with API Standard 53. The BOP is function tested every 7 days.	BOP testing records confirm testing is performed to schedule.
	(RSK-07:EPS-05) EOG will arrange for an independent pre-campaign assurance check of the MODU, including the BOP system.	Independent assurance report is available and confirms the BOP system is functional.
	(RSK-07:EPS-06) The Beehive-1 well is designed in accordance with the WCMP (as endorsed by EOG) to ensure that the well is designed in accordance with all required codes of practice and industry standards.	EOG's review of the well design verifies that the WCMP has been adhered to.
	(RSK-07:EPS-08) The DSV ensures that well kick drills are undertaken during the campaign in accordance with the MODU contractor's schedule.	DDRs confirm that well kick drills are undertaken.
	(RSK-07:EPS-09) The DSV and Drilling Superintendent are trained and qualified to International Well Control Forum (IWCF)/IADC WellCap well control standards so that well control emergencies are efficiently and properly managed.	Training records and certificates confirm these personnel are qualified and trained in well control.
EOG maintains preparedness to respond to a LoWC.	**(RSK-07:EPS-10)** A Beehive OPEP and ERP are in place and prior to the activity commencing, a desktop LoWC and spill	Oil spill response exercise report verifies that an LoWC desktop exercise was undertaken.

	response exercise is conducted to test the DIMT functions.	
	(RSK-07:EPS-11) The RWP is developed consistent with the *Source Control Emergency Response Planning Guide for Subsea Wells*, Report 594 (IOGP/IPIECA, 2019) at least 3 months prior to the start of drilling.	RWP is place prior to the start of drilling.
	(RSK-07:EPS-12) All DIMT roles have undertaken the necessary external training to fulfil their roles.	Training records verify that all DIMT roles have undertaken the necessary training (e.g., IMO II or III).
	(RSK-07:EPS-13) MAA is in place to provide access to other MODUs operating in Australia to reduce mobilisation time.	AEP MAA MoU signed by EOG prior to the start of drilling.
	(RSK-07:EPS-14) Agreement(s) are in place with well blowout engineering expertise (e.g., WWC) prior to the start of drilling.	Agreement(s) with WWC are in place prior to the start of drilling.
	(RSK-07:EPS-15) Agreement(s) will be in place with oil spill response organisations (AMOSC & OSRL) prior to the start of drilling.	Agreements with AMOSC and OSRL are in place prior to the start of drilling.
	(RSK-07:EPS-16) Agreement(s) will be in place with OSMP service provider(s) prior to the start of drilling.	Agreement with OSM provider is in place prior to the start of drilling.
Emergency response		
The DIMT responds in accordance with the OPEP, ERP and their training.	**(RSK-07:EPS-17)** The DIMT will be activated and support resources (such as AMOSC and OSRL) will be mobilised to implement the OPEP and ERP.	DDRs and incident investigation reports verify that the OPEP and ERP were implemented.
	(RSK-07:EPS-18) The RWP will be implemented to stop the LoWC within 77 days.	DDRs and incident investigation reports verify that the RWP was implemented.
Recording & reporting		
Regulatory authorities are promptly made of aware of a spill.	**(RSK-07:EPS-19)** EOG will report a spill associated with a LoWC to regulatory authorities within 2 hours of becoming aware of the incident.	Incident report verifies that contact with regulatory agencies was made within 2 hours.
Monitoring		
Characterise environmental impacts of a LoWC spill.	**(RSK-07:EPS-20)** EOG will undertake operational and scientific monitoring in accordance with the OSMP.	Daily operations reports and overall study reports verify that the OSMP was implemented.

Compensation		
Compensate for economic loss due to a spill associated with a LoWC.	As per **IMP-02:EPS-04** and **IMP-02:EPS-05.**	As per **IMP-02:EPS-04** and **IMP-02:EPS-05.**

Risk Assessment (residual)			
Receptor	Consequence	Likelihood	Risk rating
Benthic fauna	Severe	Remote	Medium
Macroalgae & seagrass	Severe	Remote	Medium
Coral	Severe	Remote	Medium
Mangroves & saltmarshes	Severe	Remote	Medium
Sandy beaches	Severe	Remote	Medium
Rocky shores	Moderate	Remote	Low
Tidal flats	Moderate	Remote	Low
Plankton	Moderate	Remote	Low
Fish	Moderate	Remote	Low
Marine mammals	Severe	Remote	Medium
Marine reptiles	Severe	Remote	Medium
Seabirds & shorebirds	Severe	Remote	Medium
Commercial fisheries	Minor to Severe	Remote	Negligible to Medium
Protected areas	Negligible to Severe	Remote	Negligible to Medium
Aboriginal cultural heritage values and sensitivities	Moderate	Remote	Low
The reasons for the LoWC risk ratings are outlined in the previous tables corresponding to each faunal group or habitat type or socio-economic sensitivity.			
Demonstration of ALARP			
The 'medium' residual risk ratings are considered to be intolerable and higher order risks. However, the adopted control measures and associated EPS cannot lower the risk ratings any lower. Engineering risk assessments including BOP risk assessments, well integrity risk assessments and the precautionary principle have been factored into the control measures.			
Demonstration of Acceptability			
Policy compliance	EOG's Safety and Environmental Policy objectives are met.		
EMS compliance	Chapter 10 describes the EP implementation strategy to be employed for this activity.		
Risk matrix standard compliance	The residual risk for each receptor ranges from negligible to medium.		

External context	No objections or claims have been raised by relevant persons regarding a large-scale hydrocarbon spill resulting from drilling. This being said, the control measures within this table incorporate the concerns expressed by relevant persons during the Beehive-1 consultation process (from the WA DoT, WAFIC, Seadragon Project, BAC and CCWA).	

Legislative context	The EPS align with the requirements of:
	• OPGGS Act 2006 (Cth):
	  ○ Section 572A-F (Polluter pays for escape of petroleum).
	• OPGGS(E):
	  ○ Part 3 (Incidents, reports and records).
	• *Protection of the Sea (Prevention of Pollution by Ships) Act* 1983 (Cth):
	  ○ Section 9 (Prohibition of discharge of oil or oily mixture to sea).
	  ○ Section 11A (SOPEP).
	  ○ AMSA Marine Orders Part 91 (Marine pollution prevention – oil).	

Industry practice	The consideration and alignment of EPS with the mitigation measures in the below-listed codes of practice and guidelines demonstrates that BPEM will be implemented in this activity	
	Environmental management in the upstream oil and gas industry (IOGP-IPIECA, 2020)	The EPS developed for this activity are in line with the management measures listed for major spills from exploration facilities in Section 4.7.4 of the guidelines: • Well design undertaken in accordance with industry best practice **(RSK-07: EPS-06 to -013)**. • OSTM undertaken to determine potential impacts to the surrounding environment (**part of ERA)**. • Blowout prevention measures to focus on maintaining wellbore hydrostatic pressure **(RSK-07: EPS-02 to -05)**. • Well integrity testing to be performed **(RSK-07: EPS-07 to -011)**. • RWP in place to regain control of the well if there is a loss of integrity **(RSK-07: EPS-07, -015)**.
	Best Available Techniques Guidance Document on Upstream Hydrocarbon Exploration and Production (European Commission, 2019)	The EPS developed for this activity are in line with the management measures listed for well blowouts in Section 18.2 of the guidelines: • Have in place a spill contingency plan **(RSK-07: EPS-014 to -020)**. • Primary and secondary well control **(RSK-07: EPS-02, -03, -04, -05, -11)**. • Well monitoring **(RSK-07: EPS-08, -09, -10, -11)**. • Relief well planning **(RSK-07: EPS-015)**.
	Health, Safety and Environmental Case Guidelines for Mobile Offshore	The EPS developed for this activity are in line with Section 2.3.12 of the guidelines (drilling and well control operations), which specify that:

	Drilling Units (IADC, 2015)	• Personnel involved in the operations are competent **(RSK-07: EPS-013, -016)**. • Drilling and well control procedures are in place to shut-in and abandon the well **(RSK-07: EPS-07)**.
	Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development (World Bank Group, 2015)	The EPS developed for this activity are in line with the following parts of the guidelines: • Section 75 (Spills): Conducting a spill risk assessment, implementing personnel training and field exercises, ensuring spill response equipment is available **(RSK-07: EPS-015 to -019)**. • Sections 76-79 (Spill response planning): A spill response plan should be prepared **(RSK-07: EPS-014, -015)**. • Section 115 (Well blowout). Blowout prevention measures should focus on maintaining wellbore hydrostatic pressure by effectively estimating formation fluid pressures and the strength of subsurface formation **(RSK-07: EPS-09)**. • Section 116 (Well blowout). A BOP system should be installed that can be closed rapidly. It should be tested at regular intervals (at least every 14 days) **(RSK-07: EPS-02, -03, -04)**. • Section 118 (Well blowout). Contingency plans should be prepared for well operations **(RSK-07: EPS-014, -015, -024)**. • Section 119 (Well blowout). A dedicated blowout risk analysis and emergency plan should be prepared, detailing the measures in place to prevent a blowout, the provisions for well control in a blowout scenario and the time necessary for intervention **(RSK-07: EPS-015)**.
	AEP CoEP (APPEA 2008)	The EPS for this activity meet the code's following objectives for offshore geophysical surveys: • To reduce the risk of damage and cross-flow between fluid strata to ALARP and an acceptable level.
Environmental context	MNES	
	AMPs	As per Table 8.36.
	Ramsar wetlands	As per Table 8.36.
	TECs	As per Table 8.36.
	Nationally threatened and migratory species	As per Tables 8.31 to Table 8.34.
	Other matters	
	KEFs	As per Table 8.36.

	NIWs	As per Table 8.36.
	State marine parks	As per Table 8.36.
	Species Conservation Advice/ Recovery Plans/ Threat Abatement Plans	Marine pollution is a threat identified for many fish, marine mammal, turtle and bird species. In general, population monitoring is the suggested action to deal with marine pollution. The Beehive OSMP addresses this. The WCP for seabirds (2020) identifies acute pollution (oil spills) as a moderate threat to seabirds. The EPS outlined within this table mitigate the chance of an oil spill, and therefore, reduce the probability of acute pollution impacts on seabirds.
ESD principles	The EIA presented throughout this EP demonstrates that ESD principles (a), (b), (c) and (d) are met (noting that principle (e) is not relevant).	
Statement of acceptability	EOG considers the risk of a spill resulting from a LoWC to be acceptable as: • It will adhere to the company's Safety and Environmental Policy; • The residual risk ratings are as low as can be achieved; • An Implementation Strategy (described in Chapter 10) is in place to ensure the EPS are achieved. • Input from engagement with relevant persons has been considered and incorporated into the risk assessment; • Relevant legislation and industry best practice will be complied with; • A spill is not predicted to have long-term or significant impacts on MNES; • The management of a spill is not inconsistent with the aims of recovery plans/conservation plans/advice that are in force for EPBC Act-listed threatened and migratory species; • The management of a spill is not inconsistent with the aims of relevant marine reserve management plans; and • The management of a spill is not inconsistent with ESD principles.	
Environmental Monitoring		
• As per the OPEP and OSMP.		
Record Keeping		
• PDSA data reports. • AEP MoU. • Agreements with service providers. • Emergency response exercise reports. • DDRs. • BOP installation and testing reports.	• BOP IAT Part 2 report. • Crew training records and certificates. • WCMP review. • DIMT training records. • Incident reports.	