Santos

Spar Halyard Infill Project Environment Plan

Information for Relevant Persons

Activity Overview

Santos is planning to drill a development well, called Halyard 2, in Commonwealth waters commencing at the earliest in Q2 2024. Installation and pre-commissioning activities will also be undertaken to support future production through Santos' Varanus Island facilities.

The Operational Area for the Halyard 2 well is approximately 45 km from the nearest coastline (Barrow Island), and approximately 114 km north of Onslow, Western Australia (see **Figure 1**).

The expected durations are 50 days to drill and complete the well and 25 days for the installation and pre-commisioning activities.

The expected duration is a forecast and is subject to change based on vessel availability, adverse weather conditions or technical/equipment issues that may arise during operations.

Consultation & Feedback

All petroleum activities in Commonwealth waters must have an Environment Plan (EP) accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before any activities can take place.

Under Commonwealth Environmental Regulations, Santos is required to consult with relevant persons about proposed activities when preparing an EP. A relevant person includes authorities, persons or organisations whose functions, interests or activities may be affected by the proposed activity.

You might be a relevant person if, for example, you have spiritual or cultural connections to land and sea country in accordance with Indigenous tradition that might be affected by our activity, if you otherwise carry out recreational or commercial fishing, tourism or other activities that might be affected by our proposed activity, or if you are part of a local community that might be affected by our proposed activity.

Santos is now consulting with relevant persons for activities proposed to be managed under an addendum to the Varanus Island Hub Operations Environment Plan. If you consider you may be a relevant person, please contact us as soon as possible if you require any further information or if you think you are not on our consultation list.

We are asking for relevant persons to provide feedback by **26 July 2023**.

Details on how to contact us are included in the **Providing Feedback** section of this information sheet.

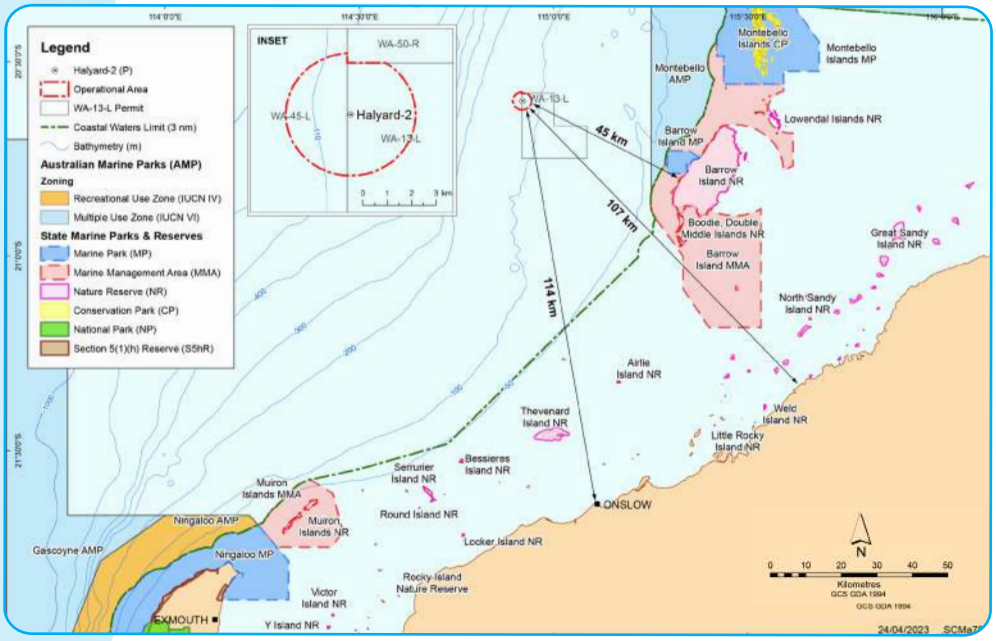

Figure 1. Spar Halyard activity location.

Activity Description

ACTIVITY DETAILS	
Location	Approximately 114 km north of Onslow, Western Australia.
Timing	The activity may occur any time between Q1 2024 and the end of 2025.
Duration	Expected duration of 75 days, comprising: + Drilling and completion - 50 days + Subsea installation and pre-commissioning - 25 days The expected duration is a forecast and is subject to change based on vessel availability, adverse weather conditions or technical/equipment issues that may arise during operations.
Water depth	Approximately 100 m to 130 m.
Planned activities	**Drilling (Halyard 2 well):** + Optional pre-mobilisation survey and pre-lay of moorings before moving the Semi-submersible mobile offshore drilling unit (MODU) to the operational area + Towing the MODU to the operational area and deploying moorings or connecting to pre-laid moorings + Install riser and blowout preventer (BOP) + Prepare and drill the well + Suspend well ready for commissioning **Installation (Halyard 2 well infrastructure):** + Seabed surveys (e.g., metrology, as-built survey) + Shut-in Halyard 1 well + Install subsea equipment and pressure test
Vessels	+ Semi-submersible MODU + Installation support vessel (ISV) + Up to four support vessels for activities such as anchor handling, MODU towing, transportation of equipment and consumables, bunkering etc.
Aircraft	Helicopters will be used for crew changes, critical equipment supply and emergency response. Helicopter flights will occur several times per week on average during the Spar-Halyard Infill Project.
Description of the natural environment	The Operational Area is flat and featureless, predominantly sand with a proportion of silt and clay.
Exclusion zone	A 500 m radius Petroleum Safety Zone (PSZ) exclusion zone will be in place around the MODU for the duration of the activity. The exclusion zone will remain around the well until eventual field decommissioning.
Operational Area	A 2,500 m radius Operational Area will be in place around the Halyard 2 well location during drilling activities. Other marine users are permitted to enter the Operational Area but should take care for safety reasons.
Petroleum permits	+ WA-13-L (Halyard 2 well and Operational Area) + WA-45-L (Operational Area only)

ACTIVITY COORDINATES	Latitude (GDA94)	Longitude (GDA94)
Halyard 2 Wellhead Coordinates	20° 36’ 04.06” S	114° 55’ 09.33” E

Activity Purpose and Approvals

Santos has a long history of exploration, development and operations in the Northern Carnarvon Basin, with the drilling of the Halyard 2 development well supporting potential future gas production via Santos' Varanus Island Hub facilities.

The Varanus Island Hub is the base of Santos' Western Australian energy portfolio and has been in operation since 1986. Located 75km offshore northwest Australia, Varanus Island is surrounded by a network of offshore fixed production platforms which feed gas, oil and condensate into the island's facilities for processing, storage and export to market.

Gas produced at this facility is transported via pipeline to shore for connection into the Dampier to Bunbury Natural Gas Pipeline for supply to Western Australian gas customers.

Santos will use a semi-submersible Mobile Offshore Drilling Unit (MODU) to drill the Halyard 2 well.

Semi-submersible MODUs are typically used in deeper waters where the rig floats on the ocean surface and can be moored using anchors deployed from the rig or use onboard propulsion systems to maintain the rig's position at the drilling location.

Installation of subsea infrastructure will also be undertaken to support future production to Santos' existing facilities.

An addendum to the Varanus Island Hub Operations EP is being prepared for planned activities, under which all activity impacts and risks are proposed to be managed to a level as low as reasonably practicable and acceptable over the life of the activity.

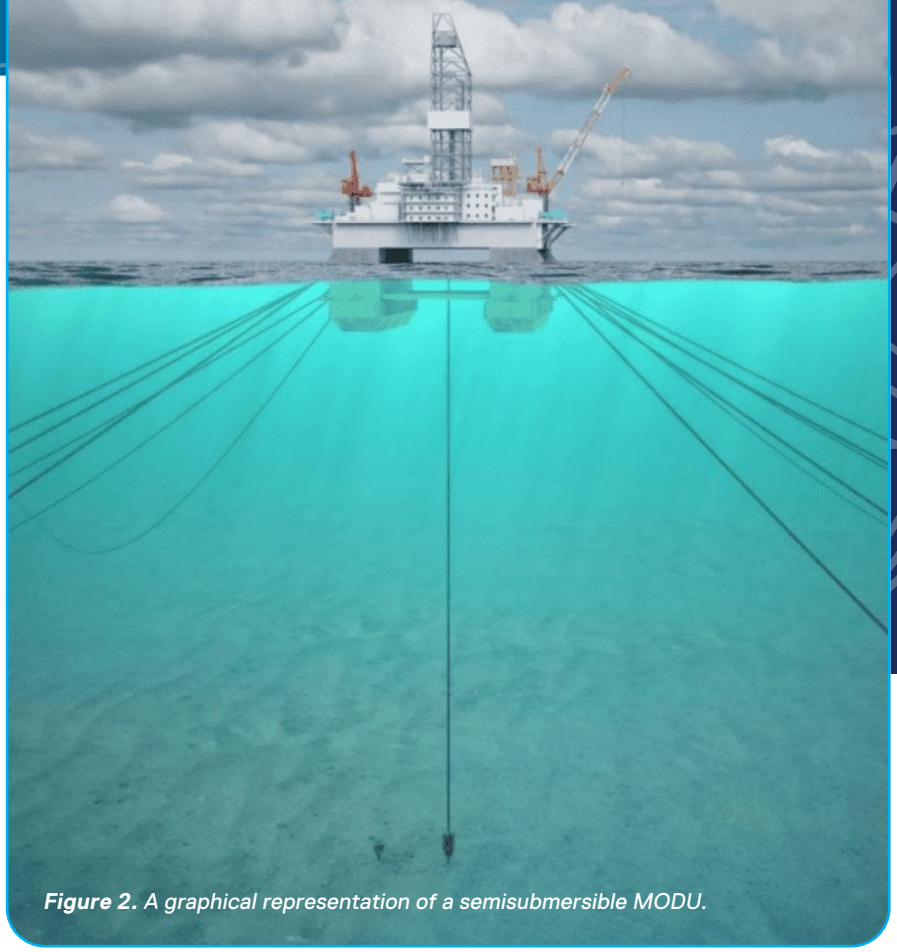

Figure 2. *A graphical representation of a semisubmersible MODU.*

The addendum to the EP will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth)*.

Santos may also undertake the activities described in the accepted Varanus Island Hub Operations EP in addition to the Spar-Halyard Infill Project activities. Santos has previously consulted with relevant persons regarding these activities, which include:

+ Operation of the John Brookes field infrastructure.
+ Operation of the Greater East Spar subsea infrastructure.
+ Operational activities, such as platform visits, inspections, maintenance and repair.
+ Associated vessel operations.
+ Eventual decommissioning of Santos' property after the end of the productive life.

Refer to the Varanus Island Hub Operations EP on NOPSEMA's website for further information.

Defining the Environment Area for Proposed Activities

Santos has undertaken an assessment to define the environmental, social, economic and cultural aspects that may be affected by proposed activities.

To do this we have considered the totality of the areas where activity impacts and risks may occur. These areas are summarised in **Table 1**. The widest extent of these areas is called the Environment that May Be Affected (EMBA), which for this activity is the outer boundary of worst-case spill resulting from a loss of well control during drilling. The EMBA for proposed drilling and installation activities is illustrated in **Figure 2**.

Oil spill EMBAs are defined by overlaying a great number (usually hundreds) of individual, computer simulated, hypothetical oil spill events into a single map. Each simulation run starts from the same location (release point) but each run will be subject to a different set of wind and weather conditions derived from historical data. The use of advanced and sophisticated models enables us to present all the areas that could be affected.

While the EMBA represents the largest possible spatial extent that could be contacted by the worst-case spill events modelled, an actual spill event is more accurately represented by a single simulation run, resulting in a smaller spatial extent in the event of an actual spill. Often one or more simulation runs are selected to be representative of the 'worst-case' based on the nature and scale of the activity and the local environment.

Please see the NOPSEMA Spill Modelling Video for more information on oil spill modelling and why it is required for the preparation of Environment Plans.

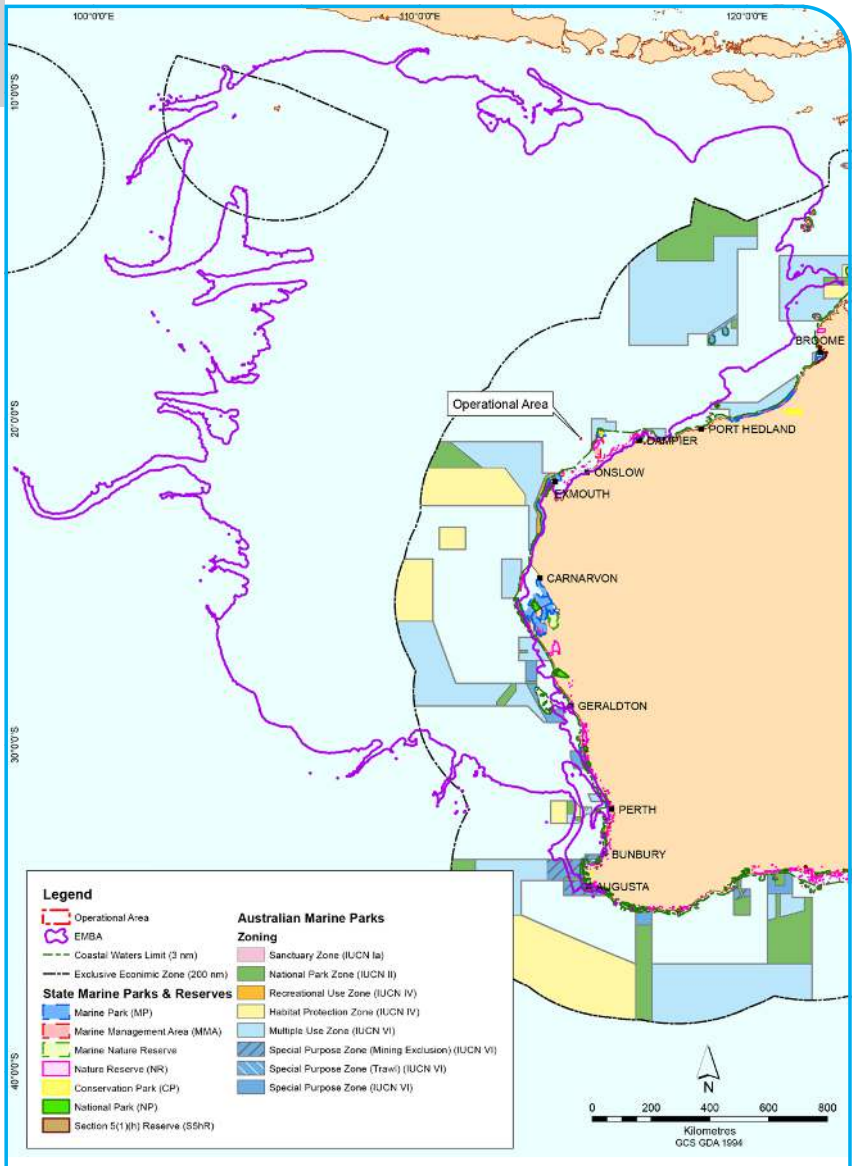

Figure 3. *Activity location map with EMBA*

TABLE 1
ENVIRONMENT AREA FOR PROPOSED ACTIVITIES

ENVIRONMENT AREA	
Operational Area	The area in which the MODU and support vessels will operate.
Environment that May Be Affected	The spatial extent of activity impacts (e.g., facility presence, light, noise) and risk (e.g., hydrocarbon spill).

Environmental, Social, Economic and Cultural Features

We have undertaken a review of publicly available information to identify environmental, social, economic and cultural features that may be affected by activity impacts and risks, which are summarised in **Table 2**. These aspects will be risk-assessed within the EP on a case-by-case basis.

TABLE 2
ENVIRONMENTAL, SOCIAL, ECONOMIC AND CULTURAL FEATURES

FEATURES	DESCRIPTION	OPERATIONAL AREA	EMBA	PUBLIC INFORMATION REVIEW
Aboriginal Heritage	Registered Aboriginal heritage sites protected under the: + *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* + *WA Aboriginal Heritage Act 2021*	No	Yes	Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef and the adjacent foreshores have a long history of occupancy by Indigenous communities.
Cultural Heritage	Registered cultural sites under the: + *Underwater Cultural Heritage Act 2018*	No	Yes	No known sites of shipwrecks, sunken aircraft or Aboriginal and Torres Strait Islander Underwater Cultural Heritage have been identified within the Operational Area. The nearest shipwreck, an unidentified probable wreck in Bandicoot Bay, is approximately 53 km southeast of the Operational Area.
Defence	Designated defence activity areas	Yes	Yes	Defence activities may take place within the Operational Area. The Operational Area is within a Defence Practice Area.
Fishing	Commercial fishing	Yes	Yes	A number of Commonwealth and State fisheries overlap the EMBA, of which some are active in the Operational Area.
	Indigenous, subsistence or customary fishing	No	Yes	Traditional Australian Indigenous fishing activities are generally concentrated within 3 NM of the Northern Territory / Western Australian coastline.
	Recreational and charter boat fishing	No	Yes	No interaction with recreational or charter boat fishers is anticipated in the Operational Area given the remoteness of the activity location. Recreational and charter boat fishing occurs within the EMBA.

Oil and Gas Operations	Petroleum operations	No	Yes	Petroleum exploration and production activities are undertaken within the EMBA. The Operational Area overlaps Santos operated infrastructure associated with the Varanus Island Hub.
Protected Areas (nearest Commonwealth and State marine parks)	Montebello Marine Park (Commonwealth)	No	Yes	The Montebello Marine Park is approximately 32 km east of the Operational Area.
	Barrow Island Marine Management Area (State)	No	Yes	The Barrow Island Marine Management Area is approximately 40 km east of the Operational Area.
Shipping	Shipping fairway	No	Yes	The Operational Area does not overlap any shipping fairways, although vessel traffic may be encountered as commercial vessels transit around Barrow Island and the Montebello Islands.
Telecommunications	Subsea telecommunications cables	No	Yes	The Darwin-Jakarta-Singapore Cable connects facilities onshore at Port Hedland, to Darwin, Christmas Island, Indonesia and Singapore and is more than 100 km north of the Operational Area.
Tourism	Tourism operations	No	Yes	Remoteness of the Operational Area and water depth limits opportunities for tourism. Tourism occurs within the EMBA.
Towns / communities	Onslow	No	Yes	Onslow is the nearest community and is approximately 114 km south of the Operational Area.
	Karratha	No	Yes	Karratha is the nearest city and is approximately 200 km southeast of the Operational Area.

Activity Impacts and Risk Management

We have summarised in **Table 3** the potential environmental impacts risks and associated management measures for the proposed activity. These aspects will be risk-assessed with the Environment Plan on a case-by-case basis.

TABLE 3
ACTIVITY IMPACT AND RISK MANAGEMENT

ACTIVITY IMPACTS (DRILLING AND INSTALLATION OF HALYARD 2 SUBSEA INFRASTRUCTURE)	
Acoustic disturbance to marine fauna	
Description of activity impacts Noise emissions from: + Flaring. + Helicopter operations. + MODU operations. + ROV operations. + Vessel operations. Elevated underwater noise has the potential to change marine fauna behaviour such as attraction, avoidance and disorientation. The sensitivity of fauna to elevated noise levels varies depending on individual response.	**Compliance with the following key management measures** + Santos procedures for interacting with marine fauna.
Atmospheric emissions	
Description of activity impacts Atmospheric emissions will result from: + MODU operations. + Vessel operations. Hydrocarbon combustion may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point during the activity. Non-GHG emissions, (NOX and SOX), can lead to a reduction in local air quality.	**Compliance with the following key management measures** + International Convention for the Prevention of Pollution from Ships (MARPOL) International Air Certificate. + Santos bulk solid transfer procedure. + Fuel oil quality compliant with MARPOL standard for fuel oil quality. + Santos Marine Assurance Standard. + MARPOL ozone-depleting substance handling procedures. + Vessel preventative maintenance systems. + Waste incineration compliant with MARPOL waste incineration standard. + Santos well test procedures.
Drilling discharges	
Description of activity impacts Drilling discharges include drilling muds, which will be water-based for this activity. Drilling discharges from the MODU will have a localised impact on water quality, sediment quality and benthic habitats.	**Compliance with the following key management measures** + Santos chemical selection procedure. + Cuttings management system. + Santos inventory control process. + Santos well test procedures.

Light emissions

Description of activity impacts

Light emissions will result from:

+ MODU operations.
+ Vessel operations.

Continuous lighting in the same location for an extended period may result in potential changes in behaviour, such as attraction, avoidance and disorientation, of marine fauna. Sources of light emissions typically used in the offshore petroleum industry are from operational lighting and flaring during well clean-up.

Compliance with the following key management measures

+ National Light Pollution Guidelines.

Operational discharges

Description of activity impacts

Planned discharges of:

+ Bilge water.
+ Boiler blowdown water.
+ Cooling water.
+ Deck drainage.
+ Desalination brine.
+ Putrescible waste.
+ Sewage and greywater.

Planned discharges associated with the activity will be small and intermittent, with volumes dependent on a range of variables. Operational discharges from vessels may create a localised and temporary reduction in marine water quality.

Compliance with the following key management measures

+ Deck cleaning and product selection.
+ Flushing spools and collections prior to disconnections.
+ Chemical management procedures.
+ Oily water treatment system compliant with MARPOL oily water treatment standard.
+ Santos product and chemical selection.
+ Sewage management compliant with MARPOL sewage management standard.
+ Santos waste management procedures.
+ Poppetted valves on subsea connections to reduce releases of fluids during flying lead and umbilical connections and disconnections.

Physical presence and interaction with other marine users

Description of activity impacts

Interaction with other marine users may occur as a result of vessel or helicopter activities. For commercial fishing licence holders, the level of interaction could lead to temporary displacement to fishing grounds. The presence of vessels could pose a navigational hazard and a collision risk.

Compliance with the following key management measures

+ Anchors are marked with surface buoys when MODU is not connected.
+ Santos marine assurance standard.
+ Maritime Notices.
+ MODU identification system.
+ Convention on the International Regulations for Preventing Collisions at Sea, 1972 /Marine Orders on navigational lighting.
+ Petroleum safety zone (exclusion zone).
+ Santos consultation activities for EP development and during the life of the EP.
+ Marine Orders on seafarer certification.
+ Support vessel on standby.

Seabed disturbance

Description of activity impacts

MODU, anchors, moorings and Halyard 2 subsea infrastructure. Seabed disturbance could result in localised removal of epifauna or decreases in the abundance and diversity of local infauna.

Compliance with the following key management measures

+ Santos vessel and MODU station keeping.
+ All equipment installed on the seabed designed such that it can be fully removed.

ACTIVITY RISKS

Accidental introduction of invasive marine species (IMS)

Description of activity risks

IMS may occur due to biofouling on vessels, discharge of high-risk ballast water and cross-contamination between vessels. IMS have the potential to cause significant loss of function for an environment or habitat.

Compliance with the following key management measures

+ Implementation of the management controls in the Santos Invasive Marine Species Management Plan.
+ International Convention on the Control of Harmful Anti-fouling Systems on Ships.

Unplanned hazardous and non-hazardous discharges

Description of activity risks

Potential release of chemicals and other non-hydrocarbon liquids may occur from:

+ MODU and support vessel operations.
+ Transferring, storing or using bulk products.
+ Mechanical failure of equipment.
+ Handling and storage spills and leaks.
+ Hose or hose connection failure or leak.
+ Lifting – dropped objects damaging liquid containers.

Liquids or chemicals released into the marine environment may lead to contamination of the water column in the vicinity of the release.

Compliance with the following key management measures

+ NOPSEMA accepted MODU safety case.
+ Oil pollution emergency plan.
+ Santos chemical selection procedure.
+ Santos Drilling and Completions Management Process.
+ Dropped object prevention procedures.
+ General chemical management procedures.
+ Hazardous chemical management procedures.
+ International Maritime Dangerous Goods Code.
+ ROV inspection and maintenance procedures.
+ Vessel preventative maintenance systems.
+ Well test procedures.

Unplanned interaction with marine fauna

Description of activity risks

Potential interaction with marine fauna may occur as a result of:

+ MODU operations.
+ Vessel operations.
+ Helicopter operations.

Marine fauna in surface waters would be most at risk from vessel collision.

Compliance with the following key management measures

+ Procedure for interacting with marine fauna.
+ Monitoring of surrounding marine environment by support vessel(s).

Unplanned hydrocarbon spill resulting from a vessel collision

Description of activity risks

A worst-case marine diesel spill for the proposed activity is a vessel collision resulting in the rupture of a fuel tank.

Compliance with the following key management measures

+ NOPSEMA accepted Oil Pollution Emergency Plan (OPEP).
+ Marine diesel fuel used for vessels.
+ MODU and support vessel spill response plans.
+ Refuelling and chemical transfer procedure.
+ Vessel Planned Maintenance System (PMS) to maintain vessel DP, engines and machinery.

Unplanned minor hydrocarbon release

Description of activity risks

A minor hydrocarbon release may occur as a result of:

+ ROV failure.
+ Loss of primary containment.
+ Pipework failure or rupture, hydraulic hose failure..
+ Lifting – dropped objects damaging diesel infrastructure.
+ The likelihood that a minor hydrocarbon release may occur is unlikely.

Compliance with the following key management measures

+ Dropped object prevention procedures.
+ Hazardous chemical management procedures.
+ Santos chemical selection procedure.
+ General chemical management procedures.
+ International Maritime Dangerous Goods Code.
+ ROV inspection and maintenance procedures.
+ NOPSEMA accepted Oil Spill Emergency Plan (OPEP).
+ Santos well test procedures.
+ MODU and support vessel(s) spill response plans.

Unplanned hydrocarbon spill resulting from a loss of well control

Description of activity risks

A worst-case credible oil spill scenario for the proposed activity is a loss of well control during drilling.

Compliance with the following key management measures

+ NOPSEMA accepted OPEP.
+ Drilling and Completions Management Process, including well integrity standards and NOPSEMA accepted Well Operations Management Plan (WOMP).
+ Isolation methodology designed and assessed by suitable qualified engineers, and isolation implemented as designed.
+ Marine assurance standard.
+ MODU and support vessel spill response plans including predrilling source control plan.

Unplanned release of solid objects

Description of activity risks

Potential release of solid objects such as:

+ Equipment and materials, such as hard hats, tools, or infrastructure parts.
+ Hazardous solid wastes, such as batteries, fluorescent tubes, and aerosol cans.
+ Non-hazardous solid wastes, such as paper and packaging.

Solid objects, equipment and other items lost at sea could lead to disturbance of benthic habitats in the area where the object has been dropped.

Key management measures

+ Bulk solid transfer procedure.
+ Santos chemical selection procedure.
+ Dropped object prevention procedures.
+ General chemical management procedures.
+ Hazardous chemical management procedures.
+ International Maritime Dangerous Goods Code.
+ Waste (Garbage) Management Plan.
+ Dropped object study to determine risk and controls.

Consultation

Consultation provides Santos with an opportunity to receive feedback from authorities, persons and organisations whose functions, interests or activities may be affected by proposed petroleum activities.

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks. Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is As Low As Reasonably Practicable (ALARP) and acceptable over the life of the activity.

Consultation also helps us to identify values and sensitivities where information is not publicly available, such as spiritual and cultural connection to land and sea country, as well as first-hand feedback on commercial and recreational fishing, tourism and local community activities and interests.

Providing feedback

If you consider you may be a relevant person, please contact us as soon as possible if you require any further information or if you think you are not on our consultation list.

We are asking for relevant persons to provide feedback by **26 July 2023**.

Feedback provided by relevant persons will be considered in an addendum to the Varanus Island Hub Operations Environment Plan (EP) and through the life of the activity. Feedback from relevant persons will be included in the EP submitted to NOPSEMA for assessment.

Please let us know if you would like your personal/organisational details or any part of your feedback to remain private and we will ensure this remains confidential to NOPSEMA.

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