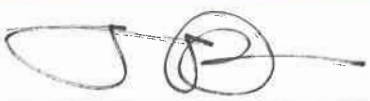
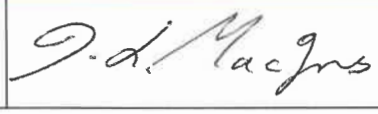
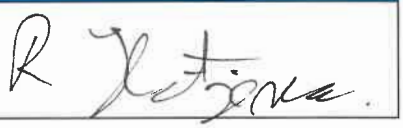
Santos Tern-1 Wellhead Abandonment Environment Plan

PROJECT / FACILITY	Tern-1
REVIEW INTERVAL (MONTHS)	No Review Required
SAFETY CRITICAL DOCUMENT	NO

Rev	Owner	Reviewer/s *Managerial / Technical / Site*	Approver
	General Manager Offshore Development	**HSE –Team Lead – Approvals**	**Production Manager – Asset Retirement**
3			

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Rev	Rev Date	Author / Editor	Amendment
A	12/06/20	Santos	Draft issued for internal review
0	02/07/20	Santos	Submission to NOPSEMA
1	19/02/21	Santos	Response to NOPSEMA RFFWI dated 10/08/20
2	1/04/21	Advisian	Response to NOPSEMA OMR dated 10/03/21
2a	10/08/21	Advisian	Response to NOPSEMA RFFWI dated 29/04/21, issued for Santos review
2b	24/08/21	Advisian	Response to NOPSEMA RFFWI dated 29/04/21, issued for Santos review
3	27/08/21	Advisian	Response to NOPSEMA RFFWI dated 29/04/21, issued for submission to NOPSEMA

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Appendices

1 Introduction

1.1 EP Summary

An Environment Plan (EP) summary has been prepared from material provided in this EP. This summarises the items listed in **Table 1-1** as required by Regulation 11(4) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS(E)R 2009).

Table 1-1: EP Summary Material Requirements

EP Summary material requirement	EP Summary material requirement
The location of the activity	Section 2.1, page 10
A description of the receiving environment	Section 3, page 25
A description of the activity	Section 2, page 10
Details of the environmental impacts and risks	Section 5, page 88
The control measures for the activity	Section 8.3.1, page 105
The arrangements for ongoing monitoring of the titleholder's environmental performance	Not applicable
Response arrangements in the oil pollution emergency plan	Not applicable
Consultation already undertaken and plans for ongoing consultation	Section 4, page 55
Details of the titleholders nominated liaison person for the activity	Section 1.3.2, page 8

1.2 Activity Overview

The Tern-1 exploration well was drilled in 1971 targeting potentially commercial gas resources. The well was plugged and abandoned in the same year, and the wellhead was left in place.

At the time of abandonment, the well was plugged using two cement plugs and the wellhead was fitted with a steel environmental cap. The abandoned wellhead was approximately 1 m in diameter and 3 m above the seabed. No other infrastructure remained above the seafloor.

This EP has been prepared to meet the requirements of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) for decommissioning.* The defined petroleum activity for this EP comprises of leaving the wellhead in-situ in perpetuity. No further operations or works are required.

The petroleum activity ends upon acceptance of the EP by National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), and on submission and acceptance of the notifications as required under Regulation 29 (end of activity) and Regulation 25A (end of EP) of the OPGGS(E)R 2009.

At process end, Santos Ltd (Santos) will have made arrangements satisfactory to NOPSEMA for leaving the wellhead (property) in-situ in perpetuity compliant to Section 270(3)(ii) of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act).

1.3 Titleholder

OPGGS(E)R 2009 Requirements
Regulation 15. Details of titleholder and liaison person
15(1) The environment plan must include the following details for the titleholder: (a) name; (b) business address; (c) telephone number (if any); (d) fax number (if any); (e) email address (if any); (f) if the titleholder is a body corporate that has an ACN (within the meaning of the *Corporations Act 2001*)—ACN. 15(2) The environment plan must also include the following details for the titleholder's nominated liaison person: name; business address; telephone number (if any); fax number (if any); email address (if any).

1.3.1 Details of Titleholder

Table 1-2 provides the titleholders and their contact details.

Additional information regarding Santos can be obtained from the Santos website at: www.santos.com.

Table 1-2: Titleholder Details for All Titles Under this EP

Title	Titleholder (Operators in bold)	ACN	Interest (%)	Address
WA-27-R	Bonaparte Gas and Oil Pty Ltd [1]	72 060 530 109	65	Business Address: Level 7, 100 St Georges Terrace, Perth, Western Australia, 6000 Telephone number: (08) 6218 7100 Fax number: (08) 6218 7200 Email address: offshore.environment.admin@santos.com
	Santos Ltd	80 007 550 923	35	Business Address: Level 7, 100 St Georges Terrace, Perth, Western Australia, 6000 Telephone number: (08) 6218 7100 Fax number: (08) 6218 7200 Email address: offshore.environment.admin@santos.com

[1]Santos holds 100% interest in this company

1.3.2 Details of Nominated Liaison Person

The nominated liaison person for the activity is as follows:

Name:	Aileen Stewart (Senior Consultation Advisor)
Business address:	Level 7, 100 St Georges Terrace, Perth WA 6000
Phone:	08 6218 7100
Email:	offshore.environment.admin@santos.com

1.3.3 Notification of Procedure in the Event of Changed Details

If there is a change in the titleholder, the titleholder's nominated liaison person or the contact details for the titleholder or liaison person, Santos will notify NOPSEMA in writing and provide the updated details.

1.4 Environmental Management Framework

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment
Description of the activity 13(4) The environment plan must: (a) describe the requirements, including legislative requirements, that apply to the activity and are relevant to the environmental management of the activity; and (b) demonstrate how those requirements will be met.
Regulation 16(a). Other information in the environment plan
The environment plan must contain the following: (a) a statement of the titleholder's corporate environmental policy;

1.4.1 Environmental Management Policy

The activities will be conducted in accordance with the Santos Environment, Health and Safety Policy presented in **APPENDIX A.**

Section 6 reflects the Santos Environmental Management Policy, detailing and evaluating impacts and risks from planned and unplanned events and providing control measures with set performance outcomes, standards, and measurement criteria to ensure environmental performance is achieved.

1.4.2 International Legislation

Australia is a signatory to numerous international conventions and agreements that obligate the Commonwealth government to prevent pollution and protect specified habitats, flora and fauna. Those that are relevant to the petroleum activity are detailed in **APPENDIX A.**

1.4.3 Commonwealth Legislation

The petroleum activity described in this EP (**Section 2**) takes place within the Commonwealth jurisdictional boundary and therefore is subject to Commonwealth legislation.

All activities conducted as part of the EP will comply with legislative requirements established under relevant Commonwealth legislation detailed in **APPENDIX B**.

A Well Operations Management Plan (WOMP) is not required for this petroleum activity under the *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011*.

1.4.4 State Legislation

As the environment that may be affected by the petroleum activity is limited to Commonwealth waters, no relevant state legislation has been identified for this EP.

2 Activity Description

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment.
Description of the activity 13(1) The environment plan must contain a comprehensive description of the activity including the following: (a) the location or locations of the activity; (b) general details of the construction and layout of any facility; (c) an outline of the operational details of the activity (for example, seismic surveys, exploration drilling or production) and proposed timetables; and (d) any additional information relevant to consideration of environmental impacts and risks of the activity. Note: An environment plan will not be capable of being accepted by the Regulator if an activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, will be undertaken in any part of a declared World Heritage property – see regulation 10A.

2.1 Location

The activity will occur in Petroleum Retention Lease WA-27-R, approximately 106 km north east of the Kimberley coast and 312 km north west of Darwin. The water depth is approximately 95 m.

The location of the wellhead is listed in **Table 2-1** and shown in **Figure 2-1**.

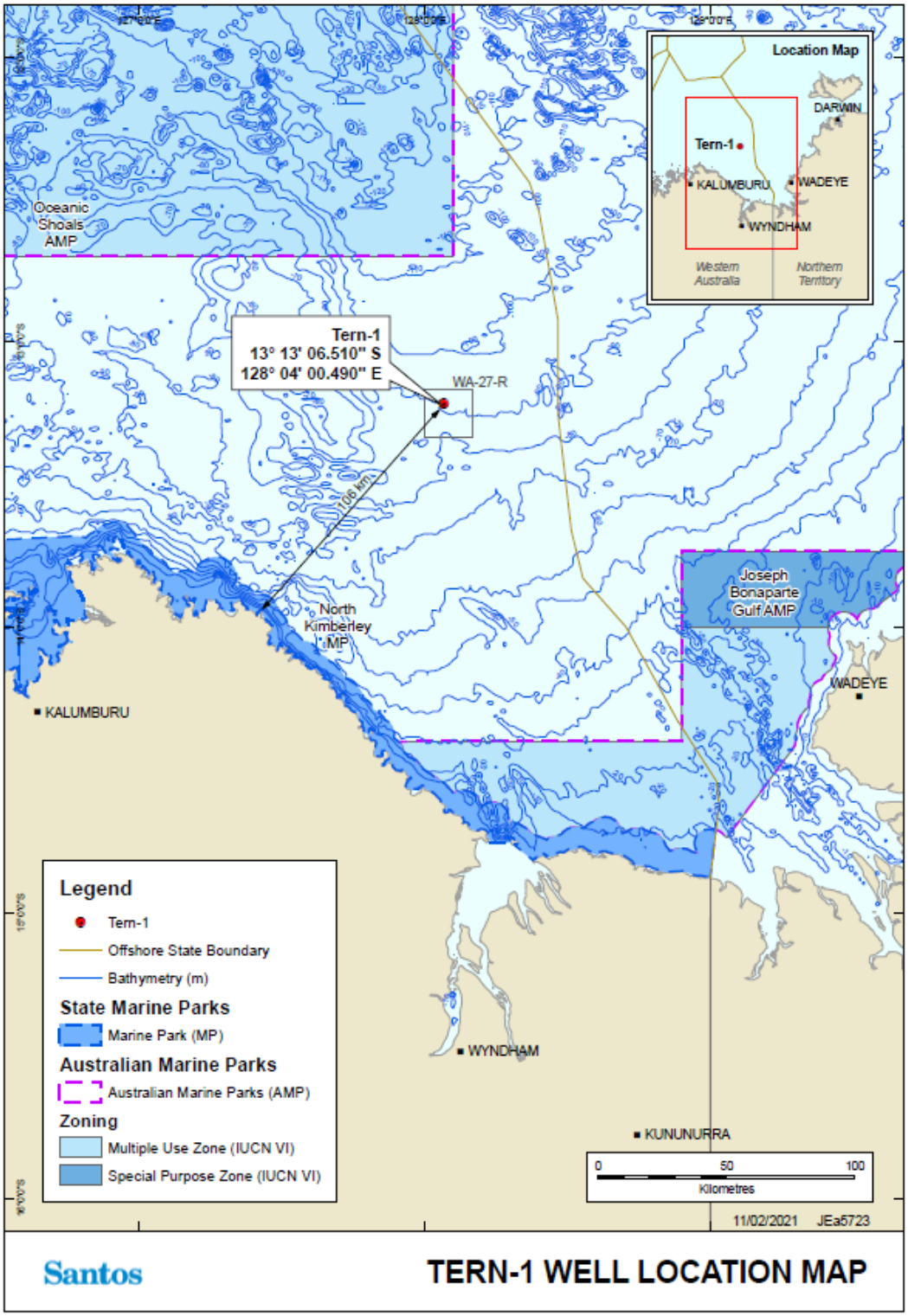


Figure 2-1: Tern-1 Wellhead Location

2.2 Operational Area

The operational area encompasses a circular area with a 500-m radius from the Tern-1 wellhead, as described, assessed, and managed by the EP. A wellhead survey conducted in November 2020 confirmed the wellhead location as per **Table 2-1**. The operational area lies within the Tern field.

Table 2-1: Tern-1 Wellhead Location

Wellhead	Title	Approx. Water Depth (m)	Coordinates (Datum/Projection: GDA 94 Zone 50)	
			Latitude	Longitude
Tern-1	WA-27-R	95	13° 13' 06.510" S	128° 04' 00.490" E

2.3 Wellhead Details

The Tern-1 wellhead was plugged and abandoned in 1971 with two cement plugs. A deep cement plug was set just above the reservoir across the cap rock. A shallow set cement plug was installed 200 m below the seabed. After the cement plugs were set, the marine riser and blow out preventer were removed, and the wellhead was left in place. The wellhead is made of steel and is approximately 1 m in diameter and 3 m above the seafloor. A wellhead corrosion cap of the same diameter as the wellhead, was installed over the wellhead.

2.4 Options Assessment

2.4.1 Overview

Section 572(3) of the OPGGS Act states that "a titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations in which the titleholder is or will be engaged and that are authorised by the permit, lease, licence or authority."

The Offshore Petroleum Decommissioning Guideline (DISER, 2018) clarifies that the Base Case is complete removal. It states that options other than complete removal may be considered if the titleholder can demonstrate that the alternative decommissioning approach delivers equal or better environmental and safety outcomes compared to complete removal, and that the approach complies with all other requirements (Department of Industry, Science, Energy and Resources 2020).

To define the petroleum activity for this EP, Santos conducted an options assessment to evaluate wellhead decommissioning options relative to the Base Case. Consistent with the Decommissioning Guidelines, the options assessment considered environmental, social and safety criteria to evaluate each decommissioning option. In accordance with the Section 572 Maintenance and Removal of Property Policy (NOPSEMA,2020), the EP must evaluate the feasibility of all options, therefore technical feasibility criteria are also considered in the options assessment.

Stakeholders were consulted on the selected option as described in **Section 4**.

The next section describes the options assessment process and the results. These results provide Santos with an understanding of the preferred decommissioning option based on how it ranks against the assessment criteria.

The preferred option is assessed against the acceptability criteria in **Section 6**. This is undertaken in accordance with **Section 5.2.7**.

2.4.2 Decommissioning Options and Screening

To develop the decommissioning options, three possible options were considered. These were:

+ Base Case - removal of the wellhead

- Option A - leave the wellhead in-situ
- Option B - install a wellhead cover or cap to reduce snagging risks to commercial trawl fishers. An options screening assessment was undertaken to determine which options would be taken forward to the decommissioning options assessment.

Option B was not taken forward as installation of a wellhead cap would reduce, but not remove, the navigational hazard posed by the wellhead and would it remain marked on nautical charts therefore installing a wellhead cap is considered to provide little benefit over the base case

The Base Case and Option A were carried forward for the options assessment. Following the options screen assessment, an additional independent study was undertaken on the base case by Add Energy on behalf of Santos to determine the technical feasibility of complete removal options for the Tern-1 wellhead. These are described **Table 2-2**.

Table 2-2: Base Case Options Summary

Base Case Option	Method	Description	Technical feasibility
Base case- Complete removal of wellhead	Option 1: External cutting above the mudline using a cutting tool such as a diamond wire saw (DWS)	External cutting: utilises cutting tools deployed from the outside of the wellhead (above the mud-line where there is access) to sever the wellhead, conductor and internal casing strings from the casing stump by cutting from the outside. This method will usually leave a stump (100 mm) protruding from the sea-floor. Conventional DWS methods and tooling have significant technical issues likely to prevent it from being a suitable option; Requires mounting to the conductor, requiring removal of the Guide Base (GB) or dredging below to allow access to the conductor below the GB. Crane deployment is not practical below the GB. Both DWS and wellhead structure require crane support during the cut.	The wellhead is located in 95 m of water, this exceeds max operating depth for air diving, consequently ROV operations required for removal. Wellhead has a GB installed which prevents direct access to the wellhead for external DWS mounting. Removal of GB would be required or dredging to access the conductor below the GB. The GB has minimal clearance above the sea-bed preventing access below the GB for any external cutting to the wellhead conductor without dredging sea-bed material from around the outside the external cut will leave stump protruding 100 mm from the mud-line. The extent of conductor cement at seabed level below GB is unknown. The cement 'porch' is likely to present a

Base Case Option	Method	Description	Technical feasibility
		A newly designed DWS tool is an alternative external cut option. This tool is more suitable for installation around the GB. However, this technology is not field proven. It has not been designed specifically for wellhead removal so may require some modification. It is bulky and difficult to handle/deploy therefore presents safety risks. As the wellhead is covered in marine growth, the condition of the wellhead and the extent of corrosion is unknown. It is anticipated that two campaigns, to remove the wellhead, would be required. These would include a cleaning and inspection campaign (which would include a determination of well bore pressure) and a subsequent removal campaign. Removal may not be feasible and would be dependent on the condition of the wellhead and extent of corrosion.	physical impediment and prevent dredging. Visibility in the region is poor due to the depth and high currents this poses a risk to effective ROV operations.
	Option 2: Internal cutting below the mudline using an internal mechanical cutter or internal abrasive water jet cutting tool	Internal cutting utilises cutting tools deployed from the inside of the wellhead (below the mudline to sever the wellhead and internal casing string from the inside of the casing stump. The severed wellhead and casing/conductor stumps (and any surrounding cement	The wellhead type is unknown therefore the high-pressure housing and upper hub interface profile in unknown. This presents a risk to getting access to the wellbore for internal cutting. Requires use of a non-heave compensated crane (or in-line

Base Case Option	Method	Description	Technical feasibility
		attached) are then pulled and recovered using the same tooling used to make the cut. This method should leave nothing protruding from the sea-floor. The wellhead removal study by Add Energy for the Tern-1 wellhead assessed a number of internal mechanical and water jet cutting options for wellhead removal. The internal abrasive water jet cutting tool provides the maximum flexibility in mounting the tool and gaining access to the well bore. As per Option 1, this removal option would require two campaigns.	compensator on the crane). The cap type and latching mechanism is also unknown, this presents a risk getting access to the wellbore for any internal cutting or pressure management options. The first of the two surveys includes a cleaning campaign to remove marine growth and to identify wellhead and temporary abandonment cap components. It may not be possible to identify the components due to the age and unknown condition of the wellhead. Visibility in the region is poor due to the depth and high currents, this poses a risk to effective ROV operations.

2.4.3 Assessment Criteria

The criteria and specific sub-criteria used for the options assessment are detailed in **Table 2-3**.

Table 2-3: **Options Assessment Criteria and Sub-criteria**

Criteria	Sub-criteria	Description
Technical Feasibility	Engineering and execution complexity	The extent to which the option requires the use of proven technology. The ability to recover from unplanned excursions and complete the planned option.
Health and Safety	Risk to personnel offshore and onshore	Health and safety risks to company-related personnel both onshore (e.g. logistics) and offshore.
	Residual risk to other marine users	Health and safety risks to marine users such as commercial vessels, fishers and members of the public.
Environment	Water quality and sediment quality	Assessment of water and sediment quality.
	Ecological services	Assessment of biodiversity and habitat changes due to the physical presence of property, and seabed disturbance because of the petroleum activity.
	Emissions	Emissions such as light, noise, air and marine discharges.
	Waste	Volume and type of waste associated with offshore operations (e.g. landfill, recyclables).
Social	Effect on commercial fisheries	Displacing commercial fisheries or affecting their catch.
	Other socio-economic effects	Effects on local communities, recreational users, commercial activities, etc.
Economic	Financial cost	Operational / capital costs to Santos.

2.4.4 Options Evaluation

The rating table used for each criterion and sub-criterion and completed options assessment is detailed in **Table 2-4** and **Table 2-5** respectively.

Table 2-4: Options Assessment Rating Template

Criteria	Sub-criteria	Most Preferred	-	Least Preferred
Technical Feasibility	Engineering and execution complexity	Scope is defined and understood. Low levels of technical risk. Methods widely used across industry.	Some uncertainty in parts of the scope and equipment used. Moderate levels of technical risk. Some examples of the method being used in industry.	Uncertainty in many areas of the scope and in equipment used. High levels of technical risk. Method not widely used across industry.
Health and Safety	Risk to personnel offshore and onshore	Low level of personnel exposure hours and/or health and safety risk.	Moderate level of personnel exposure hours and/or health and safety risk.	High level of personnel exposure hours and/or health and safety risk.
	Residual risk to other marine users	Low risk as property completely removed or remaining property presents no material health and safety risks to identified marine users.	Some property left in-place. Moderate health and safety risks to identified marine users. Risk reduction measures potentially required.	Extensive property left in place. High health and safety risks to identified marine users. Significant risk reduction measures required.
Environment	Water quality and sediment impacts	Low impact or risk to water quality and sediment quality. Potential effects short term/immediate vicinity of the property.	Moderate impact or risk to water quality and sediment quality. Potential effects medium term/local.	High impact or risk to water quality and sediment quality. Potential effects long term /extensive.
	Ecological services	Retention of hard substrate. Minimal level of seabed disturbance.	Some loss of hard substrate. Low-moderate level seabed disturbance.	Complete or significant loss of hard substrate. Moderate-high level of seabed disturbance.
	Emissions	No or low number of onshore vehicle and offshore vessel days (i.e. days).	Moderate number of onshore vehicle and offshore vessel days (i.e. weeks).	High levels of emissions. Large number of onshore vehicles and offshore vessel days (i.e. months).
	Waste	No or low levels of operational waste.	Moderate levels of operational waste.	High levels of operational waste.

Criteria	Sub-criteria	Most Preferred	-	Least Preferred
Social	Effect on commercial fisheries	Site/property will have no effect on current or future commercial fisheries. Potential benefits to commercial fishers.	Site will be available to current and future commercial fisheries, but some property will remain. Potential for low fishing gear and/or navigational risks.	Site will no longer be accessible to current and future commercial fisheries, and/or has significant fishing gear and/or navigational risks.
	Other socio-economic effects	Site/ property not expected to be of a material socio-economic concern. Potential benefits.	Site/property not expected to exclude other marine users. Potential for some socio-economic concerns.	Site/property may exclude other marine users. Potential for significant socio-economic concerns.
Economic	Financial cost1	<$300,000	<$3,000,000	>$3,000,000

[1] Costs align with the financial category of the Santos risk matrix.

Table 2-5: Options Assessment of Base Case and Option A for Management of the Tern-1 Wellhead

Criteria	Sub-criteria	Comparative Impact		Options Assessment
		Base Case – Complete removal	Option A – Leave in-situ	
Technical Feasibility	Engineering and execution complexity			Leave in-situ poses no technical risk. As the wellhead is an aging asset and the condition of the wellhead is unknown, two campaigns would be required to remove the wellhead. One campaign to remove marine growth and inspect the wellhead (which would include a determination of well bore pressure) and the other to remove the well head if feasible. The external and internal wellhead removal methods and potential risks are described in **Table 2-2**. Risk associated with removal of the wellhead by external cutting include: + The presence of a GB around the wellhead which prevents direct access to the wellhead for external DWS mounting. Removal of GB would be required or dredging to access the conductor below the GB + The extent of cement at seabed level below GB is unknown (from conductor cementing) – a cement porch is likely to prevent a physical barrier to dredging + Conventional DWS options are not possible due to technical issues such as crane deployment (not being possible to access below the GB). Due to the obstruction of the GB being present at the bottom of the well head, the only viable method for external removal of the wellhead utilises a prototype tool that has never been tested in the field and requires modification for wellhead removal. This presents a risk in term of technical feasibility. Based on the presence of the GB and the prototype tool recommended to undertake the external cut, external cutting is considered to have a high level of complexity with a low likely hood of success. Risks associated with internal cutting include: The condition of the wellhead temporary cap, internal housing, and latching mechanism are unknown which presents a risk to internal cutting operations. Based on the age of the wellheads and the uncertainty of the wellhead condition, removal by internal cutting is considered to have a high level of complexity and a low likelihood of success.

Criteria	Sub-criteria	Comparative Impact		Options Assessment
		Base Case – Complete removal	Option A – Leave in-situ	
				Considering all potential wellhead removal options have a low likelihood of success, the preference from a technical feasibility perspective is to leave the wellhead in place.
Health and Safety	Risk to personnel offshore and onshore			Leave in-situ is the preferred option as this eliminates the health and safety risks to personnel. This includes vessel mobilisation and execution, land logistics, supply base, waste disposal health and safety risks. The wellhead removal option would result in weeks of exposure hours. For these reasons, the leave in-situ option is most preferred.
	Residual risk to other marine users			Given the remote offshore location of the wellhead and the water depth of 95 m, no credible health and safety risks to marine users have been identified from leaving the wellhead in-situ. The wellhead has been in place since 1971 and no harm or events are known. The location of the well head coordinates has been communicated to relevant stakeholders. Therefore, this sub-criterion is not considered a differentiator between the two options. Refer to **Section 3.4** for detailed discussion on commercial fisheries.
Environment	Water quality and sediment impacts			As the wellhead is supported by a GB, dredging of up to 15 m3 of sediment would be required to remove the wellhead by external cutting. Up to 50 bbls of non-water-based muds would be released to the marine environment during wellhead removal. Wellhead removal would result in moderate localised impacts to water and sediment quality. If the wellhead is left in-situ it would slowly degrade overtime releasing corrosion material. The wellhead is comprised predominantly of mild steel, iron the primary component of steel (98%) is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997). All iron oxides are included on the OSPAR PLONOR list (Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment). There is the potential for 50 bbls of non-water-based muds to be released slowly to the marine environment as the wellhead degrades. The well head has been in situ for 50 years and a level of degradation will have occurred over that time.

Criteria	Sub-criteria	Comparative Impact		Options Assessment
		Base Case – Complete removal	Option A – Leave in-situ	
				Based on the low toxicity of iron, the slow release rate and rapid dilution of the open ocean environment, any impacts to sediments and water quality will be low and in the immediate vicinity of the wellhead.
	Ecological services			The leave in-situ option provides habitat for marine life around the well head structure with a potential environmental benefit. That said, any local benefit would be immaterial as the wellhead is small (1 m wide, ~3 m above the seabed). Therefore, this sub-criterion is not considered a differentiator between the two options.
	Emissions			Leave in-situ is the preferred option as there would be no emissions generated. If removed, emissions (e.g. Greenhouse Gases) would be generated by onshore vehicles and offshore vessel operations. As separate site survey and wellhead removal vessel campaigns are required, a moderate level of emissions is expected.
	Waste			Leave in-situ is preferred as there would be no waste generated. If removed a large amount of waste would be associated with wellhead disposal.
Social	Effect on commercial fisheries			There are two commercial fisheries in the vicinity of the wellhead. The Demersal Scalefish Fishery and the Northern Prawn Fishery (NPF). The ecological habitat provided by the wellhead may locally enhance fish populations, which could be of some limited benefit to the Demersal Scale fish Fishery in the area. Fishing intensity data for the NPF (**Figure 3-2**) confirms that area around the Tern-1 wellhead is currently not actively trawled. Santos engaged the Australian Maritime College (AMC) to undertake an independent study on the potential impacts of leaving the Tern-1 wellhead in-situ (AMC, 2021). The study found that fishing effort is low in vicinity of the wellhead due to the following factors: Most of the trawl effort and harvest comes from the Gulf of Carpentaria with the westernmost region (Joseph Bonaparte Gulf) of the fishery seeing much less effort (NPF25, 1994).

Criteria	Sub-criteria	Comparative Impact		Options Assessment
		Base Case – Complete removal	Option A – Leave in-situ	
				The overall number of fishing licenses has decreased in the from a peak of 290 licences in 1980 to 52 now. Weather conditions are also less favourable for prawn fishing in the Tern-1 area due to strong winds and high tides. Double rig and quad vessels operating in the NPF are designed for fishing in relatively shallow water (<50 m), due to the inside board clearance requirement, and therefore are unlikely to venture to deeper waters of the operational area (95 m). Based on the prevailing weather conditions and reduction in vessel numbers there is less capacity in the fleet for exploratory fishing, therefore remote areas such as the Joseph Bonaparte Gulf are visited less frequently. The NPF vessel fleet is also equipped with echo sounders and Geographical Positioning System (GPS) plotters which accurately shows the vessel position relative to obstacles. Trawlers use this data to trawl safely around marked seabed obstacles daily with a low risk of an interaction occurring. It is unlikely that fishing effort in the vicinity of the well head will increase in the future, it may become more focused on the Gulf of Carpentaria as larger companies acquire more of the available fishing licenses. Santos has introduced additional control measures and conducted stakeholder engagement to address initial comments raised by stakeholders no further comments have been received from stakeholders (**Section 4**). Santos notified the Australian Hydrographic Office (AHO) and the National Offshore Petroleum Titles Administrator (NOPTA) of the revised wellhead coordinates on 30 March 2021. Based on the current and future fishing effort in the area and the navigational equipment on board the NPF vessels the risk of interaction between the NPF and the wellhead is low. Although the likelihood of interaction with fisheries currently and in the future is unlikely, the base case has been conservatively selected as the preferred option as stakeholders raised comments

Criteria	Sub-criteria	Comparative Impact		Options Assessment
		Base Case – Complete removal	Option A – Leave in-situ	
				regarding the leave in-situ option. Santos responded to stakeholders as outlined in Section 4, no further comments from stakeholders have been received.
	Other socio-economic effects			Given the remote offshore location of the wellhead and the water depth, no socio-economic concerns have been identified for either option. Therefore, this sub-criterion is not considered a differentiator between the two options.
Economic	Total project cost			The technical assessment conducted by Add Energy in conjunction with Santos decommissioning engineering team estimated that wellhead removal costs would be in the range of AUD 3M to 5 M. The lower estimate of 3M considers potential cost savings by completing one of the campaigns in conjunction with future nearby petroleum activities (e.g. Tern-2 plug and abandonment). This estimate does not account for escalation in costs due to failed removal attempts. The removal cost includes two campaigns to remove the wellhead; one campaign to remove marine growth and inspect the wellhead and the other to remove the wellhead. The wellhead is located in 95 m of water, this exceeds max operating depth for air diving, consequently ROV operations required for WHD removal (saturation (SAT) diving spreads are considered high cost). Leave in-situ is preferred as it would involve no additional Santos costs. The economic cost outweighs the benefit of removal. Consistent with the Offshore Petroleum Decommissioning Guidelines, as this is not an environmental, social or safety criteria it has been coloured grey.

Note: Option analyses are coloured grey where the sub-criterion is not a measurable differentiator or not a significant influence across all the options considered, or consistent with the Offshore Petroleum Decommissioning Guidelines, it is not an environmental, social or safety criteria.

2.4.5 Results and Option Selection

The option assessment results are presented in **Table 2-5**. Option A (leave in-situ) is the preferred option in terms of technical, environmental and safety criteria. The base case (complete removal) was conservatively selected as the preferred option in terms of social criteria (effect on commercial fisheries), as there is a low snag risk associated with leaving the wellhead in situ. Santos has introduced additional control measures and conducted stakeholder engagement to address concerns raised by stakeholders (**Section 7.1**).

On this basis Option A (leave in-situ), was selected as it was the preferred option overall. The options assessment demonstrated that Option A (leave in-situ) provides a better environmental, and safety outcome compared to the Base Case (complete removal) (DISER, 2018). Santos is therefore proposing a deviation from the removal requirements of subsection 572(3) of the OPGGS Act and Option A (leave in-situ) has been defined as the petroleum activity for the purposes of this EP.

Section 6 and 7 of this EP assess complete removal (Base Case) against Option A (leave in-situ) across individual risks to demonstrate and confirm that leave in-situ is the ALARP option for decommissioning the Tern-1 wellhead.

2.5 Operational Details of the Activity

The petroleum activity is the permanent abandonment of the Tern-1 wellhead in-situ. Wellhead details are provided in **Section 2.3**. The petroleum activity involves no further property inspections or maintenance, offshore operations, or environmental monitoring.

3 Description of the Environment

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment.
Description of the environment 13(2) The environment plan must: (a) describe the existing environment that may be affected by the activity; and (b) include details of the particular relevant values and sensitivities (if any) of that environment. Note: The definition of *environment* in regulation 4 includes its social, economic and cultural features. 13(3) Without limiting paragraph (2)(b), particular relevant values and sensitivities may include any of the following: (a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act; (b) the national heritage values of a National Heritage place within the meaning of that Act; (c) the ecological character of a declared Ramsar wetland within the meaning of that Act; (d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act; (e) the presence of a listed migratory species within the meaning of that Act; (f) any values and sensitivities that exist in, or in relation to, part or all of: (i) a Commonwealth marine area within the meaning of that Act; or (ii) Commonwealth land within the meaning of that Act.

3.1 Environment that May be Affected

This section summarises the key physical, biological, socio-economic and cultural characteristics of the existing environment that may be affected by the proposed activity.

The description of the environment is limited to the operational area described in **Section 2.2** and is defined by a 500-m radius around the wellhead. As no activities are proposed, an unplanned release of hydrocarbon is not credible, therefore a broader Environment that May Be Affected (EMBA) has not been described and an Oil Pollution Environment Plan (OPEP) has not been prepared.

A desktop search of the operational area was undertaken using the DoEE Protected Matters Search Tool to identify Matters of National Environmental Significance (MNES) listed under the Environmental Protection and Biodiversity Conservation (EPBC) Act. The results of this search, undertaken on 2 April 2020, are provided in **APPENDIX C.**

A summary of the information derived from the Protected Matters Search, bioregional plans and fauna recovery plans relevant to the operational area is provided in **Section 3**.

3.2 Physical Environment

The operational area is approximately 312 km north-west of Darwin, and approximately 106 km offshore from the Western Australian coast, in 95 m water depth. Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA), Version 4.0 (DEH, 2006) IMCRA Version 4.0, the operational area occurs within the Northwest Shelf Transition IMCRA provincial bioregion, and the Bonaparte Gulf meso-scale bioregion.

3.2.1 Bathymetry and Seabed Morphology

The majority of the Northwest Shelf Transition is located on the continental shelf, with only a small area extending onto the continental slope. The bioregion is characterised by complex geomorphology, including:

- Shelves, such as the Sahul Shelf and Arafura Shelf;
- Shoals, such as Flinders–Evans Shoals
- Banks, such as Van Diemen Rise
- Terraces;
- Basins, such as the Bonaparte Basin; and
- Valleys, such as the Bonaparte Depression and Malita Shelf Valley, which provides a significant connection between the Joseph Bonaparte Gulf and the Timor Trough.

The operational area is located on one of the prominent geomorphic features of the bioregion, the Sahul Shelf (Baker *et al.* 2008). Seabed sediments are predominantly carbonate sands mostly transported by strong tidal currents and seasonal cyclones (van Andel and Veevers 1967).

The seabed within the operational area is generally smooth and flat, sloping down to the north-west with gradient less than 1:2,000 (0.03°). The seabed is punctuated by numerous isolated pockmarks up to 25 m in diameter and 0.5 m deep (ERM 2011).

3.2.2 Climate and Meteorology

The climate over the region is characterised by seasonal reversals of the prevailing winds.

During the wet season (November to April) northwest winds bring moisture from the Timor Sea and generate regular thunderstorm activity and high rainfall. During the dry season (May to October) easterly winds generated over inland Australia, result in dry and warm conditions, with little rainfall and low relative humidity.

The dry season is characterised by northeast and southeast winds ranging in speed between 5 m/s and 12 m/s (RPS 2011). In contrast, the wet season is the period of predominant northwest monsoon which is characterised by northwest and southwest winds. Tropical cyclones can develop off the northern Australian coast during the wet season which is often associated with heavy rain and strong winds, sometimes of destructive strength (RPS 2011).

Air temperatures at Point Fawcett on Bathurst Island, approximately 200 km to the northwest, are expected to be similar to those in the vicinity of the wellhead location. Mean daily maximum temperatures for this region range from 29°C to 33°C and mean daily minimum temperatures from 18°C to 26°C (RPS 2011). Relative humidity is highest between November and April and corresponds with the north-west monsoon ‘wet’ season.

3.2.3 Hydrography and Oceanography

The oceanographic environment of the Joseph Bonaparte Gulf region is dominated by diurnal and semi-diurnal tides featuring some of the largest tidal energies observed anywhere in the world, with tidal sea level ranges exceeding 8 m along the western side of the Gulf during the spring tide (CSIRO 2005). There is a well-defined spring-neap lunar cycle, with spring tides occurring two days after the new and full moon.

Superimposed on the astronomical tide are ‘meteorological’ tides resulting from changes in atmospheric pressure and strong onshore or offshore winds. Seasonal changes of mean sea level in Darwin are only ~0.15 m, and offshore the changes will be considerably less and quite insignificant (i.e. maybe ±0.05 m) (RPS 2011).

Mean monthly surface temperatures in the Joseph Bonaparte Gulf region vary between about 23°C in winter months and 33°C in summer months (RPS 2011). Monthly average sea-surface temperatures near the Petrel-1 well in the vicinity of the wellhead varied from a minimum of 26.3°C (August) to a maximum of 30.4°C (December) (RPS-APASA 2014).

3.2.4 Water Quality

Surface seawater salinities in the tropics are generally 34–35 and vary little between seasons (Middleton 1995 in Shell 2009). Modelled seawater salinity profiles in the Tern field indicated that there is little variation in salinity through the water column, monthly or seasonally with values ranging 33.9–35.5 (RPS 2011).

Surveys completed in 2010 and 2011 in the Petrel, Tern and Frigate fields showed that water quality within the Tern field is relatively pristine with results typical of nutrient poor (oligotrophic) offshore northern Australian waters (ERM 2011):

- Total petroleum hydrocarbons, BTEX (benzene, toluene, ethylbenzene, and xylenes) and polyaromatic hydrocarbons (PAH) were not detected in any samples from across all fields.
- There was no major spatial variation evident among fields, or difference in metal concentration between the surface and bottom measurements. Concentration of the metals analysed were all below their respective trigger values as defined by the Australian and New Zealand Environment Conservation Council (ANZECC/ARMCANZ 2000).
- The concentration of radionuclides (radium 226 and 228) was relatively uniform and low across all fields and depths with concentrations either below or marginally above the LOR of 0.03 Bq/L.
- The concentration of nutrients (nitrogen and phosphorous) were similar and low across all fields being below or only slightly above the laboratory LOR.
- Chlorophyll was not detected in any samples from across all fields with all samples reporting concentrations below the laboratory LOR.
- Dissolved oxygen decreased very steadily with increasing water depth through the water column.
- Total suspended solids (TSS) were largely not detected across the area during the time of sampling. The samples that did report detections, had concentrations marginally above the laboratory limit of reporting (LOR) of 5 mg/L with no differences observed between surface and bottom measurements. These data represent relatively low suspended solid values as would be expected for offshore waters in the region.

3.2.5 Sediment Quality

Sediments in the Tern field were dominated by sand, with silt and clay sized particles also present (ERM 2011). The results from sediment quality sampling from surveys completed in 2010 and 2011 are summarised below:

- Low concentrations of metals were generally reported across the Tern field including the operational area. The mean concentration of all metals was below the trigger values defined in the ANZECC guidelines (ANZECC/ARMCANZ 2000).
- TOC concentrations were similar across the field, with a mean concentration of 0.33% wt ± 0.03.
- TPH, BTEX, PAH and tributyltin was below the laboratory LOR for all samples.

3.3 Ecological Environment

3.3.1 Soft Sediment

Sediments of the Bonaparte Basin are dominated by biogenic gravels and sands, grading to muds offshore (IMCRA Technical Group, 1998).

Benthic habitat surveys in the Tern field indicated that the soft sediment seabed comprised of predominantly sand, with a proportion of silt and clay (ERM 2011).

3.3.2 Plankton

Plankton species, including both phytoplankton and zooplankton, are a key component in oceanic food chains.

3.3.2.1 Phytoplankton

Phytoplankton are autotrophic planktonic organisms living within the photic zone; and are the start of the food chain in the ocean (McClatchie *et al.* 2006).

Phytoplankton assemblages recorded across the Tern fields were characteristic of offshore tropical waters. Phytoplankton assemblages were dominated by the cyanobacteria during the 2010 wet season survey, which comprised 99.7% of identified algal cells. During 2011 dry season survey, the phytoplankton assemblage was largely dominated by the diatoms (Bacillariophyceae).

As expected, there was vertical (depth) stratification of photosynthetic biomass with light availability assumed to be a primary driver in the seasonal abundances of phytoplankton in the area (ERM 2011).

3.3.2.2 Zooplankton

Zooplankton is the faunal component of plankton, comprised of small protozoa, crustaceans (e.g. krill) and the eggs and larvae from larger animals. Zooplankton includes species that drift with the currents and also those that are motile.

Sampling during 2010 and 2011 indicated that larval fishes during both seasons were found to be dominated by the Serranidae (cods) and Lutjanidae (snappers), both of which are species of interest targeted by commercial fisheries in the region. Larval fish density also varied seasonally with the 2011 dry season recording highest densities of larval fishes in the zooplankton. This seasonal effect is consistent with the notion of an extended spawning season (and possibly planktonic larval duration) of the reef species dominating the larval fish assemblage in the study area at this time (ERM 2011).

3.3.3 Marine Invertebrates

Marine invertebrates comprise a variety of different organisms that can live in either the benthic or pelagic zone. For commercially important invertebrates, including prawn species, refer to **Section 3.4.2**.

Infauna is documented to occur in coastal waters to depths of approximately 200 m and are widely distributed through subtropical and tropical waters of Western Australia (Jones and Morgan 1994). A survey conducted in November 2010 recorded benthic infauna assemblages across the Tern field similar to the results of other studies in the bioregion in terms of the species, diversity and biomass (ERM, 2011).

A total of 18 benthic habitat sites were sampled in November 2011 with depths ranging from 85-99 m. Benthic habitat mapping found that generally the seabed composition was similar, with sparse sessile benthos except for an unidentified white colonial organism (presently recorded as a hydrozoan) across all sampled fields. Estimated percentage cover was low for octocorals and sponges (~2% for each) while the unidentified hydroid comprised between 11-30% at all sites.

3.3.4 Seabirds and Shorebirds

There are 10 seabird and shorebird species (or species habitat) classified as threatened, migratory or listed marine that may occur within the operational area (**Table 3-1**, **Section 3**). The type of presence varies between species, but is predominantly may or likely to occur, with no important behaviours (e.g., foraging, roosting, breeding) recorded within the operational area (**Table 3-1**). No Biologically Important Areas (BIAs) for any seabird or shorebird species intersects with the operational area (**Table 3-1**).

Table 3-1: Seabird and Shorebird Species or Species Habitat that May Occur in the Operational Area

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Actitis hypoluecos	Common Sandpiper	–	✓(W)	✓	MO	–	–
Anous stolidus	Common Noddy	–	✓(M)	✓	MO	–	–
Calidris acuminate	Sharp-tailed Sandpiper	–	✓(W)	✓	MO	–	–
Calidris canutus	Red Knot	E	✓(W)	✓	MO	–	Conservation Advice (TSSC 2016)
Calidris ferruginea	Curlew Sandpiper	CE	✓(W)	✓	MO	–	Conservation Advice (TSSC 2015a)
Calidris melanotos	Pectoral Sandpiper	–	✓(W)	✓	MO	–	–
Calonectris leucomelas	Streaked Shearwater	–	✓(M)	✓	LO	–	–
Fregata ariel	Lesser Frigatebird	–	✓(M)	✓	LO	–	–
Fregata minor	Greater Frigatebird	–	✓(M)	✓	MO	–	–
Numenius madagascariensis	Eastern Curlew	CE	✓(W)	✓	MO	–	Conservation Advice (TSSC 2015b)

Threatened Species:
E Endangered
CE Critically Endangered
Migratory Species:
(M) Marine
(W) Wetland
Biologically Important Area:
– No BIA Present
Type of Presence:
MO Species of species habitat may occur within area
LO Species or species habitat likely to occur within area

3.3.5 Fish

There are 10 shark and ray species (or species habitat) classified as threatened or migratory and 24 syngnathid species (or species habitat) that may occur within the operational area (**Table 3-2**). The type of presence varies between species, but is predominantly may, likely or known to occur, with no important behaviours (e.g. aggregating, breeding) recorded within the operational area (**Table 3-2**). No Biologically Important Areas (BIAs) for any fish species intersect with the operational area (**Table 3-2**).

3.3.5.1 Sharks and Rays

Narrow Sawfish

The narrow sawfish is a migratory species that may occur within the operational area (**Table 3-2**). In Australia, the narrow sawfish has been recorded from northern Western Australia, across Northern Territory, to central

Queensland; and is most common in the Gulf of Carpentaria. It is a bentho-pelagic species that inhabits estuarine, inshore and offshore waters to at least 40 m depth (and potentially up to 100 m) (IUCN 2017a). The narrow sawfish is known to form aggregations of mature females during the months of October to November

Given their preferred habitat, occurrence of this species within the operational area is considered unlikely.

Freshwater Sawfish

The freshwater sawfish is a vulnerable, migratory species that may occur within the operational area (**Table 3-2**). This sawfish is a marine/estuarine species, that spends its early years in freshwater, before predominantly occurring in rivers and estuaries as juveniles and sub-adults; large mature adults tend to occur more often in coastal and offshore waters up to 25 m depth (DSEWPaC 2012b). Breeding does occur within Australia, but not within the operational area; pupping has been recorded through the wet season. The freshwater sawfish feeds on fishes and benthic invertebrates

Given their preferred habitat, occurrence of this species within the operational area is considered unlikely.

Green Sawfish

The green sawfish is a vulnerable, migratory species that is known to occur within the operational area (**Table 3-2**). The green sawfish is a species of ray that has a historic range extending from northern Western Australia, across the Northern Territory and Queensland, down the east coast to Jervis Bay in New South Wales (DAWE 2020q). The green sawfish prefers muddy bottom habitats, and has previously been recorded in inshore marine waters, estuaries, river mouths, embankments and along sandy and muddy beaches. However, they have also been observed in offshore trawl grounds in over 70 m water depth (DAWE 2020q).

Given their preferred habitat, occurrence of this species within the operational area is considered unlikely.

Great White Shark

The great white shark is a vulnerable and migratory species that may occur within the operational area (**Table 3-2**). In Australia, the range of the great white shark is predominantly from central Queensland, around the southern coast, to northwest Western Australia (DSEWPaC 2013). The great white shark moves seasonally along the south and east Australian coasts, moving northerly along the coast during autumn and winter, and returning to southern Australian waters by early summer. The great white shark is not known to form and defend territories and is only a temporary resident in areas it inhabits (DSEWPaC 2013).

Given their predominant range and migratory pattern, occurrence of this species within the operational area is considered unlikely

Northern River Shark

The northern river shark is an endangered species that may occur within the operational area (**Table 3-2**). The Northern River Shark occurs in northern Western Australia and Northern Territory waters. Their habitat includes large tropical river systems, macrotidal embayments, and coastal marine environments (DSEWPaC 2012b). Limited observations suggest that the Northern River Sharks give birth just before the wet season; and that rivers act as nursery habitats for the species (DSEWPaC 2012b).

Given their preferred habitat, occurrence of this species within the operational area is considered unlikely.

Shortfin and Longfin Mako Sharks

The shortfin and longfin mako sharks are both migratory species that are likely to occur within the operational area (**Table 3-2**). The mako sharks are pelagic species, and both have a worldwide distribution in temperate and tropical seas. The Australian distribution of the shortfin mako shark includes all waters except those of the Arafura Sea, Gulf of Carpentaria or Torres Strait; the longfin mark shark is known to occur from central Western Australian, across the northern coast, to central New South Wales (DSEWPaC 2012c). Both species are known to forage on fish and cephalopods.

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

Whale Shark

The whale shark is a vulnerable migratory species that may occur within the operational area (**Table 3-2**). In Australia, the whale shark is most common in waters off northern Western Australia, Northern Territory and Queensland (but has been observed in waters south of this). The whale shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is generally observed close to or at the surface as a single individual but will occasionally occur in schools or aggregations of up to hundreds.

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

Manta Rays

The reef manta ray and giant manta ray are migratory species that may occur within the operational area (**Table 3-2**). Both species have a worldwide distribution and have been observed in Australian waters from Western Australia, north across to central New South Wales. The manta rays typically inhabit tropical or sub-tropical waters, and are more commonly sighted along productive coasts, such as island groups, atolls, upwelling areas, or pinnacles and seamounts (IUCN 2017b, 2017c).

Given their preferred coastal habitat, occurrence of these species within the Operational Area is considered unlikely; any occurrence that does occur is likely to be of a transient nature only.

3.3.5.2 Syngnathids

Syngnathidae is a group of bony fishes that includes seahorses, pipefishes, pipehorses and sea dragons; the closely related Solenostomidae family includes ghost pipefish. These species occupy a range of habitats, however, generally display a preference for seagrass and macroalgal beds, coral reefs, mangroves or sponge gardens (i.e. a habitat offering a protective environment) (DSEWPaC 2012d). Habitat that supports syngnathid populations is generally patchy, so populations of syngnathid species may be dispersed and fragmented (DSEWPaC 2012d). Syngnathids are typically carnivorous, feeding in the water column on or near the sea floor; their diet including small crustaceans, invertebrates, and zooplankton.

Given the habitat within the operational area is predominantly bare sediment with occasional low density of epifauna (e.g. sponges), occurrence of these species within the operational area is considered unlikely.

Table 3-2: Fish Species or Species Habitat that May Occur Within the Operational Area

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Sharks and Rays							
Anoxypristis cuspidata	Narrow Sawfish	–	✓	–	MO	–	–
Carcharodon carcharias	Great White Shark	V	✓	–	MO	–	Recovery Plan (DSEWPaC 2013)
Glyphis garricki	Northern River Shark	E	–	–	MO	–	Conservation Advice (TSSC 2014a), Recovery Plan (DoE 2015b)

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Isurus oxyrinchus	Shortfin Mako	–	✓	–	LO	–	–
Isurus paucus	Longfin Mako	–	✓	–	LO	–	–
Manta alfredi	Reef Manta Ray	–	✓	–	MO	–	–
Manta birostris	Giant Manta Ray	–	✓	–	MO	–	–
Pristis	Freshwater Sawfish	V	✓	–	MO	–	Conservation Advice (TSSC 2015a), Recovery Plan (DoE 2015b)
Pristis zijsron	Green Sawfish	V	✓	–	KO	–	Conservation Advice (TSSC 2008a), Recovery Plan (DoE 2015b)
Rhincodon typus	Whale Shark	V	✓	–	MO	–	Conservation Advice (TSSC 2015c)
Syngnathids							
Campichthys tricarinatus	Three-keel Pipefish	–	–	✓	MO	–	–
Choeroichthys brachysoma	Pacific Short-bodied Pipefish	–	–	✓	MO	–	–
Choeroichthys suillus	Pig-snouted Pipefish	–	–	✓	MO	–	–
Corythoichthys amplexus	Fijian Banded Pipefish	–	–	✓	MO	–	–
Corythoichthys flavofasciatus	Reticulate Pipefish	–	–	✓	MO	–	–
Corythoichthys schultzi	Schultz's Pipefish	–	–	✓	MO	–	–
Doryrhamphus excisus	Bluestripe Pipefish	–	–	✓	MO	–	–
Doryrhamphus janssi	Cleaner Pipefish	–	–	✓	MO	–	–
Halicampus brocki	Brock's Pipefish	–	–	✓	MO	–	–
Halicampus grayi	Mud Pipefish	–	–	✓	MO	–	–
Halicampus spinirostris	Spiny-snout Pipefish	–	–	✓	MO	–	–

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Haliichthys taeniophorus	Ribboned Pipehorse	–	–	✓	MO	–	–
Hippichthys penicillus	Beady Pipefish	–	–	✓	MO	–	–
Hippocampus histrix	Spiny Seahorse	–	–	✓	MO	–	–
Hippocampus kuda	Spotted Seahorse	–	–	✓	MO	–	–
Hippocampus planifrons	Flat-face Seahorse	–	–	✓	MO	–	–
Hippocampus spinosissimus	Hedgehog Seahorse	–	–	✓	MO	–	–
Micrognathus micronotopterus	Tidepool Pipefish	–	–	✓	MO	–	–
Solegnathus hardwickii	Pallid Pipehorse	–	–	✓	MO	–	–
Solegnathus lettiensis	Gunther's Pipehorse	–	–	✓	MO	–	–
Solenostomus cyanopterus	Robust Ghostpipefish	–	–	✓	MO	–	–
Syngnathoides biaculeatus	Double-end Pipehorse	–	–	✓	MO	–	–
Trachyrhamphus bicoarctatus	Bentstick Pipefish	–	–	✓	MO	–	–
Trachyrhamphus longirostris	Straightstick Pipefish	–	–	✓	MO	–	–

Threatened Species:
V Vulnerable
E Endangered
Biologically Important Area:
– No BIA Present

Type of Presence:
MO Species of species habitat may occur within area
LO Species or species habitat likely to occur within area
KO Species or species habitat known to occur within the area

3.3.5.3 Observed Fish Assemblages

Analysis of the 36 Baited Remote Underwater Video (BRUV) samples from the 2010 wet season survey recorded a total of 22 genera representing 17 families (positive identification was made for 33 species plus three unidentified records) for the deep waters of both the Petrel and Tern fields as well as a proposed pipeline route, that was being planned as part of a previously scoped project. The most common families by density were Terapontidae (grunters), Nemipteridae (threadfin breams), and Lutjanidae (snappers).

Higher fish density was recorded within the Tern field, which may be linked to benthic substrate. Silty sand, as observed in Tern field, is a more acceptable medium for benthic biota and associated fish communities than, for example, clay (ANZECC 2000). The fish assemblage data suggest a patchy distribution characterised by areas of increased diversity around small and localised patches of filter feeder communities within the largely unconsolidated sedimentary habitat.

The relative density of the observed species is not consistent with an aggregation or sensitive ecological community, or fish nursery grounds.

3.3.6 Marine Reptiles

There are six marine turtles and 14 sea snakes (or species habitat) classified as threatened, migratory or listed marine that may occur within the operational area **Table 3-3**. The type of presence varies between species, but is predominantly may occur, with no important behaviours (e.g. aggregating, breeding) recorded within the operational area (**Table 3-3**). Foraging BIAs for four marine turtle species intersect with the operational area (**Table 3-3, Figure 3-1**). No known habitat critical for the survival of marine turtles (DEE 2017a) occurs within the operational area.

3.3.6.1 Marine Turtles

Loggerhead Turtle

The loggerhead turtle is an endangered and migratory species that may occur within the operational area (**Table 3-3**). The loggerhead turtle has a global distribution throughout tropical, sub-tropical and temperate waters; and in Australia typically occurs in the waters of coral and rocky reefs, seagrass beds, or muddy bays throughout eastern, northern and western Australia (DAWE 2020a). While the species has a broad foraging range throughout Australian waters, a BIA has been identified extending to the northwest of the operational area (**Figure 3-1).** Loggerhead turtles are carnivorous, feeding primarily on benthic invertebrates (DAWE 2020a).

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

Green Turtle

The green turtle is a vulnerable and migratory species that may occur within the operational area (**Table 3-3**). green turtles are found in tropical and subtropical waters throughout the world; usually occurring within the 20°C isotherms, although individuals can stray into temperate waters (DAWE 2020b). Within Australia, green turtles typically nest, forage and migrate across tropical northern Australia (DAWE 2020b). Adult green turtles consume mainly seagrass and algae, although they will occasionally eat mangroves, fish-egg cases, jellyfish, and sponges; juvenile green turtles are typically more carnivorous and will also consume plankton during their pelagic stage (DAWE 2020b). The foraging BIA overlaps the operational area (**Figure 3-1**).

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

Leatherback Turtle

The leatherback turtle is an endangered and migratory species that may occur within the operational area **(Table 3-3**). The leatherback turtle has the widest distribution of any marine turtle, occurring in tropical to sub-polar oceans (TSSC 2008b). In Australia, the leatherback turtle has been recorded foraging in all Australian states, but no large nesting populations have been recorded (TSSC 2008b). The leatherback Turtles is a highly pelagic species, venturing close to shore mainly during the nesting season (DAWE 2020c). Adults feed mainly on pelagic soft-bodied creatures such as jellyfish, tunicates, salps, squid (DAWE 2020c).

Given their pelagic nature and no known breeding sites in the vicinity, any occurrence within the operational area is likely to be to a transient nature only.

Hawksbill Turtle

The hawksbill turtle is a vulnerable and migratory species that may occur within the operational area (**Table 3-3**). The hawksbill turtle is found in tropical, subtropical and temperate waters all around the world (DAWE 2020d). No nesting is known to occur within the vicinity of the operational area. Hawksbill turtles are omnivorous, feeding on sponges, hydroids, cephalopods (octopus and squid), gastropods (marine snails), cnidarians (jellyfish), seagrass and algae (DAWE 2020d). During their pelagic phase (while drifting on ocean currents),

young hawksbill turtles will feed on plankton (DAWE 2020d). After their pelagic phase, hawksbill turtles will typically settle and forage in tropical tidal and sub-tidal coral and rock reef habitat (DoEE 2017a).

Given their habitat and foraging characteristics, any occurrence within the operational area is likely to be of a transient nature only.

Olive Ridley Turtle

The olive ridley turtle is an endangered and migratory species that may occur within the operational area (**Table 3-3**). Olive Ridley Turtles are primarily carnivorous, feeding on soft-bodied invertebrates such as sea pens, soft corals, sea cucumbers, and jellyfish (DoEE 2017a). Both juveniles and adults have been observed foraging over shallow benthic habitats from northern Western Australia to south-east Queensland; although occurrences in pelagic foraging habitats also occur (DAWE 2020e). A BIA for foraging has been identified extending inshore and to the northeast offshore through the operational area This foraging is associated with the Pinnacles of the Bonaparte Basin (DSEWPAC 2012g).

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

Flatback Turtle

The flatback turtle is a vulnerable and migratory species that may occur within the operational area (**Table 3-3**). The flatback turtle is found in tropical waters of northern Australia and is one of only two species of sea turtle without a global distribution (DAWE 2020f). Flatback Turtles are primarily carnivorous, feeding on soft-bodied invertebrates; juveniles eat gastropod molluscs, squid, siphonophores (DAWE 2020f). Limited data also indicate that cuttlefish, hydroids, soft corals, crinoids, molluscs and jellyfish may also form part of their diet (DAWE 2020f). A BIA for foraging has been identified extending to the northeast from the operational area (**Figure 3-1**). Flatback turtles have been observed foraging on the carbonate banks of the Joseph Bonaparte Gulf and around the Pinnacles of the Bonaparte Depression (DSEWPAC 2012g).

Any occurrence within the operational area is likely to be of a transient nature only; however, it is possible that the species may use the area for foraging.

3.3.6.2 Sea snakes

There are 14 species of sea snakes that may occur within the operational area (**Table 3-3**). Sea snakes have a tropical distribution in Australia, extending from central Western Australia, across the Northern Territory, to southern Queensland. The habitats utilised by sea snakes varies, primarily shallow nearshore areas including coral reefs, shoals, and sandy or muddy substrates; with some species (e.g. horned sea snake) occurring in deeper waters up to 65 m (GBRMPA 2011). They are often observed in schools of several dozen individuals. True sea snakes are marine species, and don't voluntarily leave the water (unlike sea kraits that will). Most species of sea snakes are benthic foragers, feeding on crustaceans, fish eggs and demersal fish; the known exception to this is the yellow-bellied sea snake, which will feed predominantly on small pelagic fish in surface waters. The yellow-belied sea snake is the most pelagic of all known sea snakes. Breeding typically occurs during summer months; however, can occur in winter for some species (e.g. spine-tailed sea snake) (DSEWPaC 2012e). Sea snakes are often observed in trawler bycatch (e.g. NPF) within the North Marine Region (DSEWPaC 2012e).

Given their primarily nearshore and shallow water distribution, occurrence within the operational area is considered unlikely and would likely be of a transient nature only.

Table 3-3: Marine Reptile Species or Species Habitat That May Occur Within the Operational Area

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Marine Turtles							
Caretta caretta	Loggerhead Turtle	E	✓	✓	MO	✓(f)	Recovery Plan (DoEE 2017a)
Chelonia mydas	Green Turtle	V	✓	✓	MO	✓(f)	Recovery Plan (DoEE 2017a)
Dermochelys coriacea	Leatherback Turtle	E	✓	✓	MO	–	Recovery Plan (DoEE 2017a), Conservation Advice (TSSC 2008b)
Eretmochelys imbricata	Hawksbill Turtle	V	✓	✓	MO	–	Recovery Plan (DoEE 2017a)
Lepidochelys olivacea	Olive Ridley Turtle	E	✓	✓	MO	✓(f)	Recovery Plan (DoEE 2017a)
Natator depressus	Flatback Turtle	V	✓	✓	MO	✓(f)	Recovery Plan (DoEE 2017a)
Sea Snakes							
Acalyptophis peronii	Horned Sea Snake	–	–	✓	MO	–	–
Aipysurus duboisii	Dubois' Sea Snake	–	–	✓	MO	–	–
Aipysurus eydouxii	Spine-tailed Sea Snake	–	–	✓	MO	–	–
Aipysurus laevis	Olive Sea Snake	–	–	✓	MO	–	–
Astrotia stokesii	Stokes' Sea Snake	–	–	✓	MO	–	–
Disteira kingii	Spectacled Sea Snake	–	–	✓	MO	–	–
Disteira major	Olive-headed Sea Snake	–	–	✓	MO	–	–
Enhydrina schistosa	Beaked Sea Snake	–	–	✓	MO	–	–
Hydrophis atriceps	Black-headed Sea Snake	–	–	✓	MO	–	–
Hydrophis elegans	Elegant Sea Snake	–	–	✓	MO	–	–
Hydrophis mcdowelli	Small-headed Sea Snake	–	–	✓	MO	–	–
Hydrophis ornatus	Spotted Sea Snake	–	–	✓	MO	–	–
Lapemis hardwickii	Spine-bellied Sea Snake	–	–	✓	MO	–	–

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Pelamis platurus	Yellow-bellied Sea Snake	–	–	✓	MO	–	–
Crocodiles							

Threatened Species:
V Vulnerable
E Endangered
Biologically Important Area:
– No BIA Present
(f) Foraging BIA

Type of Presence:
MO Species of species habitat may occur within area
LO area Species or species habitat likely to occur within
KO area Species of species habitat known to occur within

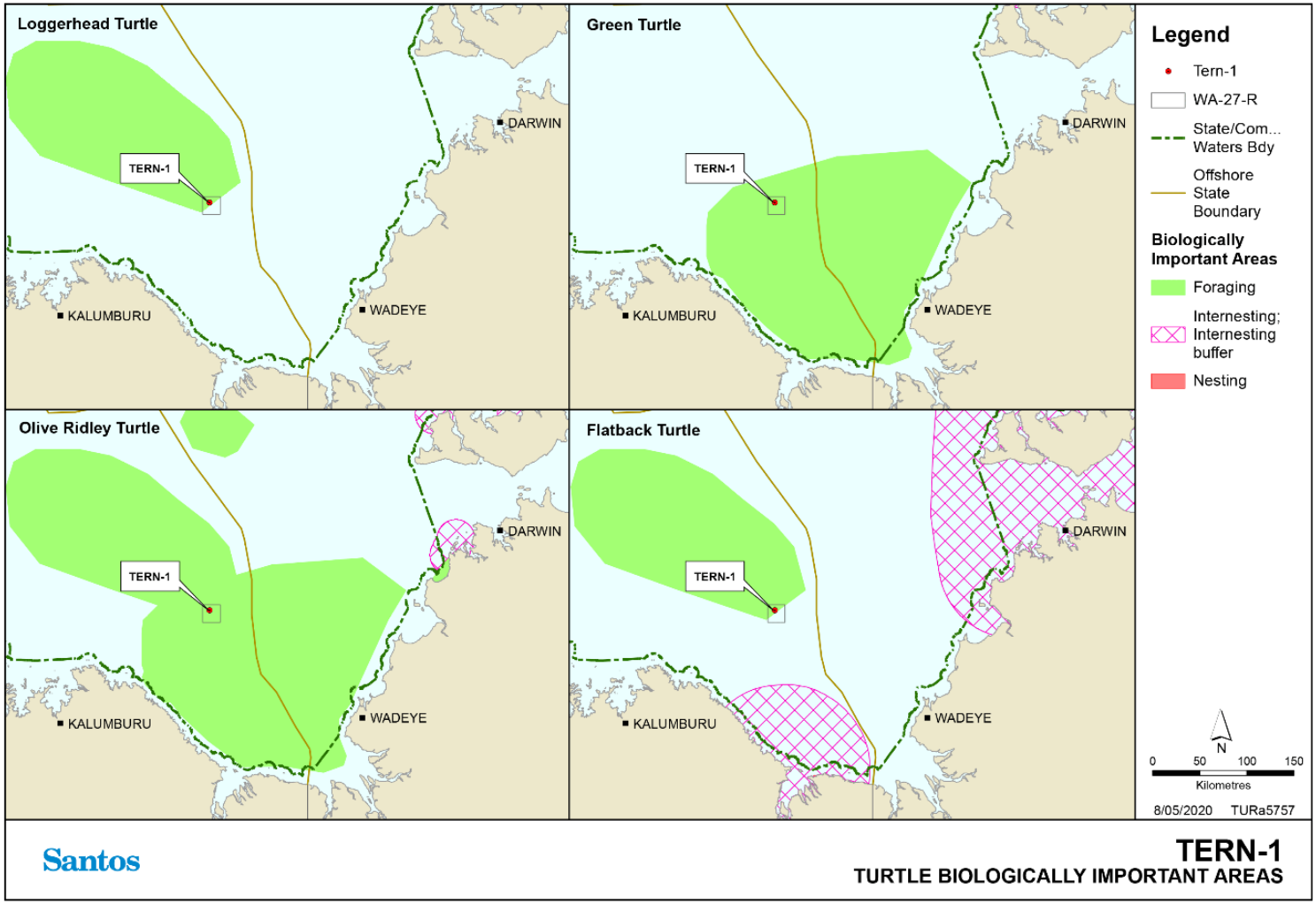


Figure 3-1: Biologically Important Areas for Marine Turtles

3.3.7 Marine Mammals

There are five whale and eight dolphin species (or species habitat) classified as threatened, migratory or a listed cetacean species that may occur within the operational area (**Table 3-4**). The type of presence varies between species, but is predominantly may occur, with no important behaviours (e.g. aggregating, breeding) recorded within the operational area. No BIAs for marine mammals have been identified within the operational area (**Table 3-4).**

3.3.7.1 Whales

Sei Whale

The sei whale is an endangered and migratory species that may occur within the operational area (**Table 3-4**). Sei Whales have been infrequently recorded in Australian waters; however occasional sightings have been recorded, typically off the southern coasts (including Tasmania) (DAWE 2020g). Sie Whales typically feed between the Antarctic and Subtropical convergences, and their diet is planktonic crustacea, in particular copepods and amphipods (DAWE 2020g). There are no known mating or calving areas in Australian waters.

Occurrence of sei whales within the operational area is considered unlikely, and if it did occur would likely be of a transient nature only.

Bryde's Whale

The bryde's whale is migratory species that may occur within the operational area (**Table 3-4**). Bryde's whales occur in temperate to tropical waters, both oceanic and inshore. Bryde's whales has been occasionally recorded from all Australian states except the Northern Territory. Insufficient information exists as to how Australian bryde's whales use their habitat, as no specific feeding or breeding grounds have been discovered off Australia. The inshore form appears to be resident in waters containing suitable prey stocks of pelagic shoaling fishes, while the offshore form appears to undergo extensive migrations between subtropical and tropical waters during the winter months (DAWE 2020r).

Occurrence of bryde's whales within the operational area is considered unlikely, and if it did occur would likely be of a transient nature only.

Blue Whale

The blue whale is an endangered and migratory species that may occur within the operational area (**Table 3-4**). There are two subspecies of blue whale that occur within Australian waters: Antarctic blue whale, and the pygmy blue whale. Blue whales have the highest known prey requirements, consuming up to two tonnes of krill per day (DoE 2015a).

Analysis of six months of noise logger data (September 2010 to March 2011) did not provide evidence of any blue whales being present in the area (ERM 2011). During two marine surveys, November 2010 and May 2011, no blue whales were sighted from the survey vessel in the area.

Occurrence of blue whales within the operational area is considered unlikely, and if it did occur would likely be of a transient nature only.

Fin Whale

The fin whale is an endangered and migratory species that may occur within the operational area (**Table 3-4**). The distribution of fin whales in Australian waters is uncertain, but they have been recorded in Commonwealth waters off most States (the species is rarely found in inshore waters) (DAWE 2020h). Fin whales frequently lunge or skim feed, at or near the surface, feeding on planktonic crustacea, some fish and cephalopods (DAWE 2020h). Fin whales generally feed in high latitudes, however depending upon prey availability and locality, it may also feed in lower latitudes.

Occurrence of fin whales within the operational area is considered unlikely, and if it did occur would likely be of a transient nature only.

Humpback Whale

The humpback whale is an endangered and migratory species that may occur within the operational area (**Table 3-4**). Humpback whales have a near global distribution, migrating annually between high latitude feeding areas and low latitude breeding and calving areas; the Australian migration period is from May to November each year (TSSC 2015d). Peak migration time occurs between June and July each year (northern migration); there has been no such peak observed during the southern migration (TSSC 2015d). Humpback whales in the southern Hemisphere primarily feed on Antarctic krill (*Euphausia superba*) and most feeding grounds are south of Australian waters (TSSC 2015d).

Analysis of six months of noise logger data (September 2010 to March 2011) did not provide evidence of humpback whale feeding, breeding or resting areas in the vicinity of the Tern field. Humpback song consistent with the Western Australian humpback population was detected at two sites in September 2010; however, calls were considered to be of a low level, given only one individual was detected at any point in time. It is most likely that these animals traversed the Western Australian coast and crossed around the northern Kimberley (McCauley 2011). During two marine surveys, November 2010 and May 2011, no humpback whales were sighted from the survey vessel in the area.

Occurrence of humpback whales within the operational area is considered unlikely, and if it did occur would likely be of a transient nature only.

3.3.7.2 Dolphins

Common Dolphin

Common dolphins are found in offshore waters and have been recorded in waters off all Australian States and territories but are rarely seen in northern Australian waters (DEE 2017k). Common dolphins appear to occur in two main locations around Australia: one cluster in the southern south-eastern Indian Ocean and another in the Tasman Sea. Common dolphins feed on a variety of small prey, mainly on epipelagic schooling and mesopelagic fishes and squids, but also on other cephalopods and crustaceans. No specific calving areas in Australia are known.

Common dolphins may occur within the operational area, but any presence is likely be of a transient nature only.

Risso's Dolphin

Risso's dolphin inhabits tropical, subtropical, temperate and subantarctic waters; it has been sighted both inshore and well offshore, although is generally considered pelagic and oceanic. In Australia, risso's dolphins have been recorded from all states except Tasmania and the Northern Territory (DAWE 2020j). Risso's dolphin occur mainly on steep sections of the upper continental slope and have a preference for waters deeper than 1,000 m (DAWE 2020j). Risso's dolphin feeds in pelagic waters primarily on squid, some octopus and possibly fish. No calving areas are known in Australian waters.

Risso's dolphins may occur within the operational area, but any presence is likely be of a transient nature only

Killer Whale

The killer whale is migratory species that may occur within the operational area (**Table 3-4**). Killer whales are the largest member of the dolphin family, and the most cosmopolitan of all cetaceans, having a wide global distribution. In Australia, killer whales have been recorded in all states, with concentrations reported around Tasmania. The preferred habitat of killer whales includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters. They may be more common in cold, deep waters, but off Australia, killer whales are most often seen along the continental slope and on the shelf, particularly near seal colonies (DAWE 2020l).

Killer whales may occur within the operational area, but any presence is likely be of a transient nature only.

False Killer Whale

False killer whales are found worldwide in deep tropical and temperate waters; in Australia, they have been recorded in all states and territories. False killer whales prefer deep, offshore waters and sometimes deep coastal waters (DAWE 2020k). They approach close to land only where the continental shelf is narrow, possibly attracted to zones of enhanced prey abundance along the continental slope (DAWE 2020k). False killer whales primarily eat fish and cephalopods. Mating and calving occur throughout the year, with no known seasonal pattern, and no calving areas are known for Australian waters (DAWE 2020k).

Occurrence of false killer whale within the operational area is considered likely (according to the PMST search), but any presence is likely to be of a transient nature only.

Spotted Dolphin

Spotted dolphins are mostly found in oceanic tropical waters, inhabiting both near-shore and oceanic habitats. In Australia, spotted dolphins have been recorded off the Northern Territory, Western Australia, Queensland and New South Wales (DAWE 2020m). Spotted dolphins feed mainly on small epipelagic and mesopelagic fish, and squids. The mating season is diffuse, with peaks in spring and autumn; the calving season is also equally diffuse, with peaks in spring and autumn (gestation lasts approximately 11 months). No calving areas are known in Australian waters.

The spotted dolphin may occur within the operational area, but any presence is likely be of a transient nature only.

Indian Ocean Bottlenose Dolphin

The Indian Ocean bottlenose dolphin is distributed continuously around Australia (DAWE 2020n). The species occurs mainly in riverine and shallow coastal waters (on the shelf or around oceanic islands) (DSEWPaC 2012f); but can also be found in nearshore waters and shallow offshore waters in open coast environments (DAWE 2020n). Indian Ocean bottlenose dolphins feed on a variety of fish and cephalopods. Calving peaks occur in spring and summer or spring and autumn (DAWE 2020n). Gestation lasts approximately 12 months, so peak mating period coincides with peak calving period in each location (DAWE 2020n).

The Indian Ocean bottlenose dolphin may occur within the operational area, but any presence is likely be of a transient nature only.

Spotted Bottlenose Dolphin

The spotted bottlenose dolphin tends to occur in deep, open coastal waters, primarily in continental shelf waters (up to 200 m deep), including coastal areas around oceanic islands (DAWE 2020m). Although they can be found in estuarine embayment's, the species does not seem to enter far into the muddy, turbid waters of estuaries (DAWE 2020m). The spotted bottlenose dolphin is an opportunistic feeder, foraging in a wide variety of habitats; typically diet consists of fish and cephalopods.

The spotted bottlenose dolphin may occur within the operational area, but any presence is likely be of a transient nature only.

Bottlenose Dolphin

Bottlenose dolphins are found in all temperate and tropical waters around the world, in both coastal (inshore and nearshore) and offshore waters. The distribution of the bottlenose dolphin in Australian waters is not well known, but there are records for Queensland, New South Wales, Tasmania, South Australia and south-western Western Australia (DAWE 2020o). Within Australia, they are usually found offshore in waters deeper than 30 m but can also occur in some coastal waters. Bottlenose dolphins feed mainly on a variety of fish and invertebrates from both the littoral and sub-littoral zones, while offshore animals feed primarily on mesopelagic fish and oceanic squids. In several non-Australian populations calving is known to peak in spring and summer or spring and autumn

The bottlenose dolphin may occur within the operational area, but any presence is likely be of a transient nature only.

Table 3-4: Marine Mammal Species or Species Habitat that May Occur within the Operational Area

Species (Scientific)	Species (Common)	Threatened Species	Migratory Species	Listed Marine Species	Type of Presence	BIA	Conservation Advice or Recovery Plan
Whales							
Balaenoptera borealis	Sei Whale	V	✓	–	MO	–	Conservation Advice (TSSC 2015e)
Balaenoptera edeni	Bryde's Whale		✓	–	MO	–	–
Balaenoptera musculus	Blue Whale	E	✓	–	LO	–	Recovery Plan (DoE 2015a)
Balaenoptera physalus	Fin Whale	V	✓	–	MO	–	Conservation Advice only (TSSC 2015f)
Megaptera novaeangliae	Humpback Whale	V	✓	–	LO	–	Conservation Advice (TSSC 2015d)
Dolphins							
Delphinus delphis	Common Dolphin	–	–	–	MO	–	–
Grampus griseus	Risso's Dolphin	–	–	–	MO	–	–
Orcinus orca	Killer Whale	–	✓	–	MO	–	–
Pseudorca crassidens	False Killer Whale	–	–	–	LO	–	–
Stenella attenuata	Spotted Dolphin	–	–	–	MO	–	–
Tursiops aduncus	Indian Ocean Bottlenose Dolphin	–	–	–	MO	–	–
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	–	✓	–	MO	–	–
Tursiops truncatus s. str.	Bottlenose Dolphin	–	–	–	MO	–	–

Threatened Species:
V Vulnerable
E Endangered
Biologically Important Area:
– No BIA Present

Type of Presence:
MO Species of species habitat may occur within area
LO Species or species habitat likely to occur within area

3.4 Social Environment

There are no Commonwealth or State marine protected areas, wetlands of international or national importance, World, National or Commonwealth heritage properties or places, Indigenous Protected Areas, or maritime heritage sites (i.e. shipwrecks) that intersect the operational area.

Due to the distance offshore, tourism and recreation activities are unlikely to occur within the vicinity of the operational area.

3.4.1 Commonwealth Marine Regions

Six marine regions have been identified in Commonwealth waters around Australia; the operational area intersects with the North-west region. Key conservation values for this region are listed in **Table 3-5**.

Table 3-5: Key Conservation Values for the North-west Marine Region

Region	Key Conservation Values[1]
North-west	+ Seasonal calving habitat for the world's largest population of the humpback whale + Foraging and inter-nesting habitat for olive ridley, green, flatback, loggerhead and hawksbill turtles + Foraging habitat for the whale shark, several species of sea snake, sawfish and for several species of migratory seabirds + BIAs for several whale species, including the Australian snubfin dolphin and humpback whale + Protection for coral reefs in Commonwealth waters adjacent to the Kimberley with additional protection for Rowley Shoals and Ningaloo reefs + Eight key ecological features are included, fully or in part, in the marine reserve network + Eight provincial bioregions, nine meso-scale bioregions, 81 depth ranges within provincial bioregions, and 15 seafloor types represented in the network

Notes:
1. Key Conservation Values as listed in DEE 2017r.

3.4.2 Commercial Fisheries

3.4.2.1 Commonwealth Fisheries

Four Commonwealth-managed commercial fisheries have management areas that intersect with the operational area (**Table 3-6**). One of these, the Skipjack Tuna Fishery, has been inactive since the 2008-2009 fishing season; and two fisheries (Southern Bluefin Tuna, and Western Tuna and Billfish) have their catch from areas well outside the Operational Area (**Table 3-6**).

The NPF is the only Commonwealth-managed fishery that may have activity within the vicinity of the Operational Area, however fishing intensity shows low levels of fishing outside the operational area (**Figure 3-2**).

The fishery covers an area of approximately 784,000 km^2 and extends from Joseph Bonaparte Gulf across the top end to the Gulf of Carpentaria. The highest catches are taken offshore from mangrove forests, which are the juvenile nursery areas (Patterson *et al.* 2019)

Most of the trawling activity and harvest comes from within the Gulf of Carpentaria with the western most region of the fishery (the Joseph Bonaparte Gulf) seeing much lower fishing effort. The Joseph Bonaparte Gulf is fished primarily for Banana Prawn, which includes adults of the white Indian variety found in 45 to 85 m, adults of the common Banana Prawn are caught in water <45 m deep (NPF25 1994).

3.4.2.2 State Fisheries

Six State-managed commercial fisheries have management areas that intersect with the operational area (**Table 3-7**). One of these, the offshore Jigging Fishery, is currently inactive. Fishing activity in the vicinity of the operational area is expected to be low, with only one of the State-managed fisheries (the offshore Demersal Fishery and Licences) identified as potentially having active fishing effort in the general region (**Table 3-7**).

Table 3-6: Commonwealth-managed Commercial Fisheries

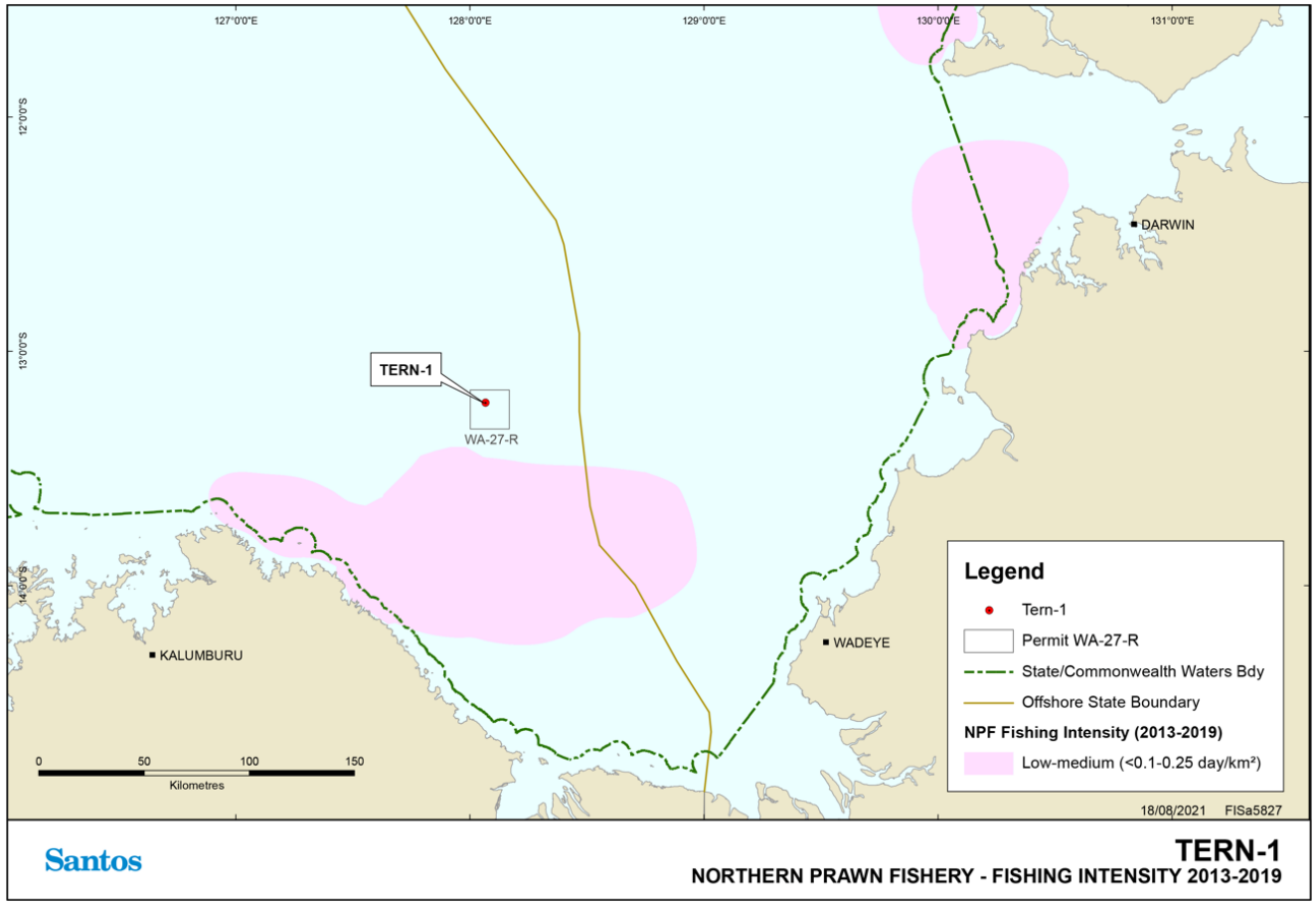
Fishery	Area	Target Species	Season	Fishing Method	Fishing Activity Expected within the Operational Area
NPF	The NPF is located off Australia's northern coast from Cape York in Queensland to Cape Londonderry in Western Australia (**Figure 3-2**).	+ White Indian banana prawns (*Fenneropenaeus merguiensis*, *F. indicus*) + Tiger prawns – brown and grooved (*Penaeus esculentus, P. semisulcatus*) + Endeavour prawns (*Metapenaeus endeavouri, M. ensis*)	+ Season 1 (mainly banana prawns caught): 1 April – 15 June + Season 2 (mainly tiger prawns caught): 1 August – end of November + Note: season end dates depends on catch rates	+ Otter Trawl -typically two, three or four bottom trawl nets. + Double and quad rig boats designed for fishing in shallow water (AMC, 2021) + Banana prawns are primarily targeted during the day; tiger (and endeavour) prawns during the night	Unlikely (see fishing intensity shown in **Figure 3-2**)
Skipjack Tuna Fishery (Western)	The Skipjack Tuna Fishery covers the entire sea area around Australia, out to 200 nm from the coast. It is split into two sectors: the Eastern Skipjack Tuna Fishery and the Western Skipjack Tuna Fishery.	+ Skipjack tuna (*Katsuwonus pelamis*)	N/A	N/A	No (there has been no activity in this fishery since the 2008-2009 season).

Fishery	Area	Target Species	Season	Fishing Method	Fishing Activity Expected within the Operational Area
Southern Bluefin Tuna Fishery	The Southern Bluefin Tuna Fishery covers the entire sea area around Australia, out to 200 nm from the coast .	+ Southern bluefin tuna (*Thunnus maccoyii*)	+ 12-month season, beginning on 1 December	+ Purse seine + Pelagic longline	No
Western Tuna and Billfish Fishery	The Western Tuna and Billfish Fishery covers the sea area west from the tip of Cape York in Queensland, around Western Australia, to the border between Victoria and South Australia. Fishing occurs in both the Australian Fishing Zone and adjacent high seas.	+ Bigeye tuna (*Thunnus obesus*) + Yellowfin tuna (*Thunnus albacares*) + Broadbill swordfish (*Xiphias gladius*) + Striped marlin (*Tetrapturus audux*)	+ 12-month season, beginning on 1 February.	+ Pelagic longline (monofilament mainline) + Minor line (handline, rod and reel, troll and poling) + Purse seine	No

Table 3-7: State-managed Commercial Fisheries

Fishery	Area	Target Species	Fishing Method	Fishing Activity Expected within the Operational Area
Inshore				
Aquarium Fishery and Licences	The Northern Territory aquarium fishery industry is a small-scale, multi-species fishery. It includes freshwater, estuarine and marine habitats to the outer boundary of the Australian Fishing Zone (200 nautical miles offshore).	+ Aquarium fishes; mostly rainbowfish, catfish and scats + Invertebrates; mainly hermit crabs, snails, whelks and hard and soft corals + Plants	+ Barrier, cast, scoop, drag and skimmer nets + Hand pumps + Freshwater pots + Hand-held equipment	No. (Freshwater and estuarine species are generally collected between the Adelaide and Daly rivers, while most marine species are collected within 100 km of Nhulunbuy and Darwin)
Pearl Oyster Fishery	The Pearl Oyster Fishery operates from the high water mark to the outer boundary of the Australian Fishing Zone.	+ Silver-lipped pearl oyster (*Pinctada maxima*)	+ By hand (diving)	No. (The silver-lipped pearl oyster is farmed in four main areas of the Northern Territory: Bynoe Harbour, Beagle Gulf, Cobourg Peninsula and Croker Island, and around the islands north west of Nhulunbuy)
Offshore				
Demersal Fishery and Licences	Demersal fishing is allowed from 15 nautical miles from the low water mark to the outer boundary of the Australian Fishing Zone, excluding the area of the Timor Reef fishery.	+ Principally target red and blue spotted emperor and gold band snapper	+ Vertical lines + Drop lines + Finfish long-lines + Baited fish traps	Unlikely. Analysis of fishcube data over the 2008 to 2018 period indicates there was no fishing effort in a 10NM block surrounding the Tern-1 wellhead (**Figure 3-3**).
Jigging Fishery	This fishery is presently closed			
Offshore Net and Line Fishery	This fishery operates in all NT waters from the high water mark to the boundary of the Australian Fishing Zone.	+ Black-tip sharks and grey mackerel are the primary species taken in off-shore net and line fishing	+ Demersal or pelagic long lines + Pelagic nets	No (most fishing effort is in the coastal zone within 12 nautical miles of the coast, and immediately offshore in the Gulf of Carpentaria)

Fishery	Area	Target Species	Fishing Method	Fishing Activity Expected within the Operational Area
Inshore				
		+ Other species include hammerhead, bull, tiger, pigeye, lemon and winghead sharks, and dusky whalers + By-product catch includes Spanish mackerel, longtail tuna, black pomfret and other finfish.		
Spanish Mackerel Fishery and Licences	Commercial fishing for Spanish mackerel is allowed from the high water mark to the outer boundary of the Australian Fishing Zone.	+ Spanish mackerel (*Scomberomorus maculate*). + Bycatch includes a small number of other mackerel species	+ Troll lines + Floating hand lines + Rods	No (Most Spanish mackerel are caught off the western and eastern mainland coasts and near islands including Bathurst Island, Groote Eylandt and the Wessel Islands. Fishing generally takes place around reefs, headlands and shoals).



(Source: Patterson et al. 2018)

Figure 3-2: Northern Prawn Fishery – Management Area and 2013 to 2019 Low Fishing Intensity

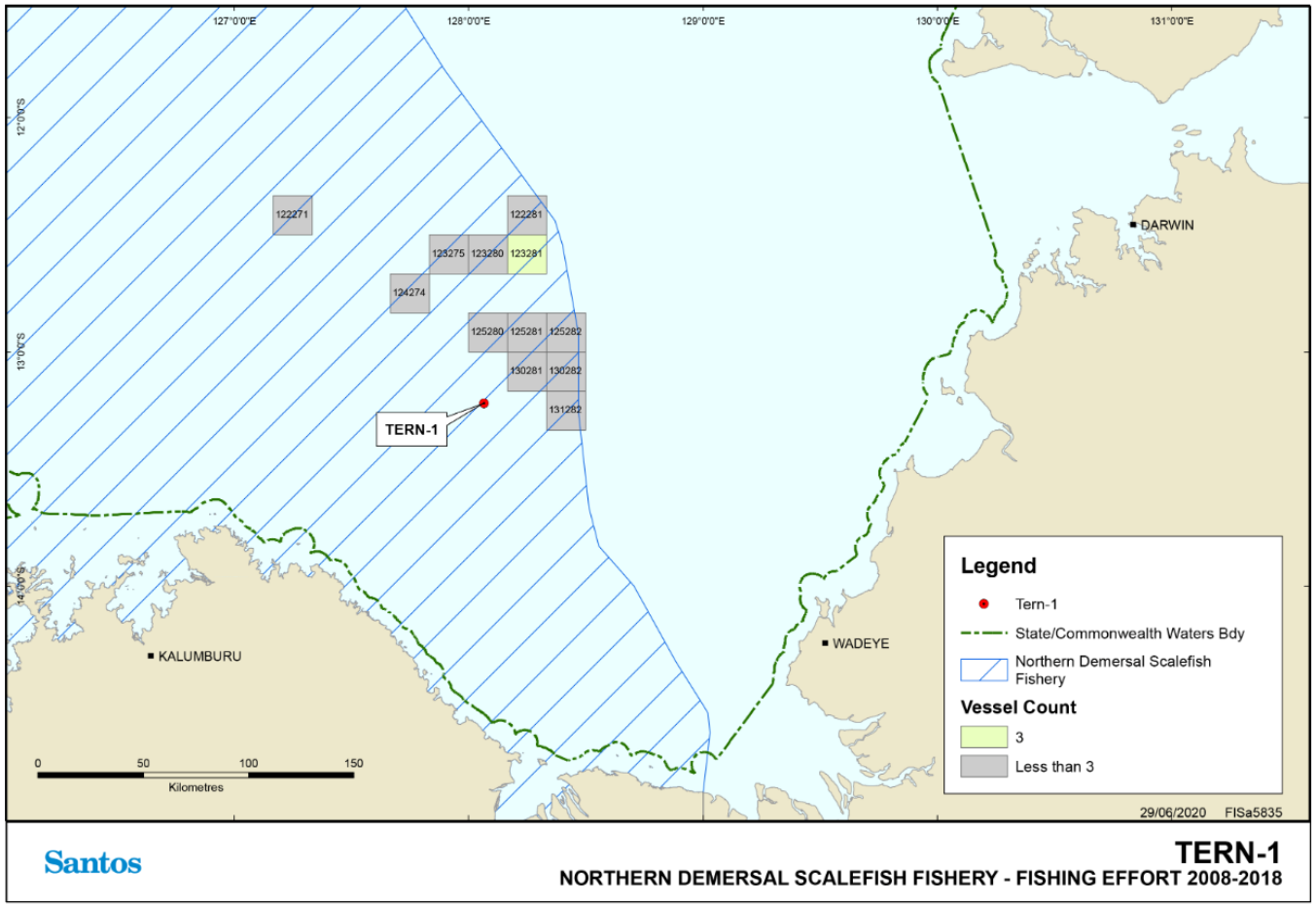


Figure 3-3: Northern Demersal Scalefish Fishing Intensity

3.4.3 Industry

3.4.3.1 Shipping

Coastal shipping traffic is common to offshore areas; the largest port in coastal waters adjacent to the activity location is the Port of Darwin. The Port of Darwin is important for trading vessels, fishing vessels, navy ships and cruise ships; and also services activity associated with the operation of the Australasia Railway and the Timor Sea oil and gas developments.

There are no known recognised major shipping routes within the immediate vicinity of the operational area, however vessels may pass through the general area (**Figure 3-4**).

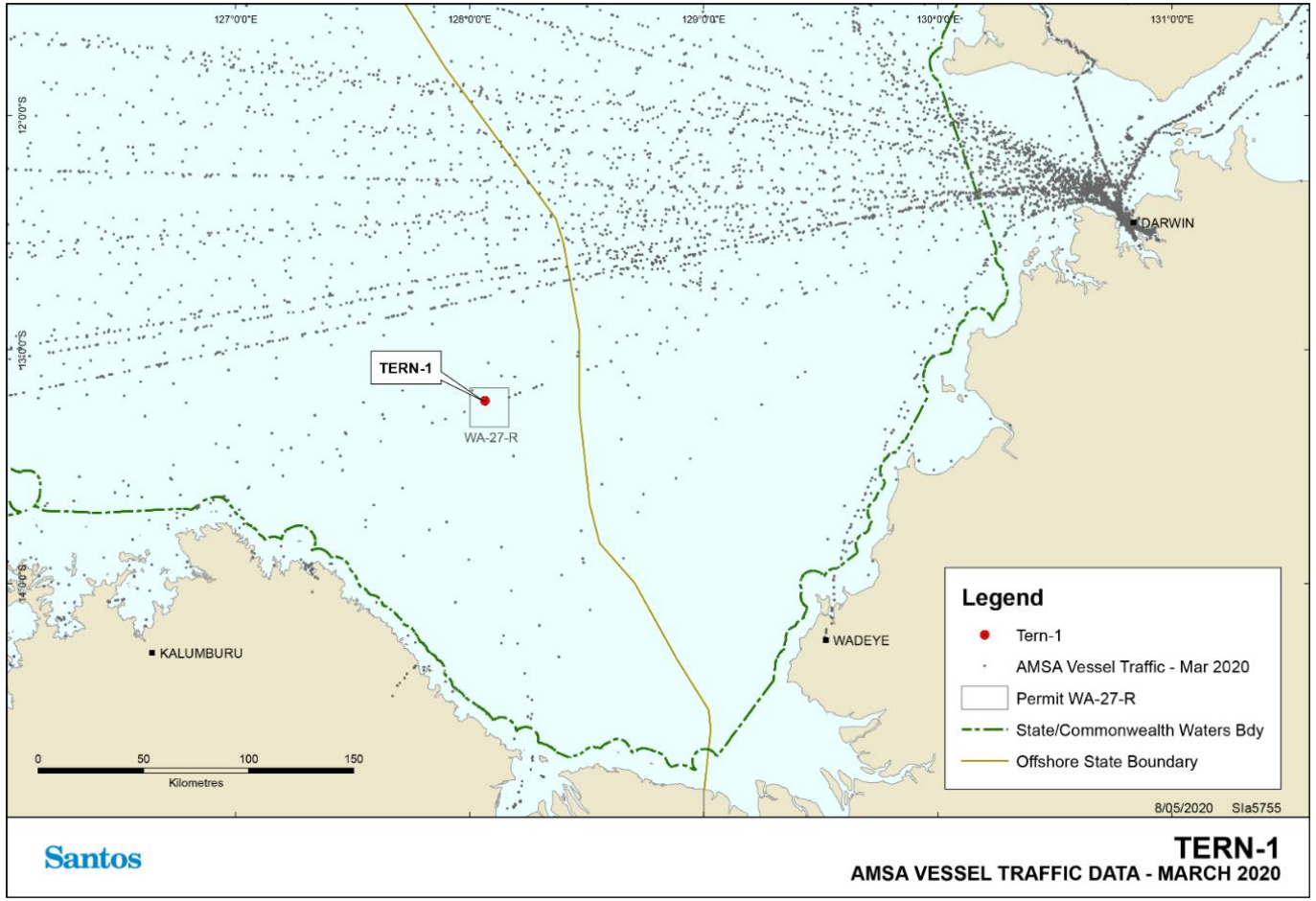
The Tern-1 wellhead appears on nautical charts.

3.4.3.2 Petroleum Exploration and Production

Petroleum exploration in the Bonaparte Basin commenced in the late 1940's. The nearest petroleum infrastructure is the Inpex Ichthys-Darwin production pipeline approximately 75 km to the north of the wellhead, and the ENI Blacktip Platform approximately 88 km to the southeast (**Figure 3-5**). Santos has current commercial interests in the Petrel/Tern/Frigate field complex in the Petrel sub-basin. The suspended Tern 2 well is approximately 10 km from the Tern-1 wellhead.

3.4.3.3 Military

The operational area is located within a military exercise zone, the Northern Australia Exercise Area (**Figure 3-6**). The zone incorporates the majority of the Northern Territories portion of the Bonaparte Basin, and is mainly utilised for activities associated with border protection including surveillance, illegal immigration and illegal fishing. Consultation with the Department of Defence indicated that unexploded ordnance may be present on and in the seafloor.



Note: Vessel traffic data for the month of March 2020 from AMSA's Craft Tracking System

Figure 3-4: Vessel Traffic Within Bonaparte Basin Area (March 2020)

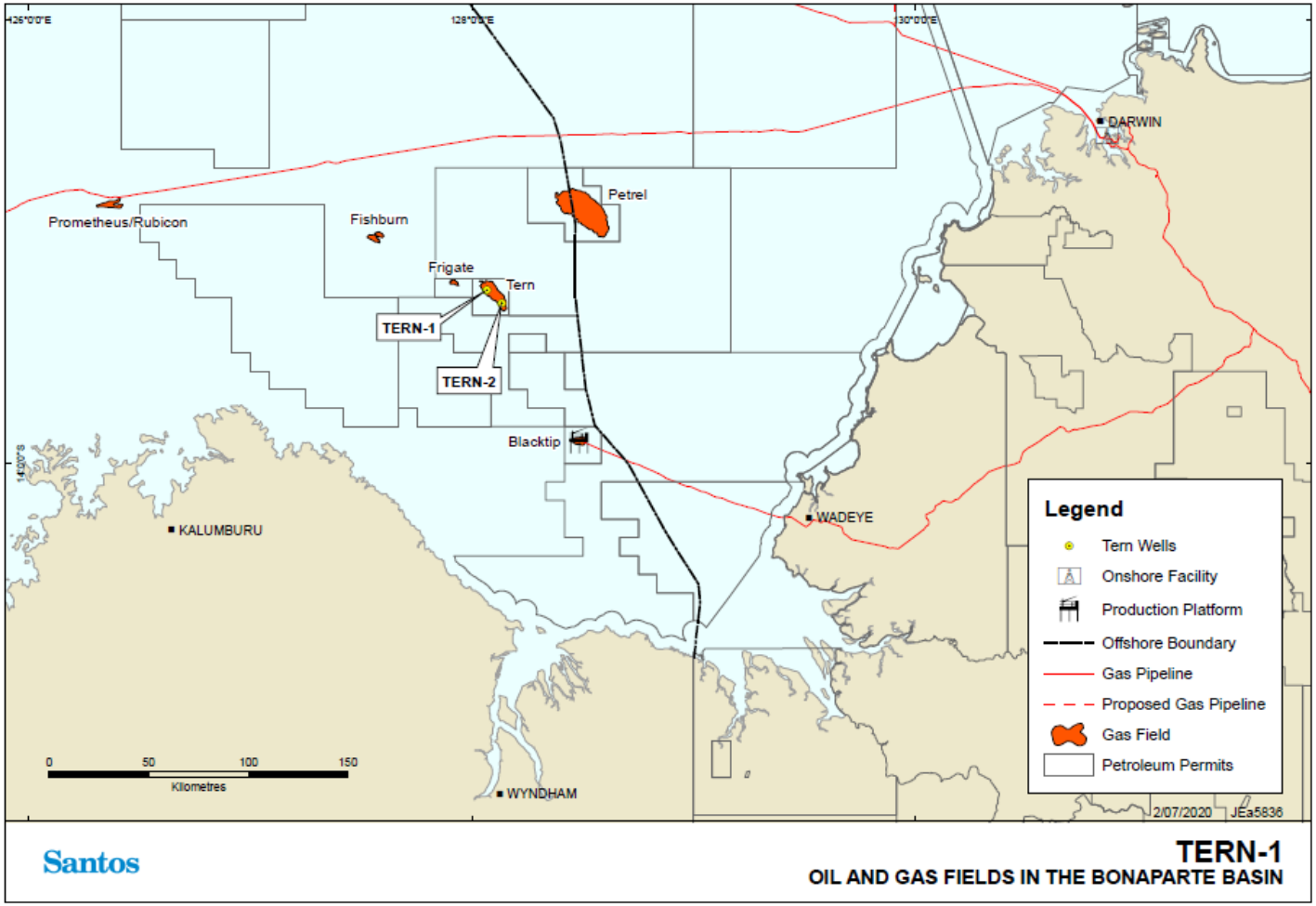


Figure 3-5: Oil and Gas Fields in the Bonaparte Basin

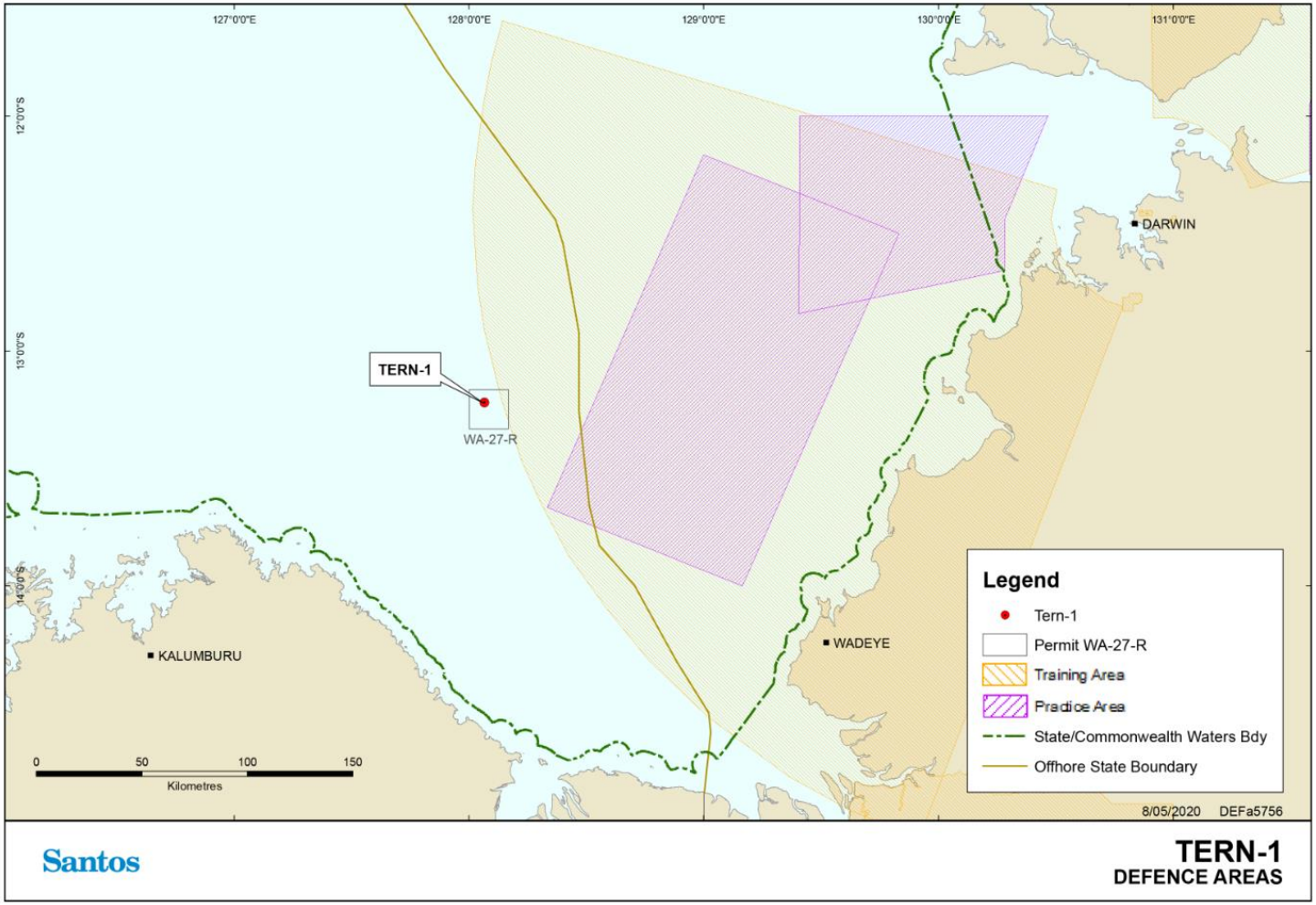


Figure 3-6: Defence Training Areas in Northern Australia

4 Stakeholder Consultation

OPGGS(E)R 2009 Requirements
Regulation 9AB
If the Regulator's provisional decision under regulation 9AA is that the environment plan includes material apparently addressing all the provisions of Division 2.3 (Contents of an environment plan), the Regulator must publish on the Regulator's website as soon as practicable: the plan with the sensitive information part removed; and the name of the titleholder who submitted the plan; and a description of the Activity or stage of the Activity to which the plan relates; and the location of the Activity; and a link or other reference to the place where the accepted offshore project proposal (if any) is published; and details of the titleholder's nominated liaison person for the Activity.
Regulation 16
16 The environment plan must contain the following: (b) a report on all consultations under regulation 11 A of any relevant person by the titleholder, that contains: (i) a summary of each response made by a relevant person; and (ii) an assessment of the merits of any objection or claim about the adverse impact of each Activity to which the environment plan relates; and (iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person.

4.1 Summary

Santos has a history of stakeholder engagement in the Bonaparte region through historical exploration drilling, seismic surveys, the previously proposed Bonaparte Floating LNG project and as a Joint Venture Partner in Darwin LNG. Santos is familiar with interested stakeholders and marine users in the region.

Stakeholders (**Table 4-1**) were informed of activities covered in this EP via several channels of engagement commencing in April 2020, including:

- WA-27-R Tern-1 consultation package distributed to identified stakeholders, and
- WA-27-R Tern-1 consultation package for commercial fishers distributed to identified fishing licence holders.
- Follow-up discussions with fishing industry bodies and commercial fishers on the Tern-1 consultation package.

Based on Santos' experience with previous EPs, and from subsequent stakeholder feedback and regulator discussions, the primary stakeholder issues raised for this activity are the potential impact of any items remaining on the seabed to trawl fishers (addressed in **Section 6.1**).

Santos has considered all stakeholder responses as outlined in **Section 4.4**. A summary of Santos' response statements is provided in **Table 4-2**.

Santos considers that consultation with relevant stakeholders has been adequate to inform the development of this EP.

4.2 Stakeholder Identification

Santos understands retaining a broad licence to operate depends on the development and maintenance of positive and constructive relationships with a comprehensive group of stakeholders in the community, government, non-government, other business sectors and other users of the marine environment. Fostering effective consultation between Santos and relevant stakeholders is an important part of this process.

Santos began the stakeholder identification process for this EP with a review of its stakeholder database, including stakeholders consulted for other activities in the area. The list of stakeholders was then reviewed and refined based on the location of the abandoned Tern-1 wellhead (refer to **Section 2.2**), and the relevance of stakeholders according to Regulation 11A of the OPGGS (E) Regulations and NOPSEMA Bulletin #2 (November, 2019). More specifically, stakeholders for this EP were identified through the following:

- Regular review of legislation applicable to petroleum and marine activities
- Identification of marine user groups and interest groups active in the area (e.g., commercial fisheries, other oil and gas producers, merchant shipping, etc.)
- A review of the Department of Primary Industries and Regional Development (DPIRD) FishCube data
- Updated fishing licence holder contact details, from these identified fisheries, as provided by DPIRD
- Utilisation of the Western Australian Fishing Industry Council (WAFIC) Oil and Gas consultation services to advise on 'relevant' commercial fisheries and fishers, and to review and distribute fishery-specific consultation material
- Discussions with identified stakeholders to identify other potentially impacted persons
- Active participation in industry bodies and collaborations (e.g., APPEA, Australian Marine Oil Spill Centre (AMOSC), NERA)
- Records from previous consultation activities in the area.

Currently identified stakeholders and an assessment of their relevance under the OPGGS (E) Regulations for the purposes of consultation for this petroleum activity are listed in **Table 4-1.**

Table 4-1: Assessment of Relevance of Identified Stakeholders for the Proposed Activity

Stakeholder	Relevant to Activity	Relevance / Reason for Engagement
Commonwealth Government Departments/Agencies		
Australian Hydrographic Office (AHO)	Considered relevant persons under Regulation 11A(1)(a)	The AHO is the part of the Commonwealth Department of Defence responsible for maintaining and disseminating nautical charts, including the distribution of Notice to Mariners. Permit WA-27-R is in Commonwealth waters.
Australian Maritime Safety Authority (AMSA)	Considered relevant persons under Regulation 11A(1)(a)	AMSA is the statutory and control agency for maritime safety and vessel emergencies in Commonwealth waters. AMSA is a relevant agency when proposed offshore activities may impact on the safe navigation of commercial shipping in Australian waters. Permit WA-27-R is in Commonwealth waters.
Department of Defence (Defence)	Considered relevant persons under Regulation 11A(1)(a)	Defence is a relevant agency where the proposed activity may impact operational requirements; encroach on known training areas and/or restricted airspace, or when nautical

Stakeholder	Relevant to Activity	Relevance / Reason for Engagement
		products or other maritime safety information is required to be updated. Permit WA-27-R is in Commonwealth waters.
Australian Fisheries Management Authority (AFMA)	Considered relevant persons under Regulation 11A(1)(a)	AFMA is responsible for managing Commonwealth fisheries and is a relevant agency where the activity has the potential to impact on fisheries resources in AFMA managed fisheries. The abandoned Tern-1 wellhead is in an area intersecting with Commonwealth managed fisheries.
Department of Agriculture, Water and the Environment (DAWE) – Fisheries	Considered relevant persons under Regulation 11A(1)(a)	DAWE (fisheries) has primary policy responsibility for promoting the biological, economic and social sustainability of Australian fisheries. The Department is the relevant agency where the activity has the potential to negatively impact fishing operations and / or fishing habitats in Commonwealth waters. The abandoned Tern-1 wellhead is in an area intersecting with Commonwealth managed fisheries.
Department of Agriculture, Water and the Environment (DAWE) – Sea dumping	Considered relevant persons under Regulation 11A(1)(a)	DAWE (Sea Dumping) to be contacted to clarify requirements for an exemption from permitting requirements of the Commonwealth *Environment Protection (Sea Dumping) Act 1981*.
State Government Departments / Agencies		
WA Department of Transport (DoT)	Not considered relevant persons under Regulation 11A for the purposes of this activity.	DoT is the control agency for marine pollution emergencies in Western Australian state waters. DoT was provided a copy of the consultation pack as a courtesy.
WA Department of Primary Industries and Regional Development (DPIRD)	Considered relevant persons under Regulation 11A(1)(b)	DPIRD is responsible for managed West Australian state fisheries. The abandoned Tern-1 wellhead is in an area that intersects with state managed fisheries.
WA Department of Mines, Industry Regulation and Safety (DMIRS)	Not considered relevant persons under Regulation 11A for the purposes of this activity.	WA Department responsible for the management of offshore petroleum in the adjacent state waters. DMIRS was provided a copy of the consultation pack as a courtesy.
NT Department of Primary Industry and Resource	Not considered relevant persons under Regulation 11A for the purposes of this activity.	NT Department responsible for the management of offshore petroleum in the adjacent state waters. The department was provided a copy of the consultation pack as a courtesy.
Industry Bodies		
Western Australian Fishing Industry Council (WAFIC)	Considered relevant persons under	WAFIC is the peak industry body representing the interests of the WA commercial fishing, pearling and

Stakeholder	Relevant to Activity	Relevance / Reason for Engagement
	Regulation 11A(1)(e)	aquaculture sector. The abandoned Tern-1 wellhead is in an area that intersects with state-managed fisheries.
Pearl Producers Association (PPA)	Considered relevant persons under Regulation 11A(1) (e	The PPA is the peak body representing the pearl fishing industry in WA. The Pearl Producers Association requests all information for activities within their fishing zones.
Commonwealth Fisheries Association (CFA)	Considered relevant persons under Regulation 11A(1)(e)	The CFA was engaged as a representative body for Commonwealth fisheries. The abandoned Tern-1 wellhead is in an area that intersects with several Commonwealth-managed fisheries. The CFA is also listed on the AFMA website as a contact for petroleum operators to use when consultation with fishing operators is required.
Northern Prawn Fishery Industry (NPF Industry)	Considered relevant persons under Regulation 11A(1) (e	NPF Industry is the peak body representing the northern prawn trawlers.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	Considered relevant persons under Regulation 11A(1)(e)	ASBTIA represents the Australian SBT industry. ASBTIA is also listed on the AFMA website as a contact for petroleum operators to use when consultation with Commonwealth fishing operators is required.
Commercial Fisheries – State Managed		
Mackerel Managed Fishery (Area 1)	Considered relevant persons under Regulation 11A(1)(d)	Based on consultation with WAFIC, the Mackerel Managed Fishery (Area 1) boundary overlaps the abandoned Tern-1 wellhead and is therefore potentially impacted and should be consulted.
Northern Demersal Scalefish	Considered relevant persons under Regulation 11A(1)(d)	Based on consultation with WAFIC, the Northern Demersal Scalefish Fishery boundary overlaps the abandoned Tern-1 wellhead and is therefore potentially impacted and should be consulted.
North Coast Shark – JA Shark	Considered relevant persons under Regulation 11A(1)(d)	Based on consultation with WAFIC, the North Coast Shark – JA Fishery boundary overlaps the abandoned Tern-1 wellhead and is therefore potentially impacted and should be consulted.
Pearling (Kimberley Development Zone)	Considered relevant persons under Regulation 11A(1)(d)	Based on consultation with WAFIC, the Pearling (Kimberley Development Zone) Fishery boundary overlaps the abandoned Tern-1 wellhead and is therefore potentially impacted and should be consulted.
Commercial Fisheries – Commonwealth Managed		
NPF	Considered relevant persons under Regulation 11A(1)(d)	Based on consultation with WAFIC, the NPF boundary overlaps the abandoned Tern-1 wellhead and is therefore potentially impacted and should be consulted.

4.3 Stakeholder Consultation

The approach to stakeholder consultation for this EP follows the process adopted by Santos for all its EPs. Some modifications to this approach have been made based on feedback from WAFIC, commercial fishers and NOPSEMA. These include:

- Providing more detailed information to commercial fishers, targeted to their fishery, in the initial consultation packs;
- Engaging WAFIC to assist in the review and distribution of commercial fisher consultation material;
- Refinements to the stakeholder identification process to clearly identify and maintain current lists of 'relevant' persons, and
- Clearly documenting and tracking commitments to relevant persons.

Key stakeholders were contacted prior to providing the WA-27-R Tern-1 consultation package to increase activity awareness and to encourage two-way communication. Stakeholders, wherever possible, were provided information tailored to their functions, interests, and activities.

The consultation package contains details such as an activity summary, location map, coordinates, water depth, distance to key regional features and any vessel exclusion zones. Stakeholders were encouraged to provide feedback on the proposed activity. A copy of the consultation material prepared for the WA-27-R Tern-1 EP is contained in **APPENDIX D**.

Individual fishing licence holders, identified in consultation with WAFIC, were provided the WA-27-R Tern-1 Commercial Fishers consultation package by email, and one by post (**APPENDIX D**).

Stakeholders were afforded at least four weeks to review consultation packs, although Santos accepted stakeholder feedback after this period.

4.4 Assessment of Stakeholder Objections and Claims

Santos apply the following standard process to address objections and claims received during the consultation process:

- Santos acknowledge receipt of all comments made by stakeholders.
- Santos assess the merits of all objections and claims made by stakeholders. This includes assessing all reasonably available options for resolving or mitigating the degree to which a stakeholder's functions, interests or activities may be affected. Control measures are then proposed where reasonably practicable.
- Santos responds to all stakeholder objections and claims, and advises the stakeholder how each of their issues will be addressed in the EP.
- Santos invites the stakeholder to provide additional feedback and comment.

A similar process is applied to information provided and requests made by stakeholders not deemed to be an objection or claim.

A summary of the stakeholder consultation undertaken for this EP, including Santos' assessment of all stakeholder comments, objections or claims received, is outlined in **Table 4-2**.

Full transcripts between Santos and stakeholders are provided in the WA-27-R Tern-1 *Sensitive Stakeholder Information Report* as a confidential submission to NOPSEMA.

In relation to stakeholder consultation Santos is of the opinion that Regulation 10A of the OPGGS(E) Regulations has been met.

Table 4-2: Consultation Summary for Activity

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
Commonwealth departments/agencies		
Australian Hydrographic Office (AHO)	AHO was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. AHO acknowledged receipt of information 30 April 2020. AHO was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020. AHO acknowledged receipt of both notifications. Santos provided notice to AHO (and NOPTA) of the revised wellhead coordinates on 30 March 2021 (refer NPF INFORMATION 001). Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Australian Maritime Safety Authority (AMSA)	AMSA was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. AMSA responded on 7 May 2020 noting Santos' proposed decision to permanently leave the abandoned wellhead in permit area WA-27-R. AMSA advised that as the wellhead has been in-situ for the past 49 years, with no impact on shipping, AMSA has no concerns with the proposal to leave the wellhead permanently in-situ **[INFORMATION 001].** Santos responded to AMSA on 8 May 2020 and acknowledged their correspondence of 7 May 2020 (refer assessment of stakeholder objections and claims). AMSA was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	[INFORMATION 001] AMSA has no concerns with the proposal to leave the wellhead permanently in-situ.	Santos responded to AMSA and acknowledged feedback.
Department of Defence (Defence)	Defence was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. Defence was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020. No formal response has been received from the DoD. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Australian Fisheries Management Authority (AFMA)	AFMA was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. AFMA was sent a follow-up email on 11 August 2020, inviting comment on the WA-27-R Tern-1 Consultation Package. AFMA was sent an additional follow-up email on 26 August 2020 in which Santos explicitly outlined that the abandoned Tern-1 wellhead is approximately 1m in diameter and approximately 5m above the sea floor and could pose a potential snag hazard to trawl fishers. Santos invited any comments from AFMA. No formal response received from AFMA to date. AFMA has previously advised it is important to consult with all fishers who have entitlements to fish within the proposed area. This can be done through the relevant fishing industry associations or directly with fishers who hold entitlements in the area. Santos has consulted directly with relevant fishers and fishing industry associations as outlined in **Table 4-2**. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Department of Agriculture, Water and the Environment (DAWE) – Sea Dumping	The Department was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. Santos contacted the Department by telephone on 30 April 2020 to discuss the current approach to permitting of abandoned oil and gas infrastructure, and if a sea dumping permit is required for the Tern-1 wellhead abandoned in 1971. The Department responded to Santos via email on 1 May 2020 and advised: + In response to the query as to whether a sea dumping permit is required for a wellhead abandoned in 1971, we can confirm that since the abandonment took place before the Sea Dumping Act came into force, a permit is not required in this instance **[INFORMATION 001**] + Please ensure you maintain records that demonstrate the date of the abandonment for future reference **[REQUEST 001]**. Santos responded to the Department on 1 May 2020 and acknowledged their correspondence of 1 May 2020 (refer assessment of stakeholder objections and claims). Santos considers the level of consultation to be adequate and will address any additional comments from the Department should they arise in the future	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	[INFORMATION 001] The Department confirmed a sea dumping permit is not required for a wellhead abandoned in 1971.	Santos responded to the Department and acknowledged its advice.
	[REQUEST 001] Ensure records are maintained that demonstrate the date of the abandonment for future reference	Santos responded to the Department and confirmed Santos has maintained the required records.
Department of Agriculture, Water and	The Department was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. The Department was sent a follow-up email on 11 August 2020, inviting comment on the WA-27-R Tern-1 Consultation Package.	

<table>
<tr><th>Stakeholder</th><th colspan="2">Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))</th></tr>
<tr><td>the Environment (DAWE) – Fisheries</td><td colspan="2">The Department responded on 17 August 2020 and in summary:
+ advised it had no comments on the proposed activity [INFORMATION 001]
+ asked to be kept informed of future developments relating to this activity [REQUEST 001]; and
+ asked that Santos maintain regular engagement with the Australian Fisheries Management Authority and the relevant Commonwealth fishing operators throughout this process [REQUEST 002].
Santos acknowledged the Department’s response on 17 August 2020.
The Department was sent an additional follow-up email on 26 August 2020 in which Santos acknowledged the Department’s previous comments and explicitly outlined that the abandoned Tern-1 wellhead is approximately 1m in diameter and approximately 5m above the sea floor and could pose a potential snag hazard to trawl fishers. Santos also confirmed it had consulted with AFMA and with the Northern Prawn Trawlers licence holders through their industry association, the NPF Industry. Santos invited any additional comments from the Department.
The Department responded on 8 September 2020 and advised:
+ the information has been noted by the Department.
+ the Department was pleased to hear that AFMA and impacted fishers have bene consulted; and
+ please keep the department informed of any future information regarding the abandonment of Tern-1 Wellhead [REQUEST 001].
Santos responded to the Department on 23 September 2020 acknowledging their response.
Santos considers the level of consultation to be adequate and will address any additional comments from this stakeholder should they arise in the future</td></tr>
<tr><td></td><td>Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))</td><td>Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))</td></tr>
<tr><td></td><td>[INFORMATION 001] The Department advised it had no comments on the proposed activity.</td><td>Santos acknowledged the Department’s response.</td></tr>
</table>

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	[REQUEST 001] The Department to be kept informed of future developments relating to this activity	Santos acknowledged the Department's response and confirmed they would be kept informed of any future developments.
	[REQUEST 002] Santos maintain regular engagement with the Australian Fisheries Management Authority and the relevant Commonwealth fishing operators throughout this process.	Santos responded and confirmed it had consulted with AFMA and with the Northern Prawn Trawl licence holders through their industry association, the Northern Prawn Trawlers Association.
State Government Departments		
WA Department of Transport (DoT)	DoT was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. DoT responded on 15 May 2020 and confirmed they had no queries from an oil spill perspective **[INFORMATION 001]** Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	[INFORMATION 001] DoT has no queries from an oil spill perspective.	Santos responded to DoT on 15 May 2020 and thanked them for their feedback.
WA Department of Primary Industries & Regional Development (DPIRD)	DPIRD was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. No formal response has been received from the Department. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.

<table>
<tr><th>Stakeholder</th><th colspan="2">Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))</th></tr>
<tr><td>WA Department of Mines, Industry Regulation and Safety (DMIRS)</td><td colspan="2">DMIRS was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020.
DMIRS responded on 5 May 2020:
+ acknowledging Santos propose to leave the Tern-1 wellhead permanently in-situ and an Environment Plan covering this will be assessed by NOPSEMA under the OPGGS(E)R [INFORMATION 001]; and
+ requesting clarification if there were any other wellheads left on the seabed in WA-27-R and of so if these were plugged and abandoned [REQUEST 001]
Santos responded to DMIRS on 8 May 2020 and addressed each of the matters raised (refer assessment of stakeholder objections and claims).
DMIRS responded on 12 May 2020:
+ acknowledging the additional information on the status of the wells [INFORMATION 002];
+ requesting further information on the decision to leave the Tern-1 wellhead in-situ, specifically, asking if Santos considered if it would be possible to remove the Tern-1 wellhead or if there would be benefit in removing the Tern-1 wellhead in future when a rig is brought in to permanently plug and abandon the Tern-2 well [REQUEST 002]
Santos responded to DMIRS on 23 June 2020 and addressed each of the matters raised in their correspondence of 12 May 2020 (refer assessment of stakeholder objections and claims).
DMIRS responded on 23 June 2020 acknowledging the additional information provided by Santos and that no further information was required [INFORMATION 003].
DMIRS was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020.
Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.</td></tr>
<tr><td></td><td>Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))</td><td>Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))</td></tr>
<tr><td></td><td>[INFORMATION 001] DMIRS acknowledged Santos proposes to leave the Tern-1 wellhead permanently in-situ and an Environment Plan covering this will be assessed by NOPSEMA under the OPGGS(E)R.</td><td>Santos responded to DMIRS and acknowledged feedback.</td></tr>
</table>

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	[REQUEST 001] DMIRS requested clarification if there were any other wellheads left on the seabed in WA-27-R and of so if these were plugged and abandoned	Santos advised DMIRS there are four wells in WA-27-R; Tern 1, 2, 4 and 5. All wells except Tern-2 are permanently abandoned. Tern-2 has been temporarily abandoned since the 1980's, with the wellhead remaining in-situ. The well is being managed in accordance with the Tern-2 Well Operations Management Plan (WOMP) and related EP.
	[INFORMATION 002] DMIRS acknowledged the additional information on the status of the wells	Santos responded to DMIRS and acknowledged feedback.
	[REQUEST 002] DMIRS asked if Santos considered if it would be possible to remove the Tern-1 wellhead or if there would be benefit in removing the Tern-1 wellhead in future when a rig is brought in to permanently plug and abandon the Tern-2 well.	Santos advised DMIRS it had conducted a comparative assessment to evaluate the Tern-1 wellhead decommissioning options (**Section 2.4**). In summary, the comparative assessment found that Santos' preferred decommissioning option is permanent abandonment of the wellhead in-situ (Option A). The option to remove the Tern-1 wellhead at a future point in time when a rig is brought in to permanently plug and abandon Tern-2 was considered as part of the financial criteria in the comparative assessment. It found that while potential cost savings would be made by completing the two activities as part of the same campaign, it did not change the results of the comparative assessment.
	[INFORMATION 003] DMIRS acknowledged the additional information, acknowledged the proposal will be assessed by NOPSEMA under the provisions	Santos responded to DMIRS and acknowledged response.

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, and advised no further information was required.	
NT Department of Primary Industry and Resources	The Department was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. No formal response has been received from the Department. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Fishing Bodies		
Western Australian Fishing Industry Council (WAFIC)	<u>WAFIC Fee for Service</u> Santos emailed WAFIC on 23 April 2020 to request WAFIC's fee for service to assist with the identification of relevant fisheries and communication with individual fishers. Draft consultation material was attached. WAFIC responded via email on 29 April and accepted the fee for service request. WAFIC responded on 5 May 2020 providing feedback on Santos' Consultation Pack and maps and identified the following fisheries and organisations as relevant and potentially affected parties to the EP: + State managed o Mackerel Managed Fishery (Area 1) o Northern Demersal Scalefish o North Coast Shark – JA Shark o Pearling (Kimberley Development Zone) + Commonwealth managed o NPF (via Northern Prawn Trawlers Association) + Sector bodies	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))
	○ PPA ○ ASBTIA ○ Northern Prawn Trawlers Association ○ Commonwealth Fisheries Association Santos emailed WAFIC on 6 May 2020 with revised consultation material and maps as requested. WAFIC emailed Santos' commercial fisher consultation material to agreed fishers on 15 May 2020. Santos copied in on all emails. WAFIC emailed Santos on 15 May 2020 confirming all emails sent, plus one consultation pack by post as follows: + Mackerel (Area 1) – all licensees + Northern Demersal Scalefish - all licensees + North Coast Shark – JA Shark - One quota owner + Pearling (Kimberley Development Zone) / Pearl Producers Association + NPF / Northern Prawn Trawlers Association + ASBTIA Australian Southern Bluefin Tuna Industry Association + Commonwealth Fisheries Association The CFA responded to WAFIC and advised it was happy for relevant associations to respond as necessary. <u>WAFIC Consultation</u> WAFIC was provided the WA-27-R Tern-1 consultation package via email on 29 April 2020. WAFIC responded on 5 May 2020 providing the following comments: + Requesting revised maps to provide a more accurate representation of which fishers are "relevant and potentially affected" parties **[REQUEST 001].** + Requesting changes to the Commercial Fisher Consultation material to ensure more commercial fishery / fisher focused and to more clearly indicate there will not be any more activity at this site (there has been nothing since 1971). No exclusion zone - not now and not in the future i.e. the status quo remains the same. **[REQUEST 002]**. + WAFIC note from the information provided that there will not be any changes over this site **[INFORMATION 001].**

<table>
<tr><th>Stakeholder</th><th colspan="2">Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))</th></tr>
<tr><td></td><td colspan="2">+ WAFIC note the potential for FAD (fish aggregation device) benefits and asked if there was a site map demonstrating the natural growth over this site (if any) that would be welcome and good to send to fishers. [INFORMATION 002]
Santos responded to WAFIC on 15 May 2020 and addressed each of the matters raised in their correspondence of 5 May 2020 (refer assessment of stakeholder objections and claims). This included a reference to where their matters had been addressed in the EP, if required.
WAFIC was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2021 and an update to this notice via email on 6 November 2020.
Refer also to consultation summary with NPF in Table 4-2.
Santos acknowledges WAFIC’s support and guidance in the preparation of consultation materials for commercial fishers and in the identification of relevant and potentially affected parties.
Santos considers the level of consultation to be adequate and will address any further comments from WAFIC should they arise in the future.</td></tr>
<tr><td></td><td>Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))</td><td>Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))</td></tr>
<tr><td></td><td>[REQUEST 001] WAFIC requested revised maps to provide a more accurate representation of which fishers are “relevant and potentially affected” parties.</td><td>Santos responded to WAFIC and provided the maps requested for each fishery.</td></tr>
<tr><td></td><td>[REQUEST 002] WAFIC requested changes to the Commercial Fisher Consultation material.</td><td>Santos accepted all WAFIC’s suggested changes and provided the revised Consultation Pack to WAFIC.</td></tr>
<tr><td></td><td>[INFORMATION 001] WAFIC noted from the information provided that there will not be any changes over this site.</td><td>Santos responded to WAFIC and confirmed there will be no additional activity in relation to the Tern-1 wellhead.</td></tr>
<tr><td></td><td>[INFORMATION 002] WAFIC noted the potential for FAD (fish aggregation device) benefits and asked if there was a site map demonstrating the natural growth over this site (if any).</td><td>Santos responded to WAFIC and advised the company does not have a recent site map that may demonstrate potential natural growth over this site since 1971.</td></tr>
</table>

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
Commonwealth Fisheries Association (CFA)	The CFA was provided the WA-27-R Tern-1 Commercial Fisher Consultation Pack and relevant maps via WAFIC on 15 May 2020. Via WAFIC, the CFA advised it was happy for the relevant associations to respond as necessary. No further response received from the CFA. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Pearl Producers Association (PPA)	The PPA was provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. No formal response received from the PPA. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	ASBITA was provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. No formal response received from ASBTIA. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
NPF Industry (NPF I)	The NPF Industry was provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. Santos sent a follow-up email to the NPF Industry on 14 August 2020 inviting comment. Santos and NPF Industry discussed the Tern-1 Wellhead consultation material via telephone on 19 August 2020. NPF Industry confirmed the consultation material had been received, they were clear that the abandoned wellhead would remain in situ, they had no comments to make at that time and would review and respond if any issues. Follow-up email sent to NPF Industry on 19 August 2020. Santos sent a follow-up email to the NPF Industry on 26 August 2020 seeking to ensure the licence holders in the fishery were aware of Santos' plans to permanently abandoned the Tern-1 wellhead and the potential for this to pose a snag hazard to trawl fishers. Santos sent a text message to the NPF Industry on 2 September 2020 advising Santos intended to email licence holders direct to ensure all licence holders were aware that the abandoned Tern-1 wellhead is approximately 1m in diameter and approximately 5m above the sea floor and could pose a potential snag hazard to trawl fishers. The NPF Industry responded on 3 September 2020 and agreed with Santos' proposed action and asked to be copied in on correspondence. Refer also to consultation with licence holders in NPF in **Table 4-2** below. NPF Industry was provided notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020. Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required	No response required.

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
State Managed Fisheries		
Mackerel Managed Fishery (Area 1)	These licence holders were provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. No comments received to date from individual fishers in this fishery. Santos has also consulted directly with relevant representative bodies. Refer to WAFIC comments **Table 4-2.** Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Northern Demersal Scalefish	These licence holders were provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. No comments received to date from individual fishers in this fishery. Santos has also consulted directly with relevant representative bodies. Refer to WAFIC comments **Table 4-2.** Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
North Coast Shark – JA Shark	One identified licence holder in this fishery was provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery maps via WAFIC on 15 May 2020. No comments received to date. Santos has also consulted directly with relevant representative bodies. Refer to WAFIC comments **Table 4-2.**	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))
	No assessment required.	No response required.
Pearling (Kimberley Development Zone)	The Pearl Producers Association, representing licence holders in the Pearling (Kimberley) Development Zone fishery, was provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via WAFIC on 15 May 2020. No comments received to date from individual fishers in this fishery. Santos has also consulted directly with relevant representative bodies. Refer to WAFIC comments **Table 4-2.** Santos considers the level of consultation to be adequate and will address any comments from this stakeholder should they arise in the future.	
	Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))	Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS€ Regulation 16 (b)(iii))
	No assessment required.	No response required.
Commonwealth Managed Fisheries		
NPF	In addition to consultation with the NPF Industry outlined in **Table 4-2** above, the following consultation was undertaken directly with licence holders in the NPF. Licence holders were provided the WA-27-R Tern-1 Commercial Fishers Consultation Pack and relevant fishery map via email on 3 September 2020. The cover email stated the abandoned Tern-1 wellhead is approximately 1m in diameter and approximately 5m above the sea floor and could pose a potential snag hazard to trawl fishers. The consultation material was also sent to the NPF Industry. Santos sent a follow-up email to licence holders on 10 September 2020 referring to the email of 3 September and invited comment. A copy was also sent to the NPF Industry.	

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))
	Santos contacted all NPF licence holders based in WA & NT by telephone on 23 September 2020 to discuss the Tern-1 consultation material. Conversations were held with three of the six licensees contacted and in summary they advised: + Contact 1: Confirmed consultation material had been received. Advised that if the wellhead is recorded on the charts, which the licensee can then relay to all vessels, the licensee had no issue with the wellhead remaining in situ. This licensee also emailed Santos on 23 September 2020 and confirmed the information on Tern-1 Wellhead had been forwarded to skippers. **[REQUEST 001]** + Contact 2: Confirmed consultation material had been received. Advised he had no issue with the abandoned Tern-1 well head remaining in situ given it had been there since 1971. + Contact 3: Confirmed the consultation material had been received and requested it be sent again. Advised he would contact Santos if he had any formal comments to make. **[REQUEST 002]** Santos responded to the matters raised in consultation with Contact 1 and Contact 2 on 23 September 2020 (refer assessment of stakeholder objections and claims). WAFIC, including NPF Industry and a licence holder in the NPF responded on 30 September 2020 providing the following comments **[INFORMATION 001]**: + Prawn trawl fishers hold genuine concern about the future safety of the Tern-1 site. + Note the following points: o Unsure if this site is located in ~ 92 metres, it may be in shallower waters (and therefore closer to or potentially over Tiger prawn fishing area) o They do not fish to a water depth of 92 metres or on “hard bottom” areas o Even if they do not fish at this water depth and if the water depth proves to be 92 metres, it is close to Tiger prawn fishing areas o Vessels do turnarounds and other manoeuvres close to / outside of their fishing areas o Noting Tern-1 is 5 metres above the seabed, there are real concerns that if this snags a vessel net then it is highly likely that the vessel will roll o Query regarding why take the risk when Tern-1 is located in a borderline area o Who will own the liability if a vessel rolls and potentially losing all crew + Commercial fisher offered to go to the Tern-1 site to assess the water depth and terrain.

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))
	Santos responded to WAFIC/NPF Industry on 1 October 2020 (refer assessment of stakeholder objections and claims). WAFIC, including NPF Industry and a licence holder in the NPF responded on 5 October 2020 providing the following additional comments **[INFORMATION 002]**: The licence holder's vessel went to the Tern-1 site on Saturday 3rd October 2020, Note the following: + Confirms the water depth is ~ 90 metres + Confirms the sub-sea terrain is not "hard bottom" (trawlers do not fish hard bottom areas) + Confirms that the sub-sea terrain at this site is what fishers call a "good bottom" i.e., trawlable area + Notes that on their vessel charts skippers have their own additional notes, this site is surrounded by a series of red crosses + Reconfirms this site is close to their Tiger prawn fishing areas + Reconfirms commercial fishing vessels do turnarounds and other manoeuvres close to / outside of their fishing areas – this site could very easily be in a potential turnaround area + Reconfirms concerns with Tern-1 being 5 metres above the seabed, potential risk if this snags a vessel net then it is highly likely that the vessel will roll o If this should occur in mild weather, there is potential to prevent / salvage from a disastrous roll o If in rough weather this would be highly dangerous, a roll close to unpreventable o If poor weather is combined with a running tide – it would be catastrophic + Noting the above points, why take the risk when Tern-1 is located in a borderline area + Seeks clarification regarding who will own the liability if a vessel rolls and potentially losing all crew Santos responded to WAFIC/NPF Industry on 15 October 2020 and requested to meet with WAFIC/NPF Industry and commercial fishers (refer assessment of stakeholder objections and claims). NPF Industry responded on 15 October 2020 and noted that while the Tern 1 location is approximately 50-60 km north of the main cluster of NPF fishing activity, there is some activity around the Tern-1 location. Santos, WAFIC, NPF Industry and commercial fisher met on 19 October 2020 to discuss the matters raised in correspondence of 30 September 2020 and 5 October 2020. A meeting summary is contained in the Sensitive Information Report to NOPSEMA. Key outcome was to check coordinates of the Tern-1 wellhead against fisher vessel records. Santos, WAFIC, NPF Industry and commercial fisher correspond by email between 20 October 2020 and 9 November 2020 to confirm Tern-1 coordinates.

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))
	Santos emailed WAFIC, NPF Industry and commercial fisher on 30 October 2020 and advised: + Santos will be conducting an ROV survey around the Tern-1 well location on or around 23 November 2020. + In the lead up to that inspection, it would be helpful if industry could provide the coordinates of any other potential snagging hazards identified in the vicinity of the Tern-1 location. + Santos will be sending formal notification shortly of the intended ROV activity. NPF Industry acknowledged Santos' advice via email on 30 October 2020. Santos provided WAFIC, NPF Industry and commercial fishers the required notification of planned activity (visual inspection) in the Tern field via email on 30 October 2020 and an update to this notice via email on 6 November 2020. WAFIC responded to Santos on 30 October 2020. WAFIC confirmed activity notification sent to relevant fishers and welcomed site inspection. Santos emailed WAFIC, NPF Industry and commercial fisher on 12 February 2021 and addressed the matters raised in their correspondence of 30 September 2020 and 5 October 2020 (refer assessment of stakeholder objections and claims). WAFIC responded on 12 February 2021, acknowledged receipt of Santos' advice of 12 February 2021 and confirmed they would consult with the commercial fisher and respond. NPF Industry responded on 12 February 2021, acknowledged receipt of Santos' advice of 12 February 2021 and confirmed they would circulate the advice to NPF Industry operators and provide any feedback. Follow-up email to commercial fisher on 19 February 2021. WAFIC responded to Santos on 23 February 2021 and noted, on the commercial fisher's behalf, the wellhead location is approximately 1.5 miles north of the previously known location / previous search area and the fisher will be advising his crew of the revised Tern-1 location **[INFORMATION 003]**. In the same email WAFIC also asked for confirmation there are no recorded entanglement / snag incidents at the Tern-1 site and various questions about liability for damage arising from the presence of the Tern-1 wellhead **[REQUEST 003]**. Santos responded to WAFIC, NPF Industry and the commercial fisher on 23 March 2021 (refer assessment of stakeholder objections and claims).

<table>
<tr><th>Stakeholder</th><th colspan="2">Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))</th></tr>
<tr><td></td><td colspan="2">Santos responded to WAFIC, NPF Industry and the commercial fisher on 11 August 2021 specifically regarding claims regarding the potential (or likelihood) of a vessel rolling and capsizing if it snags on the wellhead; and the distances that vessels travel when they are doing turnarounds or other manoeuvres during trawling operations raised in correspondence on 30 September 2020 [INFORMATION 004].

Santos considers the level of consultation to be adequate and will address any comments from this stakeholder group should they arise in the future.</td></tr>
<tr><td></td><td>Assessment of the merits of objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(ii))</td><td>Statement of response, or proposed response, to the objections, claims, information and requests (OPGGS(E) Regulation 16 (b)(iii))</td></tr>
<tr><td></td><td>[REQUEST 001]: Location of Tern-1 Wellhead recorded on charts.</td><td>Santos responded to the stakeholder on 23 September 2020 and confirmed the Tern-1 Wellhead is recorded on AHS Nautical charts (Table 7-2). Santos invited the licensees to confirm the AHS Nautical charts were the charts referred to in the telephone discussion.</td></tr>
<tr><td></td><td>[REQUEST 002] Consultation material resent to commercial fisher</td><td>Santos responded and resent information to commercial fisher.</td></tr>
<tr><td></td><td>[INFORMATION 001] Santos:
+ Undertook to investigate the concerns raised and respond,
+ Welcomed offer to inspect the site to help assess potential risks.
+ Requested to meet to discuss the concerns raised.
+ Notes on 23 February 2021, the commercial fisher confirmed the wellhead is 1.5 miles north of the previously known location and therefore 1.5 miles further north of actively trawled areas than the commercial fisher previously thought.
+ Therefore concludes, based on the confirmed location of the wellhead, that it is not located on the border of an actively trawled area or inside vessel</td><td>Santos responded to WAFIC/NPF Industry and undertook to investigate concerns raised and meet to discuss.

On 23 March 2021, Santos replied to WAFIC (and NPI and the commercial fisher) to address outstanding concerns, specifically:
+ Vessels do turnarounds and other manoeuvres close to / outside of their fishing areas – the site could be used as a turnaround area.</td></tr>
</table>

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	turnaround areas where it could snag the equipment of actively trawling vessels.	+ Noting Tern – 1 is 5 metres above the seabed, there are real concerns that if this snags a vessel net then it is highly likely that the vessel will roll. + Query regarding why take the risk when Tern-1 is located in a borderline area. + Who will own the liability if a vessel rolls and potentially losing all crew. A summary of Santos' response, with respect to these concerns, is as follows: + Santos acknowledged WAFIC's advice, following a discussion with the commercial fisher, that the confirmed wellhead location is approximately 1.5 miles north of the previously known location / previous search area and therefore 1.5 miles further north of actively trawled areas than the commercial fisher previously thought. + Santos provided the updated wellhead coordinates to NOPTA and the AHO so that notices to mariners could be updated. Santos advised that in relation to liability for damage arising from the presence of the Tern-1 wellhead, there is no allocation of liability regime set out under the relevant petroleum and environmental legislation in respect of the wellhead in respect of which Santos is seeking approval of an EP. Liability for damage to any vessels (fishing or other third parties accessing

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
		the area) arising from the presence of the wellhead is therefore governed by general law.
	[INFORMATION 002] Meeting arranged for 19 October 2020 to discuss matters raised in correspondence of 30 September and 5 October 2020. In response Santos conducted an ROV survey of the Tern-1 wellhead between 24 and 26 November 2020. Following the survey Santos can confirm: + The Tern-1 wellhead was located, and the revised coordinates are 398888.03 E and 8538515.55 N (GDA94) (13° 13' 06.510" S | 128° 04' 00.490" E). + ROV footage did not detect any visible signs of hydrocarbon seeps at or around the wellhead. + No disruption to the seabed occurred as result of the survey. + The wellhead appears to be located on a soft, sandy bottom + Height measurement between top of wellhead corrosion cap to seabed was performed using ROV Depth Gauge. o Top of wellhead corrosion cap @ 92.1m WD o Seabed @ 95.1m WD o Height Measurement = approximately 3.0m Following the survey Santos has evaluated the Tern 1 wellhead decommissioning options and proposes to: + Continue to seek approval to permanently abandon the Tern-1 well head in-situ. + Notify regulators of the revised coordinates. Santos' assessment takes into consideration a number of matters, including, but not limited to: + The wellhead is located in 95 m of water, which is greater than depths normally fished by the Northern Prawn.	Santos responded to WAFIC/NPF Industry and requested to meet to discuss concerns raised. Santos emailed WAFIC, NPF Industry and commercial fisher on 12 February 2021 and provided an update on findings and proposed action.

Stakeholder	Stakeholder Consultation Summary (OPGGS(E) Regulation 16 (b)(i))	
	The recent wellhead survey confirmed there are technical risks associated with attempting to remove the wellhead below the seabed. If the wellhead removal below the seabed is unsuccessful, the wellhead would remain as a trawling snag risk and continue to be charted as a navigation hazard on nautical charts.	
	[INFORMATION 003]. Santos notes the commercial fisher confirmed the wellhead location is approximately 1.5 miles north of the previously known location / previous search area and the fisher will be advising his crew of the revised Tern-1 location. Therefore, Santos concludes that the wellhead is not located on the border of an actively trawled area or inside vessel turnaround areas.	Santos acknowledged this information in a response to the stakeholder on 23 March 2021.
	[REQUEST 003] In correspondence from WAFIC on 23 February 2021 (on behalf of NPI and the commercial fisher), requested confirmation that there are no recorded entanglement/snag incidents at the Tern 1 site.	Santos responded on 23 March 2021 confirming that ROV footage from the survey undertaken in November 2020 showed a fishing net around the Tern-1 wellhead.
	[INFORMATION 004]. On 11 August 2021 Santos responded to WAFIC, NPF Industry and the commercial fisher specifically regarding the potential (or likelihood) of a vessel rolling and capsizing if it snags on the wellhead; and the distances that vessels travel when they are doing turnarounds or other manoeuvres during trawling operations.	Santos stated that it had engaged a Subject Matter Expert on the NPF to assess: + fishing activity and effort, including vessel turnarounds and other manoeuvres in the vicinity of Tern 1 + typical fishing vessel equipment in the NPF + given the activity, effort and technology, the likelihood of an NPF vessel snagging on the wellhead and the likelihood of a snagged net resulting in the vessel rolling. Results of this study are summarised in the Options analysis presented in **Table 2-5**.

4.5 Ongoing Consultation

Santos is seeking approval to permanently abandon, in-situ, the Tern-1 wellhead. Upon acceptance, the petroleum activity ceases and there will be no ongoing stakeholder consultation required under this EP. Notwithstanding this, Santos will continue to consult with its stakeholders on other petroleum activities as a matter of standard business practice and any stakeholder feedback will be addressed as described in **Section 4.6**.

4.6 Addressing Consultation Feedback

Santos will continue to accept and respond to stakeholder feedback during the assessment and post acceptance of this EP.

Santos will maintain records of all stakeholder consultation related to this EP and permanent wellhead abandonment.

5 Environmental Assessment Method

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment
Evaluation of environmental impacts and risks 13(5) The environment plan must include: (a) details of the environmental impacts and risks for the activity; and (b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and (c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level. 13(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from: (a) all operations of the activity; and (b) potential emergency conditions, whether resulting from accident or any other reason.

Environmental impact and risk assessment refers to a process whereby planned and unplanned events that may or will occur during an activity are quantitatively and/or qualitatively assessed for their impacts on the environment (physical, biological, and socio-economic) at a defined location and specified period of time. In addition, unplanned events are assessed on the basis of their likelihood of occurrence, which contributes to their level of risk.

Santos has undertaken environmental impact and risk assessments for this petroleum activity in accordance with the OPGGS(E)R 2009.

The following information relating to the environmental impact and risk assessment approach is provided in this Section of the EP:

+ Terminology used
+ Summary of the approach.

A full description of the process applied in identifying, analysing and evaluating the impacts and risks relating to the petroleum activity is documented in Santos' Environmental Hazard Identification and Assessment Procedure (EA-91-IG-00004).

5.1 Impact and Risk Assessment Terminology

Common terms applied during the impact and risk assessment process and used in this EP are defined in **Table 5-1**.

Table 5-1: Impact and Risk Assessment Terms

Name	Definition
Acceptability	An 'acceptable level' is the specified amount of environmental impact and risk that an activity may have that is tolerable, is consistent with all relevant principles, and does not compromise the EPOs. A definition of acceptability adopted in this EP is provided in **Section 5.2.7**.
ALARP	As low as reasonably practicable. The ALARP principle is that the residual impacts and risk shall be 'as low as reasonably practicable'. It has particular connotations as a route to reduce risks when considering law, regulation and standards.

Name	Definition
	For an impact or risk to be ALARP, it must be possible to demonstrate that the cost involved in reducing the impact or risk further would be grossly disproportionate to the benefit gained. The ALARP principle arises from the fact that infinite time, effort and money could be spent on the attempt to reduce a risk to zero. It should not be understood as simply a quantitative measure of benefit against detriment. It is more a best common practice of judgement of the balance of impact or risk and societal benefit.
EMBA	Environment that may be affected by planned or unplanned events.
Environment	The environment (physical, biological and socio-economic) within the spatial extent over which the planned activity will occur.
Environmental consequence	The severity of an impact in terms of its adverse effects on the environment.
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partly resulting from the planned activity.
Environmental risk	Applies to unplanned events. Risk is a function of the likelihood of the unplanned event occurring and the severity (consequence) of the environmental impact that arises from that event.
Grossly disproportionate	Where the sacrifice (cost and effort) of implementing a control measure to reduce impact or risk grossly exceeds the environmental benefit to be gained.
Hazard	A situation with the potential to cause harm.
Likelihood	Probability of an unplanned event occurring.
Non-routine planned event	An attribute of the planned activity that results in some level of environmental impact and may occur or will occur infrequently during the planned activity.
Planned activity	The activity to be undertaken, including the services, equipment, products, assets, personnel, timing, duration and location.
Receptor	A feature of the environment that may have environmental, social and/or economic values.
Routine planned event	An attribute of the planned activity that results in some level of environmental impact and will occur continuously or frequently through the duration of the planned activity.
Unplanned event	An event that results in some level of environmental impact and may occur despite preventive safeguards in place. An unplanned event is not intended to occur during the activity.

5.2 Summary of the Environmental Impact and Risk Assessment Approach

5.2.1 Overview

Santos' risk management framework considers the requirements of AS ISO 31000:2018, Risk Management – Guidelines (Australian Standards, 2018). The key steps are illustrated in **Figure 5-1.**

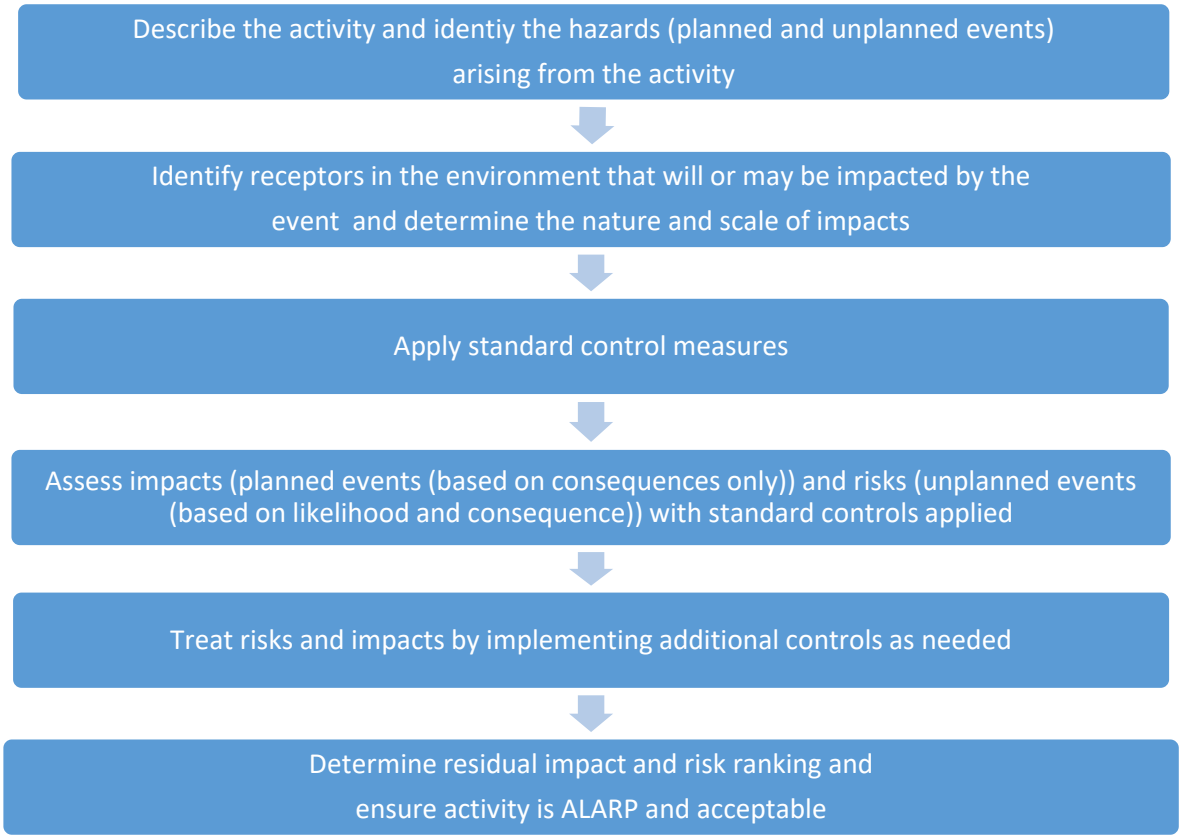


Figure 5-1: Environmental Impact and Risk Assessment Process

Santos' Environmental Hazard Identification and Assessment Procedure (EA-91-IG-00004) includes consideration of the following key areas in an impact and risk assessment:

+ Description of the activity (including location and timing);
+ Description of the environment (potentially affected by both planned and unplanned activities);
+ Identification of relevant persons;
+ Identification of legal requirements ('legislative controls') that apply to the activity;
+ Santos' Environmental Management Policy and Standards;
+ Principles of Ecologically Sustainable Development (ESD); and
+ Santos' acceptable levels of impact and risk.

5.2.2 Describe the Activity and Hazards (Planned and Unplanned Events)

The petroleum activity is described in **Section 2** of this plan. An assessment against the activity was undertaken, and the environmental hazards and aspects were identified. The outcome of this assessment is detailed in **Section 6**. No unplanned environmental events were identified for the activity.

5.2.3 Determine the Nature and Scale of Impacts and Identify Receptors that Will or May be Impacted

The extent of actual or potential impacts from each planned or unplanned event is assessed using, where required, modelling (e.g., hydrocarbon spills) and scientific reports. The duration of the event is also described, including the potential duration of any impacts should they occur. Receptors identified as potentially occurring in impacted areas are detailed in **Section 3**.

5.2.4 Describe the Environmental Performance Outcomes and Control Measures

Typically, for each planned and unplanned event, a set of environmental performance outcomes, environmental performance standards, control measures and measurement criteria are identified. The definitions of the performance outcomes, standards and measurement criteria are consistent with the OPGGS(E)R 2009 and the NOPSEMA Environment Plan Content Requirements Guidance Note (NOPSEMA, 2019).

5.2.5 Determine the Impact Consequence Level and Risk Rankings (on the Basis that All Control Measures have been Implemented)

This step looks at the causal effect between the aspect or hazard and the identified receptor. Impact mechanisms and any thresholds for impacts are determined and described, using scientific literature and modelling where required. Impact thresholds for different critical life stages are also identified where relevant.

The consequence level of the impact is then determined for each planned and unplanned event based on the severity of the impact to relevant receptors in the following categories:

+ Threatened, migratory or local fauna;
+ Physical environment or habitat;
+ Threatened ecological communities;
+ Protected areas; and
+ Socio-economic receptors.

The level of information required to determine the impact or risk assessment depends on nature and scale. This process determines a consequence level based on set criteria for each receptor category and takes into consideration the duration and extent of the impact; receptor recovery time; and the effect of the impact at a population, ecosystem or industry level. Impacts to social and economic values are also considered based on existing knowledge and feedback from stakeholder consultation.

A description of the consequence level is provided in **Table 5-2**.

Table 5-2: Consequence Level Description

Consequence Level		Consequence Level Description
A	Negligible	No impact or negligible impact. Environmental impact lasting days up to 1 week.
B	Minor	Detectable but insignificant change to local population, industry or ecosystem factors. Environmental impact lasting weeks up to 12 months.
C	Moderate	Significant impact to local population, industry or ecosystem factors. Environmental impact lasting 1 to 10 years.
D	Major	Major long-term effect on local population, industry or ecosystem factors. Environmental impact lasting 10 to 20 years.
E	Critical	Complete loss of local population, industry or ecosystem factors AND/ OR major widespread regional impacts with slow recovery to no full recovery. Environmental impact lasting more than 20 years to no recovery.

Note: Injury or mortality to a protected species is included as a moderate consequence level.

As planned events are expected to occur during the activity, the likelihood of their occurrence is not considered during the risk assessment, and only a consequence level is assigned in accordance with Santos' Environmental Severity Descriptors and Consequence Levels.

For unplanned events, in addition to the consequence level of the impact, a risk ranking is determined using an assessment of the likelihood (likelihood ranking) of the impact occurring from an unplanned event (**Table 5-3**). The risk matrix is provided in **Figure 5-2**.

Table 5-3: Likelihood Description

No.	Matrix	Description
5	Probable	1. Event has occurred frequently within the Company. 2. Between 1 and 10 incidents every 10 years (i.e., up to a frequency of 1/year).
4	Likely	1. Event has occurred frequently within the industry. 2. Between 1 and 10 incidents every 100 years (i.e., up to a frequency of 10^{-1}/year).
3	Unlikely	1. Event has occurred occasionally within the Company. 2. Between 1 and 10 incidents every 1,000 years (i.e., up to a frequency of 10^{-2}/year).
2	Very Unlikely	1. Event has occasionally occurred within the industry. 2. Between 1 and 10 incidents every 10,000 years (i.e., up to a frequency of 10^{-3}/year).
1	Rare	1. Event could happen under exceptional circumstances only. 2. Between 1 and 10 incidents every 100,000 years (i.e., up to a frequency of 10^{-4}/year).

		Consequence				
		Negligible	**Minor**	**Moderate**	**Major**	**Critical**
		A	**B**	**C**	**D**	**E**
Likelihood	**5. Probable**					
	4. Likely					
	3. Unlikely					
	2. Very Unlikely					
	1. Rare					

Key:

High Risk	Reduction of risk required
Medium Risk	Reduction of risk required based on ALARP principle
Low Risk	Deemed acceptable based on standard risk controls in place

Figure 5-2: Santos Risk Matrix

The process and definitions supporting the consequence and severity rankings and the likelihood and residual risk ranking determination are included in the Environmental Risk Identification and Analysis Procedure (EA-91-IG-0004).

5.2.6 Evaluating Whether Impacts and Risks are ALARP

For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that the standard control measures adopted reduce the impact (consequence level) or risk to as low as reasonably practicable (ALARP). This process relies on demonstrating that further potential control measures would require a disproportionate level of cost or effort to reduce the level of impact or risk. If this cannot be demonstrated, then further control measures are adopted. The level of detail included in the ALARP assessment is based on the nature and scale of the potential impact or risk. For example, more detail is required for a risk ranked as Medium compared to a risk ranked as Low.

5.2.7 Evaluating Impact and Risk Acceptability

Santos considers an impact or risk associated with the proposed activity to be acceptable if the following criteria are met:

+ The consequence of a planned event is ranked as A or B; or a risk of impact from an unplanned event is ranked Low to Medium;
+ An assessment has been completed to determine whether further information or studies are required to support or validate the consequence assessment;
+ Assessment and management of risks have addressed the principles of ecologically sustainable development;
+ That the acceptable levels of impact and risks have been informed by relevant species recovery plans, threat abatement plans, and conservation advice can be demonstrated;
+ Performance standards are consistent with legal and regulatory requirements;
+ Performance standards are consistent with the Santos Environmental Management Policy;
+ Performance standards are consistent with industry standards and best practice guidance (e.g., National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (Marine Pest Sectoral Committee, 2018));
+ Performance outcomes and standards are consistent with stakeholder expectations; and
+ Performance standards have been demonstrated to reduce the impact or risk to ALARP.

6 Planned Activities Risk and Impact Assessment

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment.
Environmental performance outcomes and standards 13(7) The environment plan must: (a) set environmental performance standards for the control measures identified under paragraph (5)(c); (b) set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and (c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

Santos' environmental assessment identified one potential environmental impacts associated with the defined activity. The results of the impact assessment are summarised in **Table 6-1**

Table 6-1: Summary of the Consequence Level Rankings for Hazards associated with Planned Events

EP Section Reference	Hazard	Residual Consequence Level
6.1	Physical presence – consequences to the environment	A - Negligible

The Tern-1 wellhead was permanently plugged and abandoned in 1971; hence, a well-related hydrocarbon release has not been considered further. There is no Well Operations Management Plan (WOMP) for the Tern-1 well or requirement for an Oil Pollution Emergency Plan (OPEP).

6.1 Physical Presence

6.1.1 Description of Event

Event	The permanent physical presence of the wellhead will continue to: + Provide a hard substrate resulting in the creation of a new habitat + Disturb seabed from the wellhead remaining in-situ permanently + Introduce contaminants to the water column and sediment surrounding the wellhead as it degrades overtime.
Extent	**Localised:** Immediate area surrounding the wellhead.
Duration	**Long term:** The wellhead is expected to persist long term (i.e. it will take many decades to degrade completely).

6.1.2 Nature and Scale of Environmental Impacts

Benthic Habitats

Studies of erosion/accretion around subsea structures (e.g. shipwrecks, artificial reefs) indicate indirect impacts may be limited to within 20 m of the structure (Smiley 2006; Lewis and Pagano 2016). Given the small size of the Tern-1 wellhead, this is considered a reasonable, if not conservative, potentially affected area.

Surveys undertaken in the Tern field more recently (ERM, 2011) do not indicate a significant change in the existing seabed, with sand identified as the predominant seabed habitat and no unique marine invertebrates or benthic assemblages (**Section 3.3**).

As the wellhead degrades over time breakdown products (predominantly non-toxic iron oxides) will be released into the surrounding water column and the surrounding sediments. Ocean currents are expected to rapidly disperse the breakdown products.

As the wellhead integrity reduces over time, sections of the wellhead may break off and fall onto the surrounding seabed. This would only affect habitat (i.e. unconsolidated sediments) within 5 m of the wellhead.

Fauna

Since 1971, the wellhead is expected to have become a stable benthic habitat with higher marine life abundance and diversity (notably fish) than the surrounding naturally flat, sandy sediments. This 'reef effect' of anthropogenic structures has been well documented (e.g. Love and York 2005; Pradella et al 2014). The value of the wellhead as artificial benthic habitat will continue until the wellhead has completely degraded (i.e. potentially in excess of a hundred years).

The release of breakdown compounds into the water column and accumulation in sediments may affect marine fauna, particularly infauna species surrounding the wellhead. Notwithstanding this, iron oxide is naturally occurring and generally has low toxicity to marine biota.

6.1.3 Environmental Performance Outcomes and Control Measures

The control measures considered to prevent or mitigate the identified impacts are shown in **Table 6-2**.

The well head is comprised predominantly of iron which is not considered to be a contaminant in the marine environment. Corrosion is likely to be a relatively slow process about 0.2mm/year (Melchers, 2005). Based on the composition of the wellhead and the low corrosion rate of the wellhead materials environmental impacts associated with leaving the wellhead in situ are considered to be of an acceptable level. As the potential impacts are considered to be acceptable and changes to the marine environment as a result of leaving the wellhead in situ are likely to be undetectable, environmental performance outcomes relating to environmental monitoring have not been included.

Table 6-2: Wellhead Physical Presence (Environmental Consequence) Control Measure Evaluation

Control Measure Reference No.	Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
N/A	Complete Removal (Base Case)	Removing the wellhead will result in the environment being left in a condition close to what it was before the well was drilled. However, given the small size (1 m wide by 3 m tall) and properties of the wellhead (inherit material) the environmental benefits are expected to be small.	It is estimated that wellhead removal costs would be in the range of AUD 3M to 5 M. The removal operations would, amongst other environmental affects, cause localised seabed disturbance, generate metal cuttings and remove artificial habitat. The operation would also result in health and safety risks to the workforce.	**Rejected** – As detailed in **Section 2.5**, wellhead removal would pose more environmental impacts and risks than it mitigated. Further unnecessary health and safety risks to the workforce would result. As such, the costs and health and safety risks to remove the wellhead are considered disproportionately high to the low environmental effects of leaving the wellhead in-situ.
N/A	Wellhead monitoring	Monitoring of the wellhead would assist in validating the environmental assessment that concluded only negligible impacts.	It is estimated that each monitoring campaign would cost between AUD 100,000 to 200,000. Numerous monitoring campaigns would be required to collect meaningful data. Impacts are unlikely to be detectable beyond the immediate area surrounding the wellhead Impacts are also unlikely to be detected for a number of years based on the slow rate of wellhead corrosion (0.2 mm/year) (Melchers, 2005). Similar to above, offshore vessel operations would generate	**Rejected** – There is no compelling reason for wellhead monitoring given the environmental assessment is predicting negligible impacts. There is a low level of uncertainty associated with the impact prediction. As such, the costs and health and safety risks associated with an offshore monitoring program are considered disproportionately high to the low environmental benefits that a monitoring program would possibly provide.

Control Measure Reference No.	Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
			environmental emissions (e.g. Greenhouse Gas (GHG), noise, etc.) and result in health and safety risks to the workforce.	
N/A	Wellhead maintenance	No environmental benefit is expected from any wellhead maintenance.	Refer to above costs and health and safety issues associated with wellhead monitoring.	**Rejected –** There is no justification for maintaining the wellhead. The wellhead is not expected to be contaminated with any hazardous material. The well has been permanently plugged and abandoned, hence, the wellhead is of no use. The wellhead will slowly degrade, lose its structure integrity and break apart. This is inevitable and the desired outcome.

6.1.4 Environmental Impact Assessment

An environmental impact assessment of the abandoned wellhead is provided in **Table 6-3**.

Table 6-3: Environmental Impact Assessment of the Abandoned Wellhead

Receptor	Consequence Level
Threatened or migratory fauna	Corrosion of the wellhead over time could result in the release of trace amounts of metals (e.g., iron and manganese) to the water column and surrounding sediments. Due to the robustness of the materials of the wellhead and the deep-water location of the wellheads, corrosion is likely to be a relatively slow process about 0.2mm/year (Melchers, 2005). Iron, the main constituent (~98%) of the wellheads and casing material, is not considered a significant contaminant in the marine environment and is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997) and is an abundant element in marine sedimentary systems (Taylor et al, 2011). Given the slow breakdown process, such levels will not be met at any point during the breakdown of the wellhead. The operational area overlaps the foraging BIAs for the green turtle, the olive ridley turtle and the flatback turtle (**Section 3.3.6.1**) although the presence of these species in the operational area for any duration is unlikely (**Section 3.3.6.1**).

Receptor	Consequence Level
	Given the low toxicity of iron (iron is on the OSPAR PLONOR list), the slow release rate and rapid dilution in the open ocean environment, no impacts are expected to protected species that may occur at the depth of the wellhead. Therefore, impacts to threatened or migratory fauna are assessed as negligible (A).
Physical environment or habitat	Localised scouring and accretion has the potential to alter the seabed and associated benthic communities around the wellheads. Studies of erosion/accretion around subsea structures (e.g. shipwrecks, artificial reefs) indicate indirect impacts may be limited to within 20 m of the structure (Smiley 2006; Lewis and Pagano 2016). Corrosion of the wellhead over time could result in the release of trace amount of metals (e.g. iron and manganese) to the water column and surrounding sediments. Considering the composition of the wellhead and the flat featureless benthic habitat within the operational area comprised predominantly of sand with a proportion of silt and clay, impacts to the physical environment or habitat are assessed as negligible (A).
Threatened ecological communities	Not applicable – No threatened ecological communities occur at or near the wellhead.
Protected areas	Not applicable – No protected areas occur at or near the wellhead (**Section 3.4.1**).
Socio-economic receptors	Adverse impacts to commercial fisheries' target species are not predicted given the small size and inherent properties of the wellhead. The wellhead will provide a hard substrate habitat on a seabed predominantly comprised of soft sediment. Several studies undertaken on wellheads on the NWS have observed a diverse range of reef dependant and transient pelagic species associating with structures including commercially fished species (Pradella et al. 2014). Wellheads in the NWS at depths between 82 and 135 m were found to sustain full populations of Prubrizonatus from juveniles through to adults (Fowler and Booth, 2012). The physical presence of the wellhead is likely to have a localised increase the diversity and abundance of some fish species; thereby providing the potential for fish assemblages. No commercial fisher or stakeholder concerns have been raised to date. Therefore, impacts to socio-economic receptors are assessed as negligible (A).
Worst-case consequence level	A – Negligible

6.1.5 Demonstration of ALARP

As described in **Section 1.1**, abandonment of the wellhead in-situ is the preferred option. The environmental impacts of this option have been assessed as negligible.

While removing the wellhead would also result in negligible environmental impacts, this option introduces company financial costs, environmental risks (e.g. vessel fuel oil spills) and workforce health

and safety risks. Santos has concluded that the financial costs and health and safety risks are disproportionately high to the low environmental benefits obtained from removing the wellhead.

Wellhead maintenance and monitoring control measures were considered but rejected given they provided no material environmental benefit. The cost and health and safety risks associated with these control measures could not be justified in this instance.

6.1.6 Acceptability Evaluation

Is the consequence ranked as A or B?	Yes – maximum environmental consequence is A (Negligible).
Is further information required in the consequence assessment?	No – potential impacts and risks are sufficiently understood through the information available.
Are risks and impacts consistent with the principles of ecological sustainable development?	Yes – activity evaluated in accordance with Santos WA's Environmental Hazard Identification and Assessment Procedure which considers principles of environmentally sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?	Yes – there are four Recovery Plans under the EPBC Act for species that may occur in the operational area. The petroleum activity does not impact the recovery objectives set out in these plans. The Recovery Plans are for sawfish, blue whales, marine turtles and white sharks (**Section 3.3**). Santos has consulted with relevant decision-making government authorities and no concerns or objections have been raised. DAWE has advised that a Sea Dumping Permit is not required in this instance.
Are risks and impacts consistent with Santos WA's Environmental Management Policy?	Yes – aligns with Santos' Environment, Health and Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – no concerns or objections raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes (see ALARP above).

The potential environmental consequence of leaving the wellhead in-situ has been assessed as negligible (A). No control measures are considered necessary to further reduce the environmental impacts. The wellhead has been in place since 1971 without any known environmental or reported stakeholder impacts.

7 Environmental Assessments for Unplanned Events

OPGGS(E)R 2009 Requirements
Regulation 13. Environmental assessment.
Evaluation of environmental impacts and risks 13(5) The environment plan must include: (a) details of the environmental impacts and risks for the activity; and (b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and (c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level. 13(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from: (a) all operations of the activity; and (b) potential emergency conditions, whether resulting from accident or any other reason. Environmental performance outcomes and standards 13(7) The environment plan must: (a) set environmental performance standards for the control measures identified under paragraph (5)(c); and (b) set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and (c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

Santos' environmental assessment identified one potential source of environmental risk associated with unplanned events for this activity. The results of the environmental assessment are summarised in **Table 7-1**.

Table 7-1: Summary of the Risk Assessment Rankings for Unplanned Activities

EP Section Reference	Hazard	Consequence	Likelihood	Risk Level
7.1	Interaction with other marine users	B (minor)	3 (unlikely)	Low

A comprehensive risk and impact assessment for this unplanned event and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP are detailed in the following section.

7.1 Interaction with other Marine Users

7.1.1 Description of Event

Event	The physical presence of the wellhead may interfere with third-party activities including: + Current and future commercial fishing activities (accidental damage to trawling equipment). + Current and future oil and gas activities + Current and future shipping activities
Extent	**Localised:** Within the operational area.
Duration	**Long term:** The potential effects may occur until equipment degrades (i.e. many decades).

7.1.2 Nature and Scale of Environmental Impacts

7.1.2.1 Commercial Fisheries

Consultation

Fisheries which may be active within the vicinity of the operational area include the NPF and Northern Demersal Scalefish Fishery (**Section 3.4**). The NPF is a trawl fishery; hence, the wellhead may represent a trawl net snag hazard.

Santos consulted with NPF Industry, WAFIC and all individual fishing licence holders within the NPF as described in **Section 4.4**. One licence holder within the NPF raised concerns regarding the physical presence of the wellhead and potential snag risk as the wellhead lies in a trawlable area close to tiger prawn fishing areas (**Section 4.4**).

Given uncertainty over the exact location of the wellhead and changes in geographic datum systems over time, as well as stakeholder concern regarding the presence of the wellhead, Santos conducted an ROV survey of the wellhead in November 2020. The survey confirmed the wellhead is on a softbottom, approximately 1 m in diameter and 3 m above the seabed at a depth of approximately 95 m.

In February 2021, Santos provided the confirmed wellhead coordinates to NOPTA and AHO, to update navigation charts, as well as to the NPF licence holder, who disseminated the wellhead location to vessel crews. The NPF licence holder confirmed they do not trawl in waters as deep as 95 m and no further concerns have been raised by the licence holder.

Fishing effort in the operational area

To ensure concerns raised by the licence holder were assessed and addressed adequately, Santos engaged a Subject Matter Expert, the AMC to undertake an assessment of the potential impacts of the wellhead on the NPF. The study found that most of the trawling activity and harvest comes from the Gulf of Carpentaria, especially during the tiger prawn season. The western most area of the fishery (Joseph Bonaparte Gulf in the vicinity of the operational area) has a much lower fishing effort. This is consistent with analysis of fishing intensity data presented in Fishery Status Reports (Patterson et al.), which indicates that the operational area is 23 km north of the current recorded fishing effort areas (**Figure 3-2).**

The Joseph Bonaparte Gulf is fished primarily for Banana prawns which are found at shallower depths than the operational area (95 m). The common Banana prawn is caught in water <45 m deep (NPF25, 1994). Adults of the deeper water Indian white variety of banana prawns are found in depths from 45-85 m.

The number of vessels working in the NPF has also decreased in the last four decades from a peak of 292 licenced vessels in the 1980s to 52 vessels in present day. With this reduction in vessel numbers there is less capacity in the fleet for exploratory fishing, therefore remote areas such as the Joseph

Bonaparte Gulf are less frequently fished. This is unlikely to change in the foreseeable future, fishing in the Joseph Bonaparte Gulf may decrease even further as larger fishing companies acquire boat licences (AMC, 2021).

Double rig and quad rig vessels operating in the NPF are designed for fishing in relatively shallow waters (<50 m), due to the inside board clearance requirement, and therefore are unlikely to venture to the deeper waters of the operational area (95 m) (AMC, 2021).

Based on this information although the wellhead is located within a trawlable area, fishing effort in the vicinity of the operational area is likely to be low.

Assessment of snag risk

The NPF vessels are equipped with one or more echosounders and GPS plotters. Echo sounders detect strong target strength seabed obstacles such as the wellhead. Given the water depth of the operational area, the trawl gear in 95 m of water may reside some 250 to 300 m astern of the vessel, so there would be sufficient time and room to manoeuvre to avoid the obstacle. GPS plotters accurately show the vessels position relative to marked seabed infrastructure such as the well-head and allow trawlers to plan their routes to safety avoid the obstacle (John Wakeford Pers Comm, 2021).

Further, a review of the historical fishing vessel incident data from AMSA Monthly Domestic Vessel Incident Reporting Database (2 year data set) and Australian Transport Safety Bureau (ATSB) Marine Safety Investigations Reports (1982-2020) shows that there are no reported fishing vessel incidents confirmed as related to offshore oil and gas infrastructure in Australia.

Outside of Australia, historically, wellheads are recorded to have caused fewer snag incidents in commercial fisheries, compared to pipelines and marine debris from oil and gas operations, which accounted for more than 50% of incidents in the UK between 1989 and 2016 (Rouse, 2020). In comparison, production infrastructure, which includes wellheads, were involved in 4% of incidents over the same period (Rouse, 2020). Overall, the likelihood of interactions between trawl equipment and oil and gas infrastructure is reducing over time, as a result of an increase in communication between the oil & gas industry and improvement in fishery GPS equipment (Rouse, 2020).

Based on the low level of fishing effort in the area, the navigational equipment on board the NPF vessels and likely improvements in GPS fishing equipment in the future, the risk of trawl net snagging is low.

Footage from the November 2020 ROV survey shows a fishing net around the Tern-1 wellhead. The net has not been identified and could be a net washed up from elsewhere. Santos considers it unlikely to be a snag risk based on the information outlined above specifically:

+ Santos consults regularly with fishing licence holders and has not received any reports of snagging on the wellhead or damage to equipment.
+ ATSB and AMSA databases show that there are no reported fishing vessel incidents confirmed as related to offshore oil and gas infrastructure in Australia.
+ Fishing intensity data indicates the wellhead is 23 km north of the low-moderately trawled areas (**Figure 3-2**)
+ SME advice confirmed that vessels in the NPF have equipment (echo sounders, GPS etc) designed to avoid navigational hazards.

Risk of vessel capsizing

In the unlikely event of snagging, potential consequences are financial loss to commercial fishers either through lost fishing time or damages to, and losses of, fishing gear (Rouse, 2020). Studies of historical snag incidents in the UK have found that vessel damage or loss occurred less than 0.5% of the time, with one capsize resulting in fatalities/injuries occurring in the UK between 1989 and 2016 (Rouse, 2020), equating to 0.06% of incidents.

The Northern Demersal Scalefish Fishery is a trap and line fishery. As it is not a trawl fishery, the wellhead does not represent a trawl net snag hazard. Further, analysis of DPIRD Fishcube data over

the 2008 to 2018 period indicates there was no fishing effort in a 10 NM block surrounding the Tern-1 wellhead (**Figure 3-3**). Impacts to the current and future Northern Demersal Scalefish fishery are considered negligible.

7.1.2.2 Petroleum Industry

The presence of the wellhead on the seabed may interfere with future petroleum activities (e.g. interfere with jack-up rig placement). However, due to the small footprint (~1 m diameter) and known presence of the wellhead any such interference would be insignificant. The debris clearance survey conducted as routine precursor would identify the structure on the seabed. As such, this potential impact is not discussed further.

7.1.2.3 Shipping

There are no known recognised major shipping routes within the immediate vicinity of the operational area, however vessels may pass through the general area. Interactions with shipping is unlikely currently or in the future based on the water depth of the Operational Area (95 m) and the height of the wellhead (3 m).

7.1.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event is:

+ Reduce impacts on other marine users through the provision of information to relevant stakeholders such that they are able to plan for their activities and avoid unexpected interference [EPO-2].

The control measures for this event are shown in **Table 7-2,** and environmental performance standards and measurement criteria for the EPOs are described in **Table 8-1**.

Table 7-2: Control Measure Evaluation for Interaction with Other Marine Users

Control Measure Reference No.	Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls				
CM-1	Navigational charting of property.	Wellhead is charted on AHO nautical charts so that marine users are aware of its location, they can therefore avoid the wellhead if required thus reducing snag risk Marine users will not be excluded from area.	No additional costs to Santos.	**Adopted** – The positive benefits of identifying the wellhead to other marine users by confirming it continues to be charted with the AHO is considered acceptable. Charting is considered an effective measure to reduce the snag risk to NPF. Under the Navigation Act 2012, AHO is responsible for maintaining and disseminating hydrographic and other nautical information and nautical publications. Specifically, subsea infrastructure is identified as a potential subsea hazard to commercial shipping activities (such as fisheries) and thus locations are included on appropriate marine charts.
CM-2	Notification of NPF stakeholders of the wellhead location via the NPF Industry (representative body)	NPF are aware of the wellhead location, they can therefore avoid the wellhead if required thus reducing snag risk	No additional cost	**Adopted** – Benefit, NPF are aware of location of the wellhead and can avoid it if required in the vicinity.
Additional Controls				
N/A	Complete Removal (Base Case).	Removing the wellhead will remove the current and future trawl net snag hazard risk. However, removal by external cutting may not be	It is estimated that wellhead removal costs would be in the range of AUD 3M to 5M* as two campaigns would be required one for marine growth cleaning and	**Rejected** – As detailed in **Section 2.5**, leave in situ is the preferred decommissioning outcome as it provides a benefit from an environmental, safety and technical perspective.

Control Measure Reference No.	Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
		technically feasible due to the presence of the GB and would result in seabed disturbance. Removal by internal cutting may not be technically feasible as the high-pressure housing, temporary abandonment cap and latching mechanism are unknown potentially preventing internal access,	inspection, the other for removal of the wellhead. The removal operations would, amongst other environmental affects, cause localised seabed disturbance, discharge of non water based muds, generate metal cuttings and remove artificial habitat. The operation would also result in health and safety risks to the workforce due to the unknown condition of the wellhead. There would also be GHG emissions associated with the removal campaign and subsequent wellhead disposal. * The lower estimate considers potential cost savings by completing on of the campaigns in conjunction with future nearby petroleum activities (e.g. Tern-2 plug and abandonment). The upper estimate is based on two dedicated wellhead removal campaigns.	Attempting to remove the wellhead would also introduce technical risks (described in **Section 2.5**) and cost in the range of AUD 3M to 5M. Given the wellhead is in an area that is not actively trawled, will be marked on navigational charts and the trawl vessels are equipped with navigational equipment such as echo sounders and GPS plotters the risk of snagging is low. Future fishing effort in the area is likely to low as the larger fishing companies acquire available boat licences, leaving less capacity for exploratory fishing. Interactions between trawl equipment and oil and gas equipment are likely to reduced overtime due to improvements in fishery GPS equipment Based on the low current and future likelihood of interactions between the well head and the NPF fishery and the environmental impacts, potential technical difficulties and costs associated with removal, leaving the wellhead in situ is the preferred option.

Control Measure Reference No.	Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
N/A	Install a wellhead cover or cap	Installing a wellhead cover or cap to reduce snagging risks to commercial trawl fishers.	Significant cost (in the range of AUD 1.4M to 1.8 M.) associated with conducting installation program. Offshore campaign would introduce environmental impacts and risks, including air emissions and fuel oil spill risks, associated with vessel operations. Disturbance to seabed while placing the cover or cap on the seabed. Health and safety risks associated with vessel and installation operations, plus onshore logistics operations.	**Rejected** –. The height of the wellhead may need to be reduced to allow for the placement of a 'low profile' cover or cap. The impacts would be similar to those associated with complete removal. This option was rejected as it provided little benefit over the base case.

7.1.4 Environmental Impact Assessment

The impacts and consequence ranking for interactions with other marine users are outlined in **Table 7-3**.

Table 7-3: Impacts and Consequence Ranking – Interaction with Other Marine Users

Receptor	Consequence Level
Interaction with other marine users	
Threatened or migratory fauna	Not applicable – related to socio-economic receptors only.
Physical environment or habitat	
Threatened ecological communities	
Protected areas	
Socio-economic receptors	The impact of the Tern-1 wellhead on socio-economic receptors is considered to be minor (B) due to the fact that: + There is no exclusion zone placed over the wellhead, therefore fishing can occur. + The wellhead is marked on nautical charts. + The equipment presents an isolated, small vertical feature in a relatively flat seabed that may be detectable to sonar used by trawling vessels. + The small size (approx. 1 m diameter) of the wellhead means any deviation from normal fishing practices would be minimal. Based on historical data, the operational area is not a frequently fished by commercial fishers. + The risk of the wellhead being a snag hazard is considered low given that stakeholder consultation confirms the wellhead is at least 1.5 miles north of actively trawled Tiger prawn areas. + Based on fishing intensity data indicating the wellhead is 23 km north of low-moderately trawled areas (**Figure 3-2**), as well as confirmation that vessels in the NPF have equipment (echo sounders, GPS etc) designed to avoid navigation hazards and there has been no recorded fishing incidents related to the oil and gas industry recorded in Australia, the risk The risk of the wellhead being a snag hazard is considered low. + Any future users could reasonably be expected to become aware of its presence through due diligence (e.g., reviewing nautical charts).
Overall worst-case consequence	B-Minor
Likelihood	Unlikely
Residual risk	Low

7.1.5 Demonstration of ALARP

As described in **Section 1.1**, abandonment of the wellhead in-situ is the preferred option.

While removing the wellhead would result in negligible impacts to other marine users, this option introduces company financial costs, environmental risks (e.g. vessel fuel oil spills, GHG emissions) and workforce health and safety risks.

Stakeholder consultation has confirmed that the wellhead lies in a trawlable area close to tiger prawn fishing areas. However, fishing effort in the vicinity of the wellhead is likely to be low due to the following factors:

- The main fishing effort of the NPF is within the Gulf of Carpentaria.
- Joseph Bonaparte Gulf is fished primarily for Banana prawns which are found at shallower depths than the Operational Area (95 m)
- The number of working vessels in the NPF has decreased in recent years
- The vessels operating within the NPF are configured for fishing in shallow water and are therefore unlikely to venture into the deeper waters of the Operational area
- The wellhead will be marked on navigational charts and the NPF is equipped with echo sounders and GPS plotters therefore snag risk is also low.

Fishing effort is likely to remain low in the future as larger companies acquire more available boat licenses reducing the capacity for exploratory fishing. Improvements in fishery GPS equipment will also reduce snag risk overtime.

Given the low risk of interaction with current and future prawn trawlers, Santos considers the financial costs and health and safety risks disproportionately high in comparison to the negligible benefits to other marine users obtained from removing the wellhead.

7.1.6 Acceptability Evaluation

Is the consequence ranked as A or B?	Yes – maximum consequence is B (Minor).
Is further information required in the consequence assessment?	No – potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecological sustainable development?	Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?	Yes – Santos has consulted with relevant decision-making government authorities and no concerns or objections have been raised. DAWE has advised that a Sea Dumping Permit is not required in this instance.
Are risks and impacts consistent with Santos WA's Environmental Management Policy?	Yes – aligns with Santos' Environment, Health and Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes –. One licence holder within the NPF raised concerns with regard to the presence of the wellhead and potential snag risk. Santos responded to the stakeholder concerns by

	+ undertaking an ROV survey to confirm the location of the wellhead in relation to fished areas + Commissioning an independent study to assess the potential impacts of the wellhead to the NPF + Adopting additional controls such as notifying NPF Industry of the well location No further comments have been received from the stakeholders regarding the presence of the wellhead A summary of consultation undertaken is provided in **Section 4**.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes (see ALARP above).

The potential socio-economic risk of leaving the wellhead in-situ has been assessed as minor (B). With the control measures in place, including charting on nautical charts via the AHO and notification of the well head location to NPF licence holders via the NPF Industry no significant impacts are expected. The wellhead has been in place since 1971 without any reported impact to stakeholders.

8 Implementation Strategy

OPGGS(E)R 2009 Requirements
Regulation 14(1)
The environment plan must contain an implementation strategy for the activity in accordance with this regulation.
Regulation 14(10)
The implementation strategy must comply with the Act, the regulations and any other environmental legislation applying to the activity.

8.1 Environmental Performance Reporting

The defined petroleum activity ends upon acceptance of the EP by NOPSEMA.

Santos will submit Regulation 29 (1) and (2) notifications within 10 days of EP acceptance.

Santos will provide an environmental performance report, in accordance with Regulation 26C, as well as a Regulation 25A notification, within 3 months of EP acceptance.

8.2 Environmental Management System

Santos' Management System (SMS) exists to support its moral, professional and legal obligations to undertake work in a manner that does not cause harm to people or the environment. The SMS is a framework of policies, standards, procedures and tools, that when used together by a properly resourced and competent organisation, result in:

+ A common management approach being followed across the organisation;
+ Risk being appropriately identified, managed, monitored and reported;
+ Compliance with legal obligations;
+ Mandatory environmental management requirements being implemented and audited;
+ Environmental management performance being measured and corrective actions taken;
+ Opportunities for improvement being recognised and implemented where feasible;
+ The workforce being engaged and environmental management commitments being understood and implemented; and
+ External stakeholders being consulted and appropriately informed.

8.3 Environmental Performance Outcomes

To ensure environmental risks and impacts will be of an acceptable level, environmental performance outcomes have been defined and are listed in **Table 7-1**.

Table 8-1: Environmental Performance Outcomes

Reference	Environmental Performance Outcomes
EPO-1	Marine users are not adversely impacted by the physical presence of the wellhead.

8.3.1 Control Measures and Performance Standards

The control measures that will be used to manage identified environmental impacts and risks and the associated statements of performance required of the control measure (i.e., environmental performance standards) are listed in **Table 8-2**. Measurement criteria outlining how compliance with the control measure and the expected environmental performance could be evidenced are also listed.

Table 8-2: Control Measures and Performance Standards

Control Measure	Control Measure Reference No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	Relevant Sections of the EP
Navigational charting of wellhead.	T1-CM-1	The Tern-1 wellhead is charted on Australian Hydrographic Service nautical charts.	T1-CM-1-EPS01	Australian Hydrographic Service nautical charts show that the wellhead is charted.	**Section 7.1**
Notification of NPF stakeholders of the wellhead location via the NPF Industry (representative body)	T1-CM-2	The NPF Industry notifies NPF stakeholders of the wellhead location.	T1-CM-2-EPS01	Correspondence from the NPF Industry demonstrates that NPF stakeholders have been notified in writing of the Tern 1 wellhead location coordinates.	**Section 7.1**

8.4 Chain of Command

Provided in **Table 8-3** is an outline of the chain of command and associated roles and responsibilities relevant to this EP.

Table 8-3: Chain of Command, Roles and Responsibilities

Role	Responsibilities
Santos Offshore EVP	+ Has overall accountability for the implementation of the SMS, including the Environment, Health and Safety Policy, within the Santos Offshore Division
General Manager – Offshore Development	+ Has overall responsibility for approving the EP and ensuring compliance.
Santos HSE Coordinator	+ Reviews conformance with environmental performance outcomes and standards, and the implementation strategy; and + Submits required regulatory reports.
Santos Consultation Coordinator	+ Responds to stakeholders and maintains stakeholder consultation records and database.

8.5 Workforce Training and Competency

There are no training or competency requirements that apply to the implementation of this petroleum activity.

8.6 Environmental Performance Management

There is no monitoring, auditing, management of nonconformances or review of Santos' environmental performance or implementation strategy required for this petroleum activity.

Santos will retain records of conformance against the control measure stated in **Table 8-2**, along with any additional stakeholder consultation specific to the Tern-1 wellhead abandonment.

8.7 Emissions and Discharges

There will be no emissions or discharges for this petroleum activity; hence, no need for monitoring or record keeping.

8.8 Emergency Preparedness and Response

An oil spill emergency plan is not required for this petroleum activity as no unplanned events or risks were identified during the environmental assessment (**Section 6**).

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APPENDIX A SANTOS ENVIRONMENT, HEALTH AND SAFETY POLICY

Santos

Environment, Health & Safety

SMS Santos

Policy

Our Commitment

Santos is committed to being the safest gas company wherever we have a presence and preventing harm to people and the environment

Our Actions

We will:

1. Integrate environment, health and safety management requirements into the way we work
2. Comply with all relevant environmental, health and safety laws and continuously improve our management systems
3. Include environmental, health and safety considerations in business planning, decision making and asset management processes
4. Identify, control and monitor risks that have the potential for harm to people and the environment, so far as is reasonably practicable
5. Report, investigate and learn from our incidents
6. Consult and communicate with, and promote the participation of all workers to maintain a strong environment, health and safety culture
7. Empower our people, regardless of position, to "Stop the Job" when they feel it necessary to prevent harm to themselves, others or the environment
8. Work proactively and collaboratively with our stakeholders and the communities in which we operate
9. Set, measure, review and monitor objectives and targets to demonstrate proactive processes are in place to reduce the risk of harm to people and the environment
10. Report publicly on our environmental, health and safety performance

Governance

The Environment Health Safety and Sustainability Committee is responsible for reviewing the effectiveness of this policy.

This policy will be reviewed at appropriate intervals and revised when necessary to keep it current.

Kevin Gallagher

Managing Director & CEO

Status: APPROVED

Document Owner:	Jodie Hatherly, General Counsel and VP Legal, Risk and Governance		
Approved by:	The Board	Version:	3

20 August 2019

APPENDIX B REQUIREMENTS (LEGISLATION, GUIDELINES AND CODES OF PRACTICE)

Commonwealth Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
Corporations Act 2001	This Act is the principal legislation regulating matters of Australian companies, such as the formation and operation of companies, duties of officers, takeovers and fundraising.	Yes	Commonwealth – Australian Securities and Investments Commission	The titleholder has provided ACN details within the meaning of the Act	**Section 1**
Environment Protection and Biodiversity Conservation Act 1999 Environment Protection and Biodiversity Conservation Amendment Regulations 2006	The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is the sole assessor for offshore petroleum activities in Commonwealth water (as of 28 February 2014). Under the new arrangements, environmental protection will be met through NOPSEMA's decision-making processes. This Act is the Australian Government's key piece of environmental legislation. The Act focuses on the protection of matters of national environmental significance (MNES). Australian Marine Park Management Plans were also developed under this Act.	Yes	Commonwealth – Department of Environment and Energy	This Act applies to all aspects of the petroleum activity that have the potential to impact MNES. Appropriate environmental approvals will be sought from NOPSEMA for all operations (this EP) which outlines compliance with the relevant regulations and plans under the Act. Where activities have existing approvals under the Act, these will continue to apply.	**Section 6.1** **Section 7.1**
Environment Protection (Sea Dumping) Act 1981	Regulates the loading and dumping of waste at sea and fulfils Australia's international obligations under the London protocol to prevent marine pollution by controlling dumping of wastes and other matter. The Sea Dumping Act applies to all vessels, aircraft and platforms in Australian waters and to all Australian vessels and aircrafts in any part of the sea. This Act does not apply in relation to the disposal or storage of controlled material (other than a vessel, aircraft or platform) directly arising from, or related to, the exploration, exploitation and associated	No	Department of Agriculture, Water and the Environment	The Act regulates the loading and dumping of waste at sea. Since the abandonment took place before the Sea Dumping Act came into force, a permit is not required.	**Section 4.2**

Commonwealth Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	off-shore processing, of seabed mineral resources				
Offshore Petroleum and Greenhouse Gas Storage Act 2006 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009	Petroleum exploration and development activities in Australia's offshore areas are subject to the environmental requirements specified in the OPGGS Act and associated Regulations. The OPGGS Act contains a broad requirement for titleholders to operate in accordance with "good oil-field practice". Specific environmental provisions relating to work practices essentially require operators to control and prevent the escape of wastes and petroleum. The Act also requires that activities are carried out in a manner that does not unduly interfere with other rights or interests, including the conservation of the resources of the sea and sea-bed, such as fishing or shipping. In some cases, where there are particular environmental sensitivities or multiple use issues it may be necessary to apply special conditions to an exploration permit area. The holder of a petroleum title must maintain adequate insurance against expenses or liabilities arising from activities in the title, including expenses relating to clean-up or other remedying of the effects of the escape of petroleum. The OPGGS Environment Regulations provide an objective based regime for the management of environmental performance for Australian offshore petroleum exploration and production activities in areas of	Yes	NOPSEMA	The activity involves the permanent abandonment of the Tern-1 wellhead in-situ, which is a petroleum activity regulated by NOPSEMA under this Act.	**Section 6** – Risk Assessments for Planned Events

Commonwealth Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	Commonwealth jurisdiction. Key objectives of the Environment Regulations include: + to ensure operations are carried out in a way that is consistent with the principles of ecologically sustainable development; + to adopt best practice to achieve agreed environment protection standards in industry operations; and + to encourage industry to continuously improve its environmental performance.				
Sea Installations Act 1987	The Sea Installations Act regulates the placement, use and maintenance of seabed installations in Australian waters. A sea installation refers to any man made structure that is in contact with the seabed and used for an environment-related activity: • tourism or recreation • carrying on of a business • exploring, exploiting or using the living resources of the sea, seabed or sub-soil of the seabed whether by way of fishing, pearling, oyster farming, fish farming or otherwise • marine archaeology other activities including a scientific activity or transport activity.	No		**Yes** – the London Protocol is implemented through **Section 5** of the Sea Dumping Act; Article 1.4.1.4 of the London Protocol covers the abandonment of man-made structures. DAWE advice received 2/05/20 (refer **Section 4**) advised that a sea dumping permit is required as the abandonment of the wellhead pre-dates the enactment of the Act. 17.	**Section 4.2**
International Legislation					
London Convention and Protocol (2006)	The objective of the London Convention and Protocol is to promote the effective control of all sources of marine pollution. Contracting Parties shall take effective measures to prevent pollution of the marine environment caused by dumping at sea. The Protocol is	No		See Sea Installations Act 1981	**Section 4.2**

Commonwealth Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	more restrictive than the convention as application of a "precautionary approach" is included as a general obligation; a "reverse list" approach is adopted, which implies that all dumping is prohibited unless explicitly permitted.				

APPENDIX C MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE SEARCH REPORT

Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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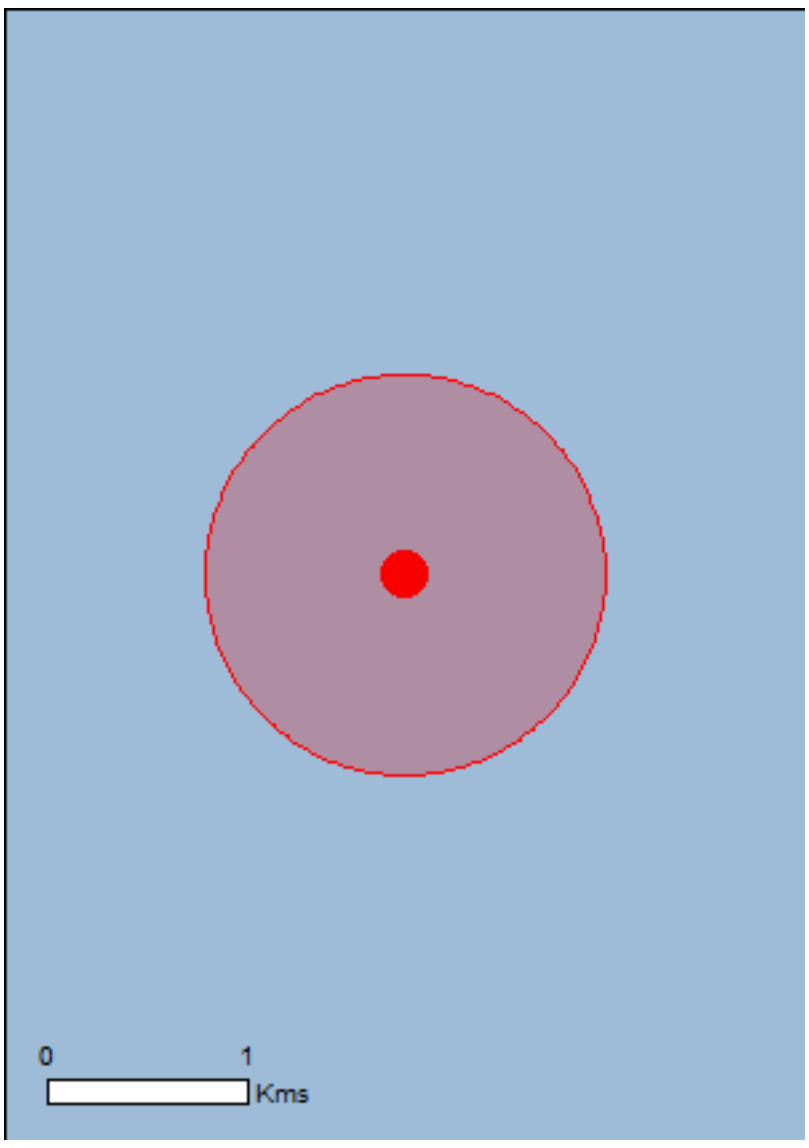


Coordinates

Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	18
Listed Migratory Species:	32

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	54
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki		
Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata		
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
[Rhincodon typus](#)		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
[Tursiops aduncus (Arafura/Timor Sea populations)](#)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#)		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Numenius madagascariensis](#)		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat may occur within area
[Anous stolidus](#)		
Common Noddy [825]		Species or species habitat may occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#)		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Calonectris leucomelas](#)		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Fish		
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-13.21472 128.06139

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D STAKEHOLDER CONSULTATION RECORDS

Santos

STAKEHOLDER CONSULTATION

WA-27-R Tern 1

Environment Plan

Santos

STAKEHOLDER CONSULTATION

Example of
Consultation Correspondence

From: [redacted]

Subject: Santos Consultation | WA-27-R Tern-1
Date: Wednesday, 29 April 2020 2:59:00 PM
Attachments: image001.jpg
Santos Consultation WA-27-R Tern 1.pdf
image008.jpg
image009.jpg
image010.jpg

Good afternoon

On behalf of Santos, please find attached consultation material relating to Santos' plans to permanently abandon (in-situ) the Tern-1 wellhead located in Commonwealth permit WA-27-R, approximately 106 km offshore from the Kimberley coast.

The Tern-1 exploration well was originally drilled in 1971 and was plugged and abandoned in the same year. At the time of abandonment, the wellhead was approximately 1 m in diameter and 5 m above the seabed. No other property or equipment remains above the seafloor. There is no exclusion zone surrounding the wellhead and it is marked on nautical charts.

Santos now proposes to leave the well permanently in-situ. Permanent abandonment of a wellhead requires approval under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and associated regulations. As such, an Environment Plan (EP) will be developed in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Should you require additional information or have a comment to make on Santos' plans to permanently leave in-situ the Tern-1 wellhead, please be in touch via the contact details below. All correspondence relating to this EP will be provided to NOPSEMA by Santos, as required by the Environment Regulations. The EP will contain a summary of all comments received, however Santos will not use or disclose your personal information in the EP. Full transcripts of all correspondence will be contained in a separate Sensitive Information Report to NOPSEMA.

Kind regards

[redacted]
Santos Limited, Level 7 100 St Georges Tce, Perth WA 6000
t: +61 8 6218[redacted]

https://www.santos.com/

[redacted]

From: [redacted]
Sent: Friday, 15 May 2020 9:22 AM
To: [redacted]
Subject: ![EXT]: 2020 May 15 - Santos Tern 1 - WA-27-R - Permanent Abandonment of a wellhead
Attachments: Santos Consultation - Commercial Fishers - WA-27-R Tern1.pdf; FISa5750_Tern-1_[redacted].pdf

Good morning [redacted]

Santos is preparing a NOPSEMA Environment Plan (EP) for approval to permanently abandon (in-situ) the Tern-1 wellhead located in Commonwealth permit WA-27-R, approximately 106 km offshore from the Kimberley coast (see attached map with the [redacted] fishery overlay).

[redacted]

In effect this EP means that nothing will change at the Santos Tern-1 wellhead location, there will be NO additional activity over this site, NO exclusion zone now or any time in the future, still accessible to commercial fishers, Santos is formalising via the Regulator the end of the wellhead.

The Tern-1 exploration well was originally drilled in 1971 and was plugged and abandoned in the same year. At the time of abandonment the wellhead was approximately 1 m in diameter and 5 m above the seabed. No other property or equipment remains above the seafloor. The location is marked on nautical charts.

Santos now proposes to leave the well permanently in-situ. Permanent abandonment of a wellhead requires approval under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and associated regulations. As such, an Environment Plan (EP) and consultation with stakeholders, including commercial fishers, is required.

WAFIC is sending this information to stakeholders and their representative peak bodies on a fee-for-service basis on behalf of Santos to ensure you receive this information in a timely manner via an accurate list. All feedback / input etc is to go directly to [redacted] at Santos (see below).

Please find attached a fact sheet with further information and a site map.

Summary:

- *Location:* Approximately 195 km offshore from Kalumburu (106 km offshore from the Kimberley coast)

Latitude (GDA 94)	Longitude (GDA 94)
13° 13' 09.869" S	128° 03' 57.408" E

- *Water Depth:* Approximately 92 metres.
- *Equipment:* Metal wellhead approx. 1 m wide and 5 m above the seabed. No other property or equipment remains above the seafloor.
- *Duration:* Permanently abandon (in-situ) the wellhead.
- *Exclusion Zone:* There is no exclusion zone around the wellhead. There will not be any future exclusion zone over this site.

If you have any queries regarding the proposed activities please respond directly to Santos: [redacted] or 08[redacted]

All correspondence relating to this EP will be provided to NOPSEMA by Santos, as required by the Environment Regulations. The EP will contain a summary of all comments received, however Santos will not use or disclose your personal information in the EP. Full transcripts of all correspondence will be contained in a separate Sensitive Information Report to NOPSEMA.

[redacted]

WAFIC FISHING PEARLING AQUACULTURE

[redacted]

L1, 56 Marine Tce. Fremantle WA 6160
PO Box 1605. Fremantle WA 6959

[redacted]

wafic.org.au
wamsc.com.au

WESTERN AUSTRALIAN FISHING INDUSTRY COUNCIL INC

[redacted]

Santos

STAKEHOLDER CONSULTATION

Consultation Packs

STAKEHOLDER CONSULTATION

Santos

WA-27-R Tern-1

Permit WA-27-R Tern-1 wellhead abandonment

The Tern-1 exploration well was drilled in 1971 targeting potentially commercial gas resources. The well was plugged and abandoned in the same year, and the wellhead was left in place. Santos Limited (Santos) now proposes to formalise the permanent abandonment of the wellhead in-situ.

The Tern-1 wellhead is located in Commonwealth Permit WA-27-R, as shown in **Figure 1**.

Permanent abandonment of a wellhead requires approval under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and associated regulations. As such, an Environment Plan (EP) will be developed in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). The EP will be publicly available via the NOPSEMA website.

As part of the EP process, Santos must have consulted with relevant stakeholders. As a relevant and potentially affected party Santos seeks your feedback. Please advise if you have any objections, claims or information requests about the wellhead abandonment. Santos will endeavour to address all stakeholder feedback prior to the EP being submitted for assessment.

Activity Description

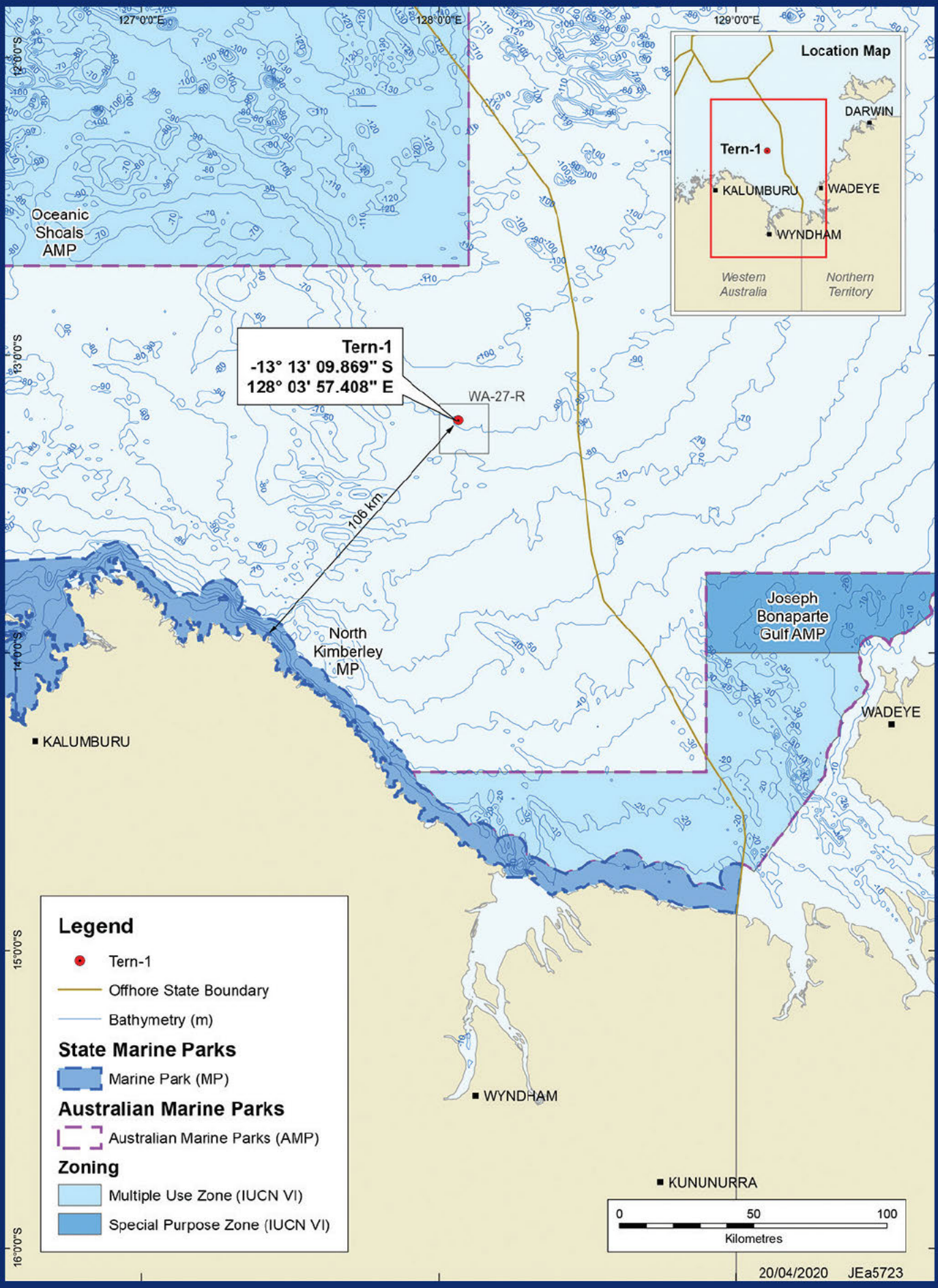
Santos proposes to permanently leave in-situ the Tern-1 wellhead.

The wellhead is approximately 1 m in diameter and 5 m above the seabed. No other property or equipment remains above the seafloor.

There is no exclusion zone surrounding the wellhead and it is marked on nautical charts.

The well is plugged and abandoned.

Figure 1: WA-27-R Tern 1 Well Site



WELLHEAD DETAILS		
Permit number	WA-27-R	
Water depth	Approx. 92 metres	
Exclusion zone	There is no exclusion zone around the wellhead.	
Location	**Latitude (GDA 94)** 13º 13' 09.869" S	**Longitude (GDA 94)** 128º 03' 57.408" E
Timing and duration	Permanent (in perpetuity) abandonment of the wellhead, which has been in-situ since 1971.	
Property/Equipment	Metal wellhead approx. 1 m wide and 5 m above the seabed.	
Description of natural environment	Located within the Bonaparte Gulf mesoscale bioregion within the Northwest IMCRA Transition provincial bioregion. These regions are described in the Integrated Marine and Coastal Regionalisation (IMCRA) of Australia, version 4.0.	
Nearest Proximity to Key Regional Features	Oceanic Shoals Australian Marine Park	57 km NW
	Joseph Bonaparte Gulf Australian Marine Park	107 km SW
	North Kimberly Marine Park	100 km S
	Darwin	312 km NE
	Kalumburu	195 km SW
	Wadeye	194 km SE
Worst case hydrocarbon spill scenario	The well is plugged and abandoned.	

Santos has conducted the following assessment of potential environmental risks and impacts [redacted].

POTENTIAL RISKS AND/OR IMPACTS	MANAGEMENT MEASURE
Interaction with other marine users and commercial fishers	• Relevant stakeholders will be consulted with during the preparation of the EP. • The wellhead is marked on nautical charts. • There is no exclusion zone around the wellhead.
Disturbance to benthic habitat from the wellhead remaining in-situ permanently.	• No additional controls identified. • The wellhead remaining permanently in-situ is expected to have a localised impact, not significant to any environmental receptor. The wellhead will be a long-term artificial habitat for marine organisms.

Consultation

Relevant stakeholders have been provided information in this Stakeholder Consultation document to allow stakeholders to assess potential impacts and risks to their functions, interests or activities. If you wish to comment on these activities, please respond or contact Santos on the contact details below. Santos would appreciate feedback by **27 May 2020** to enable the timely submission of regulatory documents.

[redacted]
Santos, PO Box 5624, Perth, 6831
Telephone: [redacted]
[redacted]

COMMERCIAL FISHER
STAKEHOLDER CONSULTATION

Santos

WA-27-R Tern-1

Permit WA-27-R Tern-1 wellhead abandonment

Overview

The Tern-1 exploration well was drilled in 1971 targeting potentially commercial gas resources. The well was plugged and abandoned in the same year, and the wellhead was left in place. Santos Limited (Santos) now proposes to formalise the permanent abandonment of the wellhead in-situ. There will be no additional activity over this site.

The Tern-1 wellhead is located in Commonwealth Permit WA-27-R, as shown in **Figure 1**.

Permanent abandonment of a wellhead requires approval under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and associated regulations. As such, an Environment Plan (EP) will be developed in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). The EP will be publicly available via the NOPSEMA website.

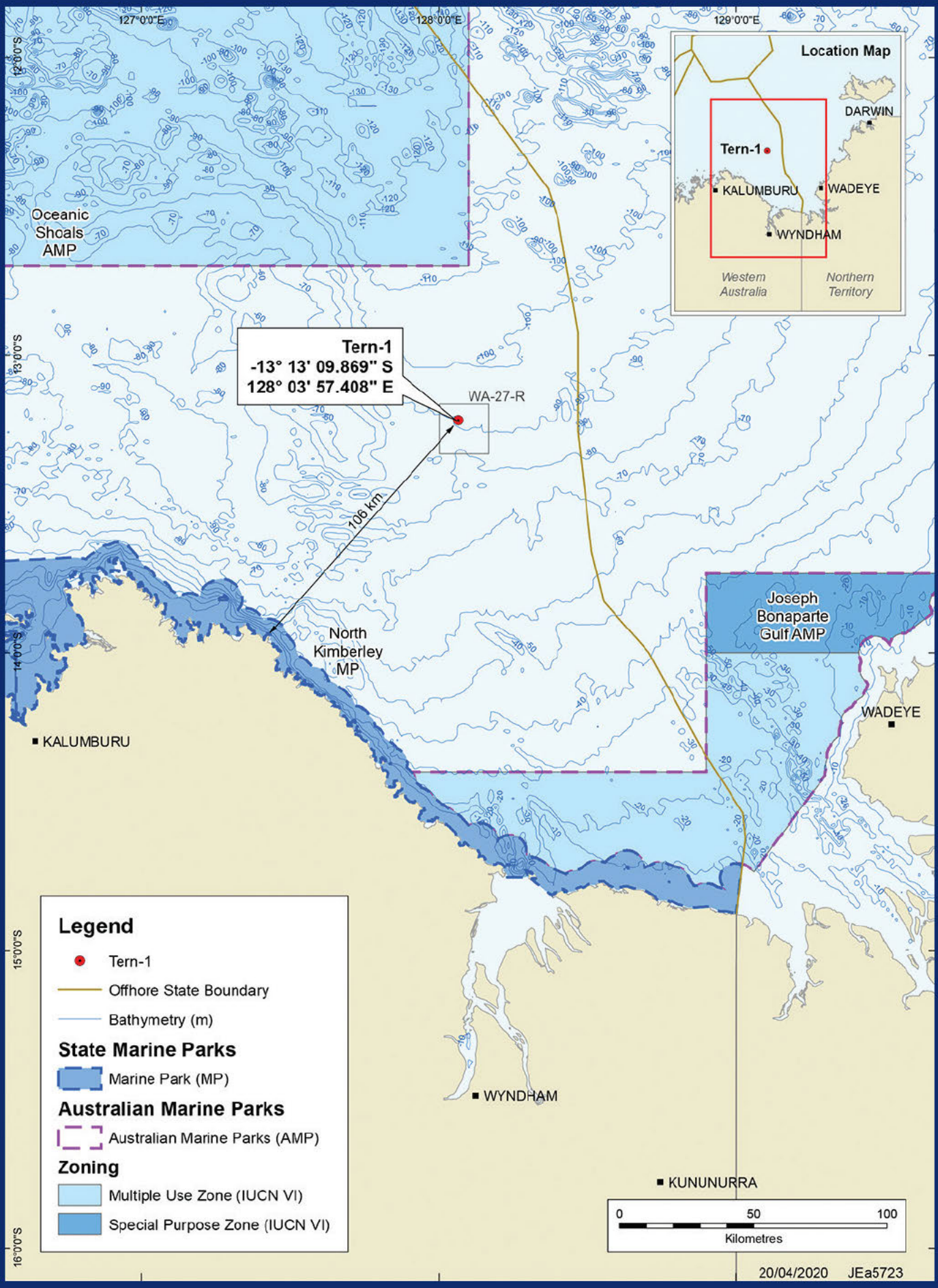
As part of the EP process, Santos must have consulted with relevant stakeholders, especially seeking feedback from commercial fishers, as relevant and potentially affected parties over this site. Please advise if you have any objections, claims or information requests about the wellhead abandonment. Santos will endeavour to address all commercial fisher feedback prior to the EP being submitted to NOPSEMA for assessment.

Environment Plan Description

Santos proposes to permanently leave in-situ the Tern-1 wellhead.

The wellhead is approximately 1 m in diameter and 5 m above the seabed. No other property or equipment remains above the seafloor. There is no exclusion zone surrounding the wellhead (this will not change) and it is marked on nautical charts. The well is plugged and abandoned.

Figure 1: WA-27-R Tern 1 Well Site



WELLHEAD DETAILS		
Permit number	WA-27-R	
Water depth	Approx. 92 metres	
Exclusion zone	There is no exclusion zone around the wellhead, this will not change.	
Location	**Latitude (GDA 94)** 13º 13' 09.869" S	**Longitude (GDA 94)** 128º 03' 57.408" E
Timing and duration	Permanent (in perpetuity) abandonment of the wellhead, which has been in-situ since 1971.	
Property/Equipment	Metal wellhead approx. 1 m wide and 5 m above the seabed.	
Description of natural environment	Located within the Bonaparte Gulf mesoscale bioregion within the Northwest IMCRA Transition provincial bioregion. These regions are described in the Integrated Marine and Coastal Regionalisation (IMCRA) of Australia, version 4.0.	
Nearest Proximity to Key Regional Features	**Regional Feature**	**Well head location**
	Oceanic Shoals Australian Marine Park	57 km NW
	Joseph Bonaparte Gulf Australian Marine Park	107 km SW
	North Kimberly Marine Park	100 km S
	Darwin	312 km NE
	Kalumburu	195 km SW
	Wadeye	194 km SE
Worst case hydrocarbon spill scenario	The well is plugged and abandoned with no access to any hydrocarbons.	

Santos has conducted the following assessment of potential environmental risks and impacts associated with the wellhead.

POTENTIAL RISKS AND/OR IMPACTS TO COMMERCIAL FISHERS	MANAGEMENT MEASURE
Interaction with other marine users and commercial fishers	• There will be zero ongoing on-water interactions, there is no future activity at this site. • Commercial fishers will be consulted with during the preparation of the EP. • The wellhead is marked on nautical charts. • There has not been an exclusion zone around the wellhead since plug and abandonment in 1971, this will not change.
Disturbance to benthic habitat from the wellhead remaining in-situ permanently.	• No additional controls identified. • The wellhead remaining permanently in-situ is expected to have a localised impact, not significant to any environmental receptor. • The wellhead will be long-term artificial habitat for marine organisms.

Consultation

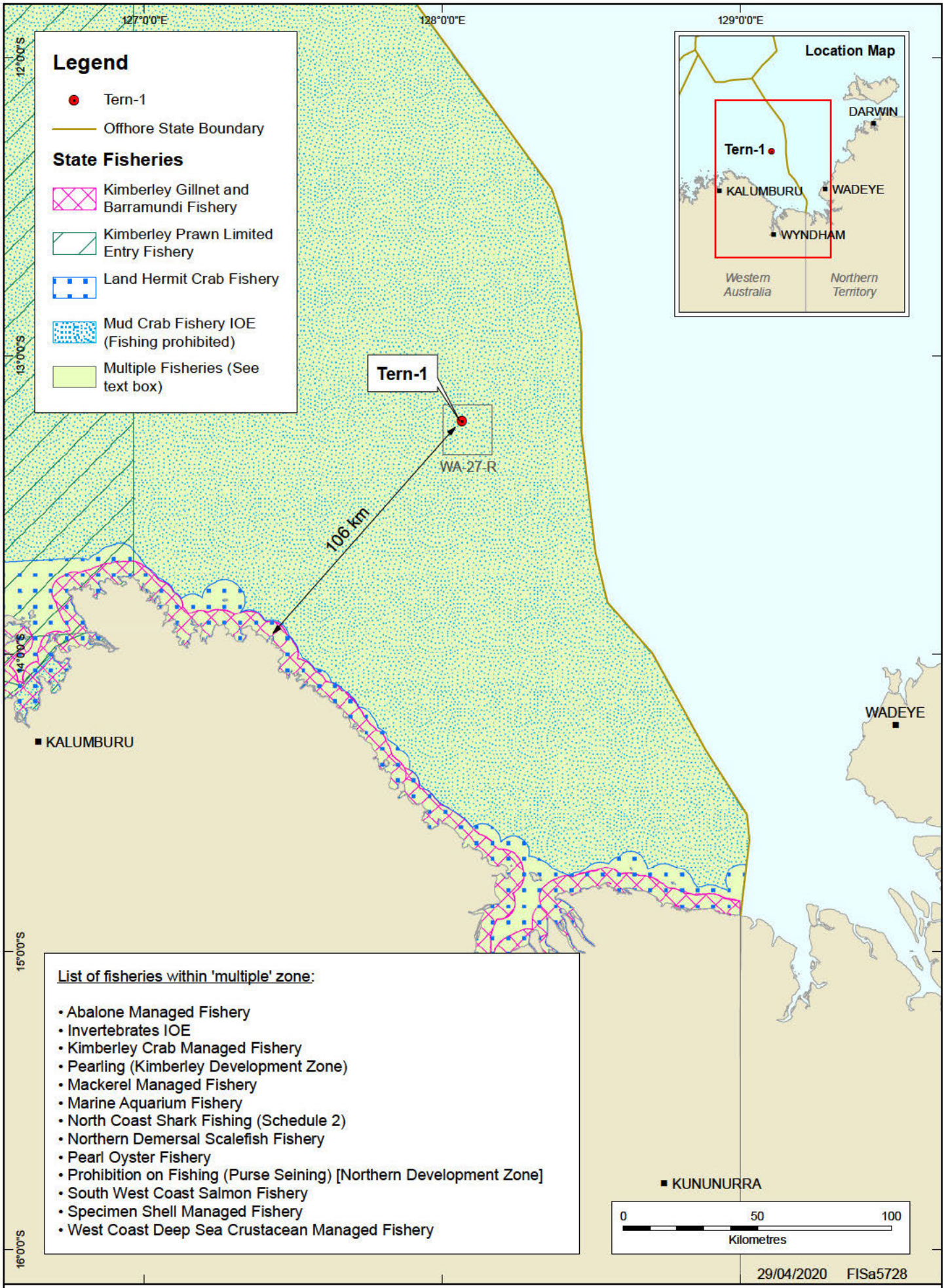
Relevant stakeholders have been provided information in this Stakeholder Consultation document to allow stakeholders to assess potential impacts and risks to their functions, interests or activities. If you wish to comment on these activities, please respond or contact Santos on the contact details below. Santos would appreciate feedback by **31 May 2020** to enable the timely submission of regulatory documents.

[redacted]
Santos, PO Box 5624, Perth, 6831
Telephone: [redacted]
[redacted]

Santos

STAKEHOLDER CONSULTATION

Consultation Maps



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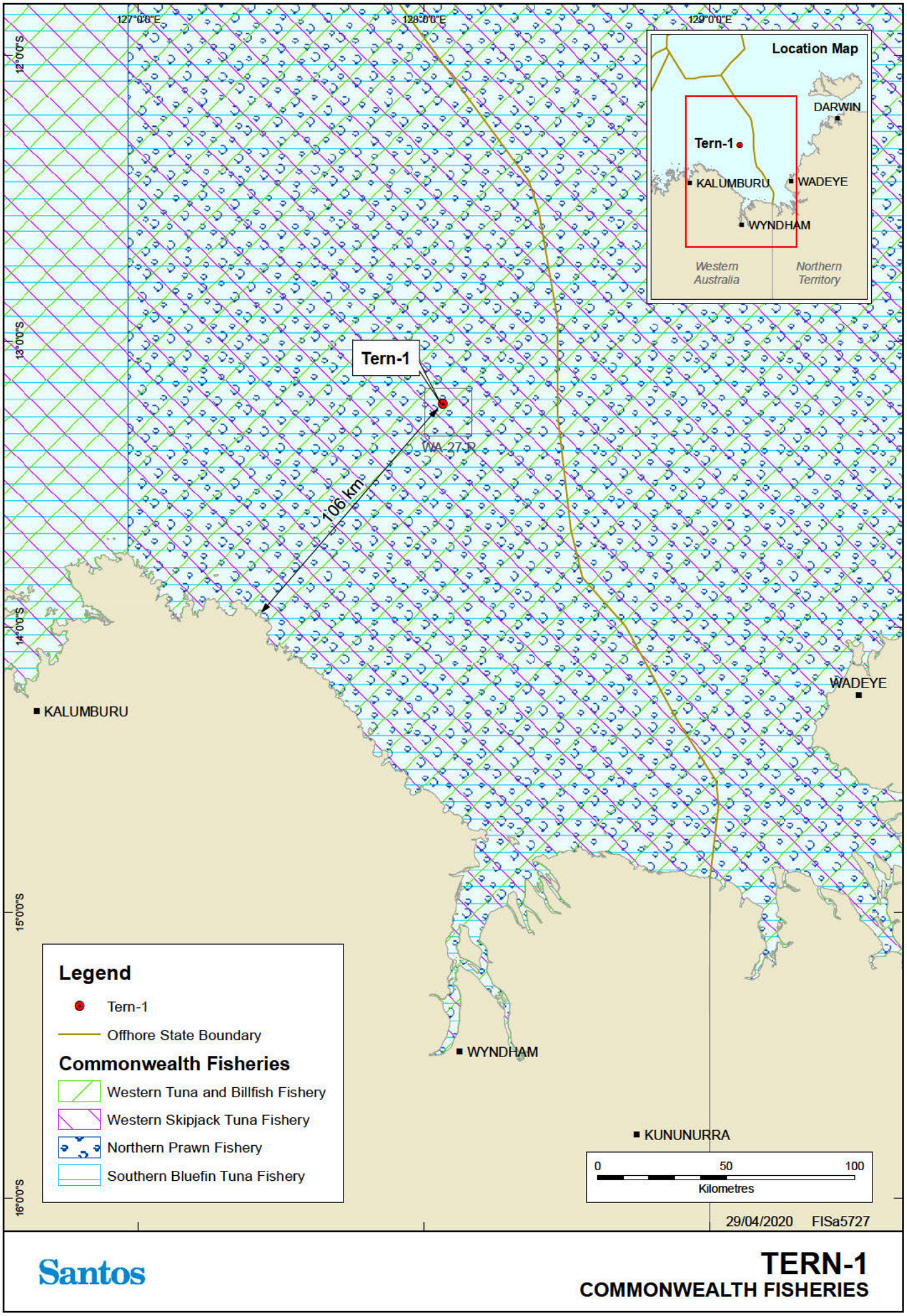
TERN-1
STATE FISHERIES



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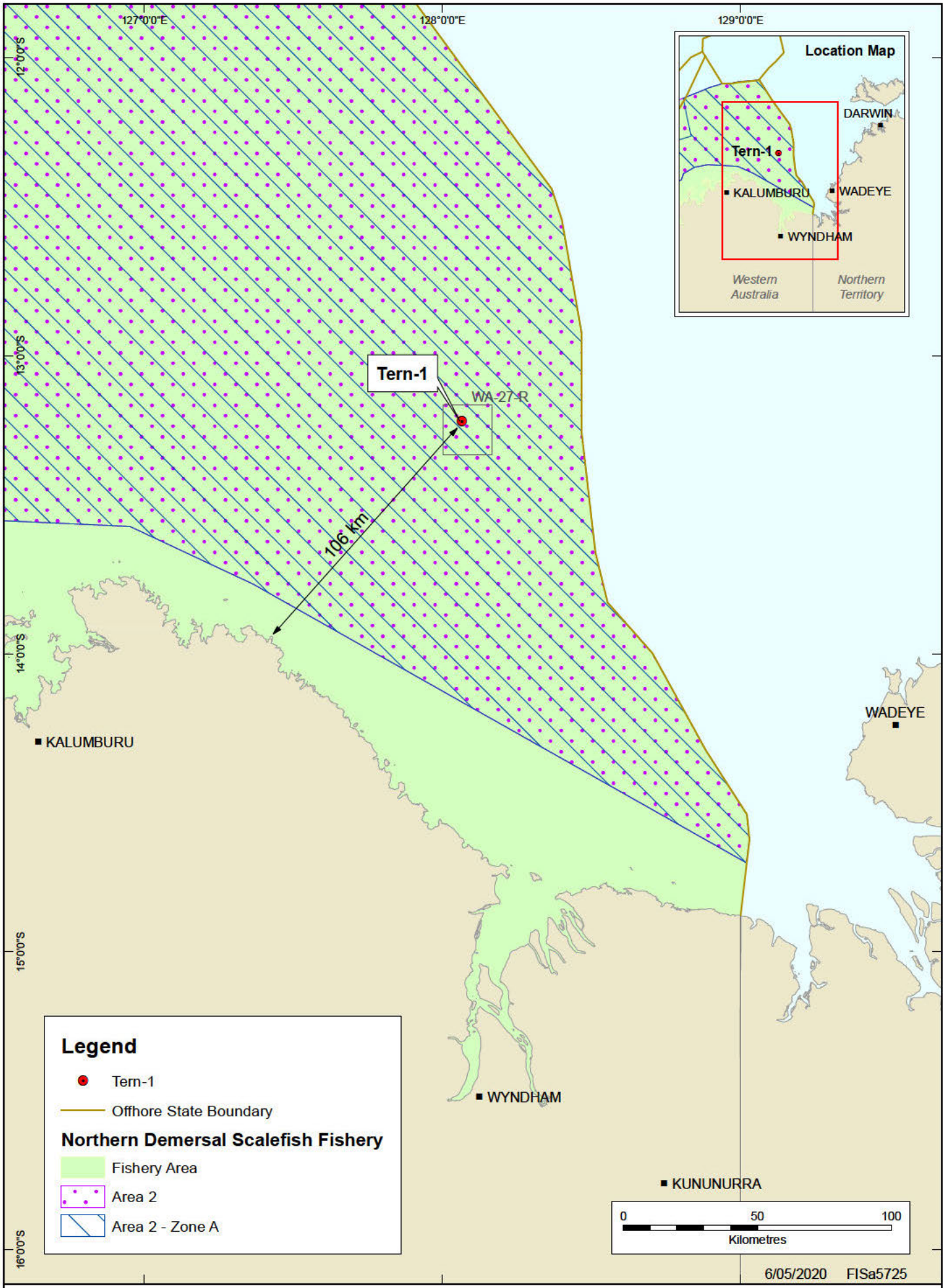
TERN-1
COMMONWEALTH FISHERIES



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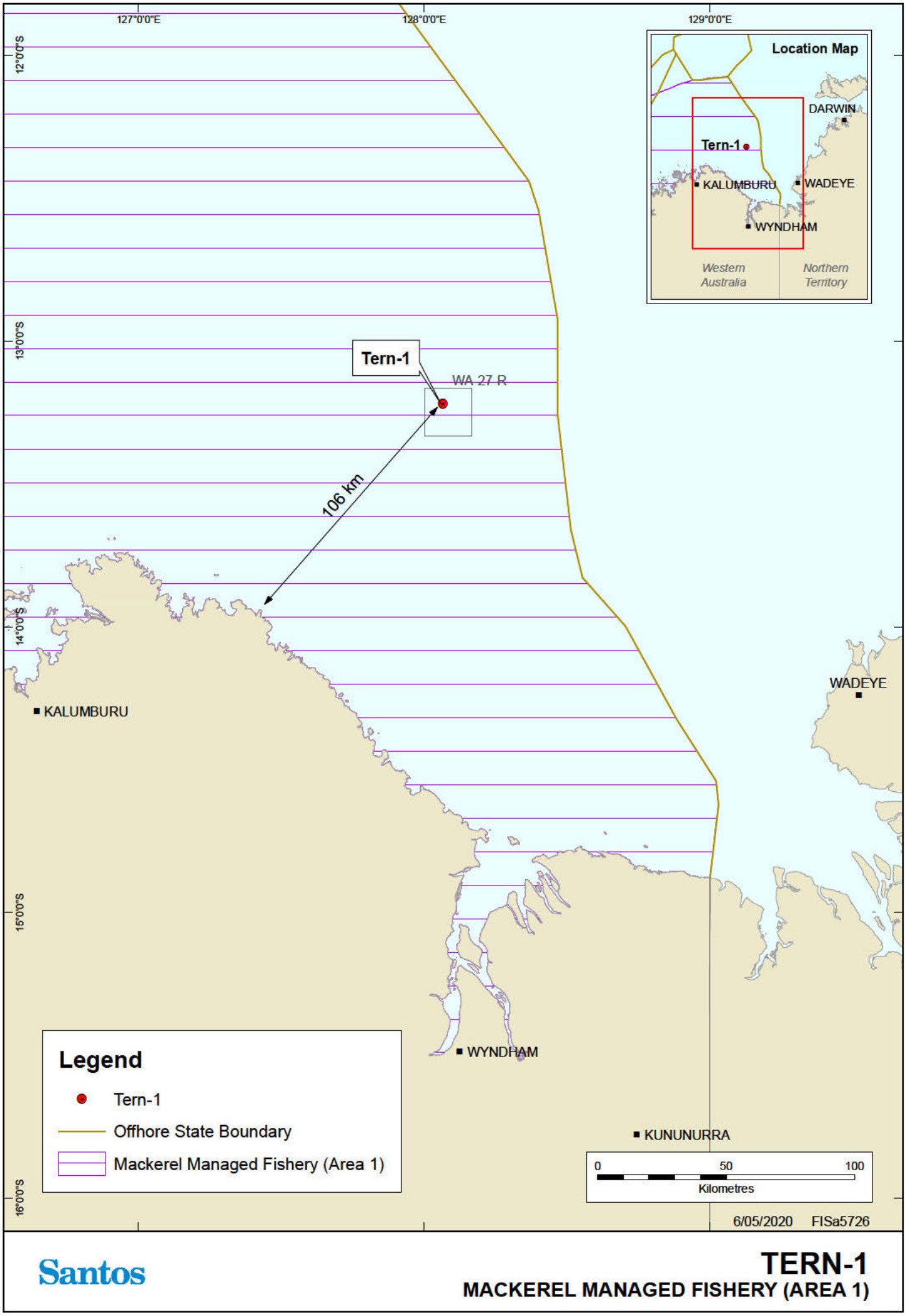
TERN-1

NORTHERN DEMERSAL SCALEFISH FISHERY



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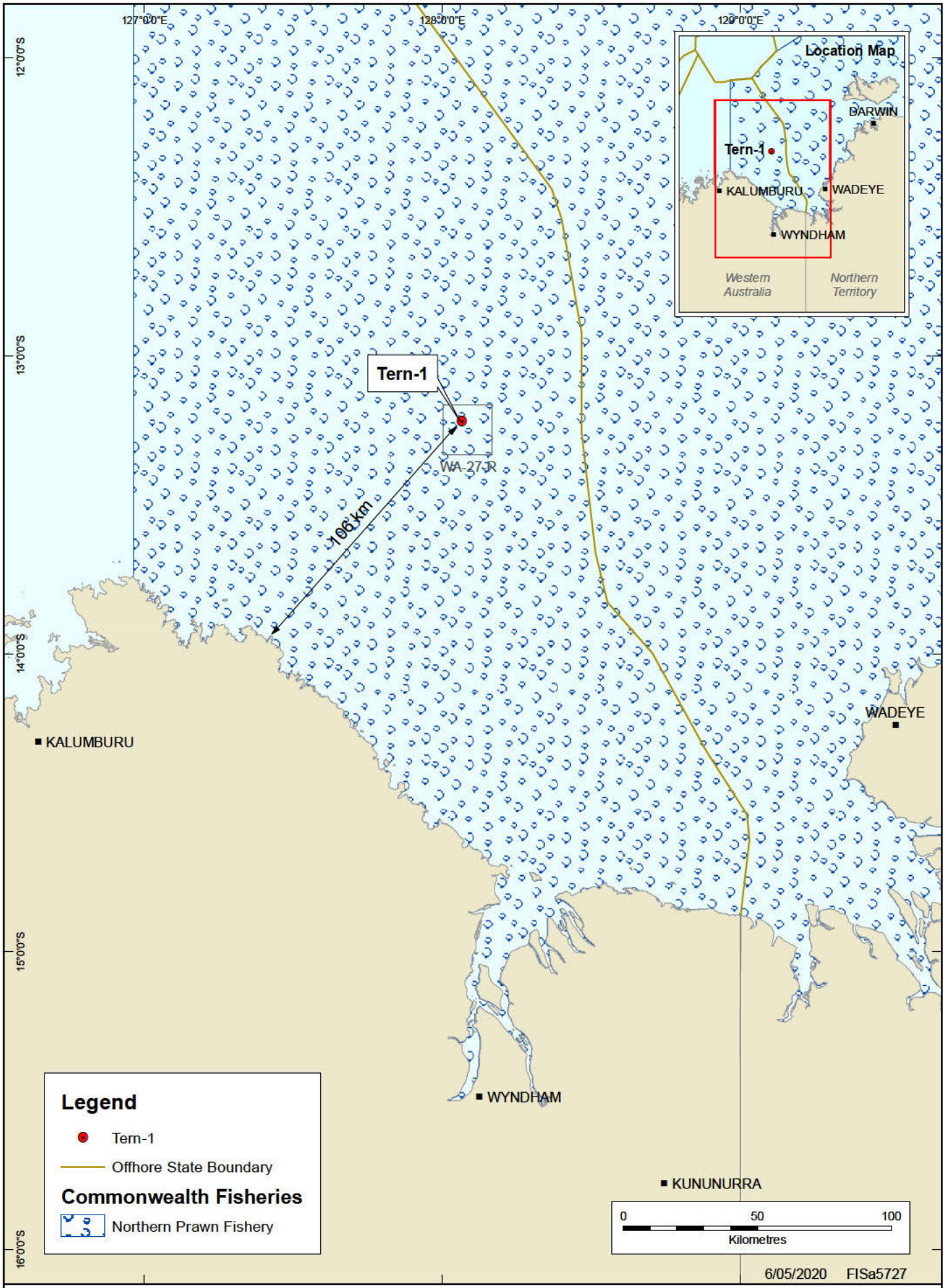
TERN-1
MACKEREL MANAGED FISHERY (AREA 1)



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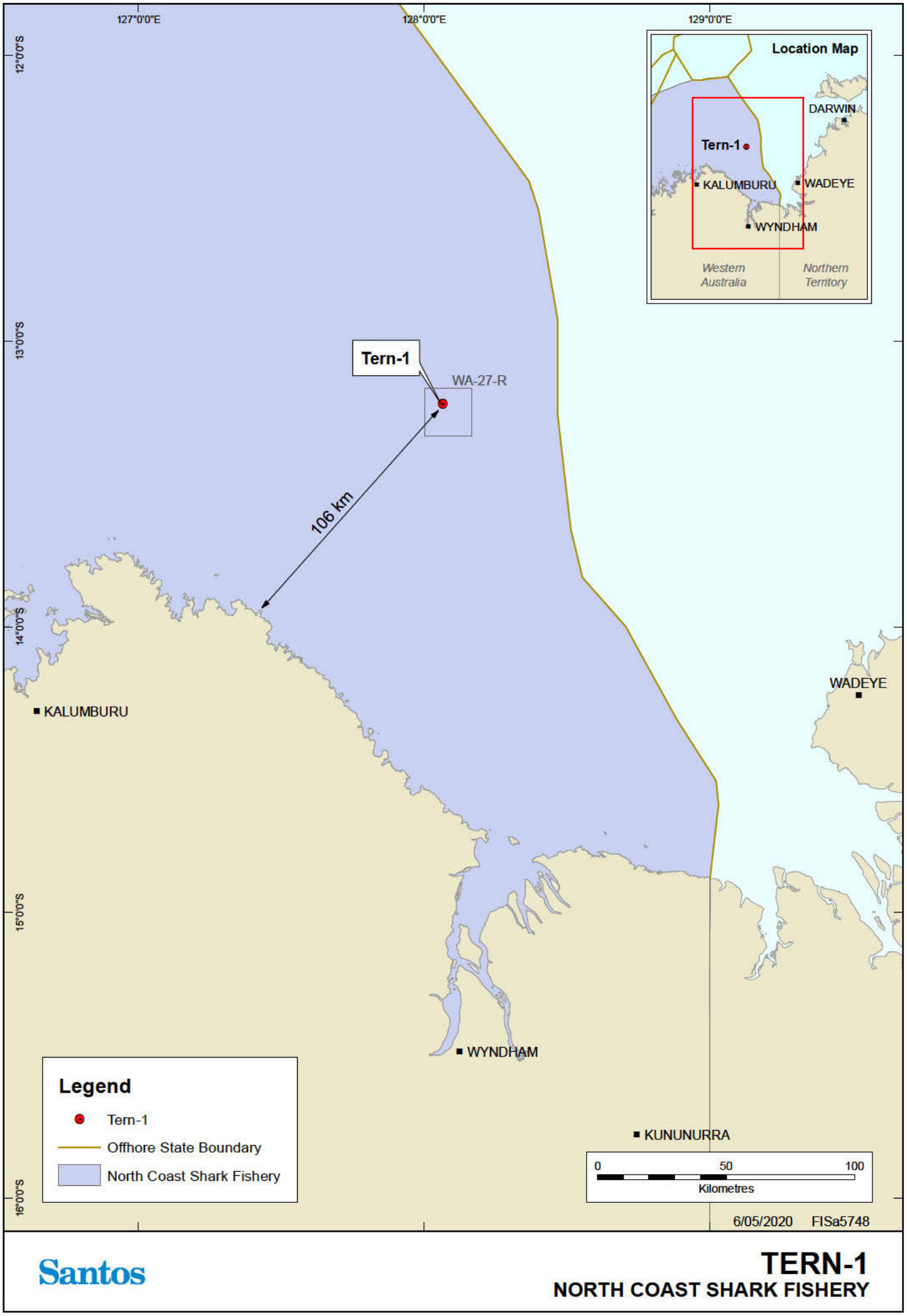
TERN-1
NORTHERN PRAWN FISHERY



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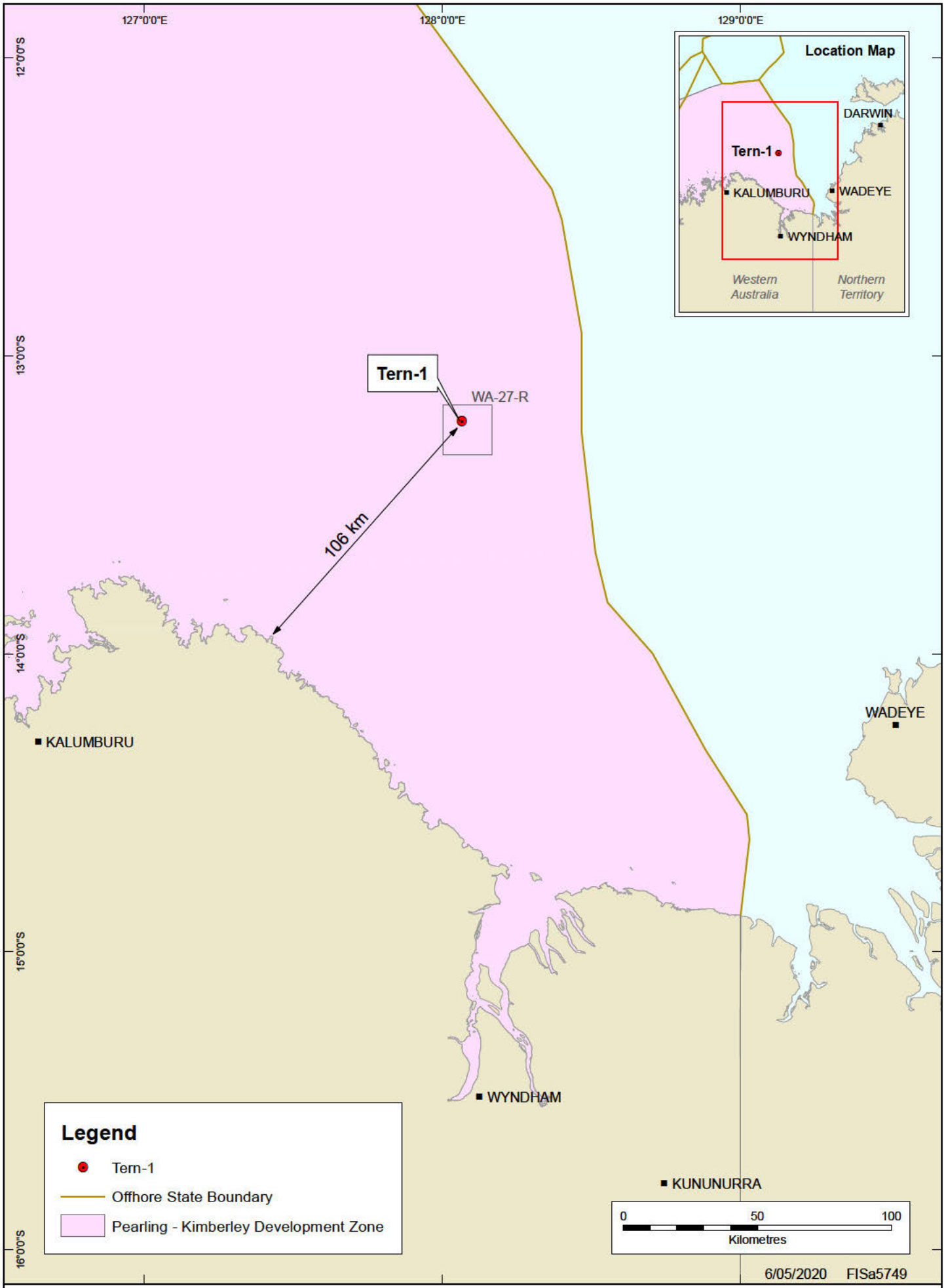
TERN-1
NORTH COAST SHARK FISHERY



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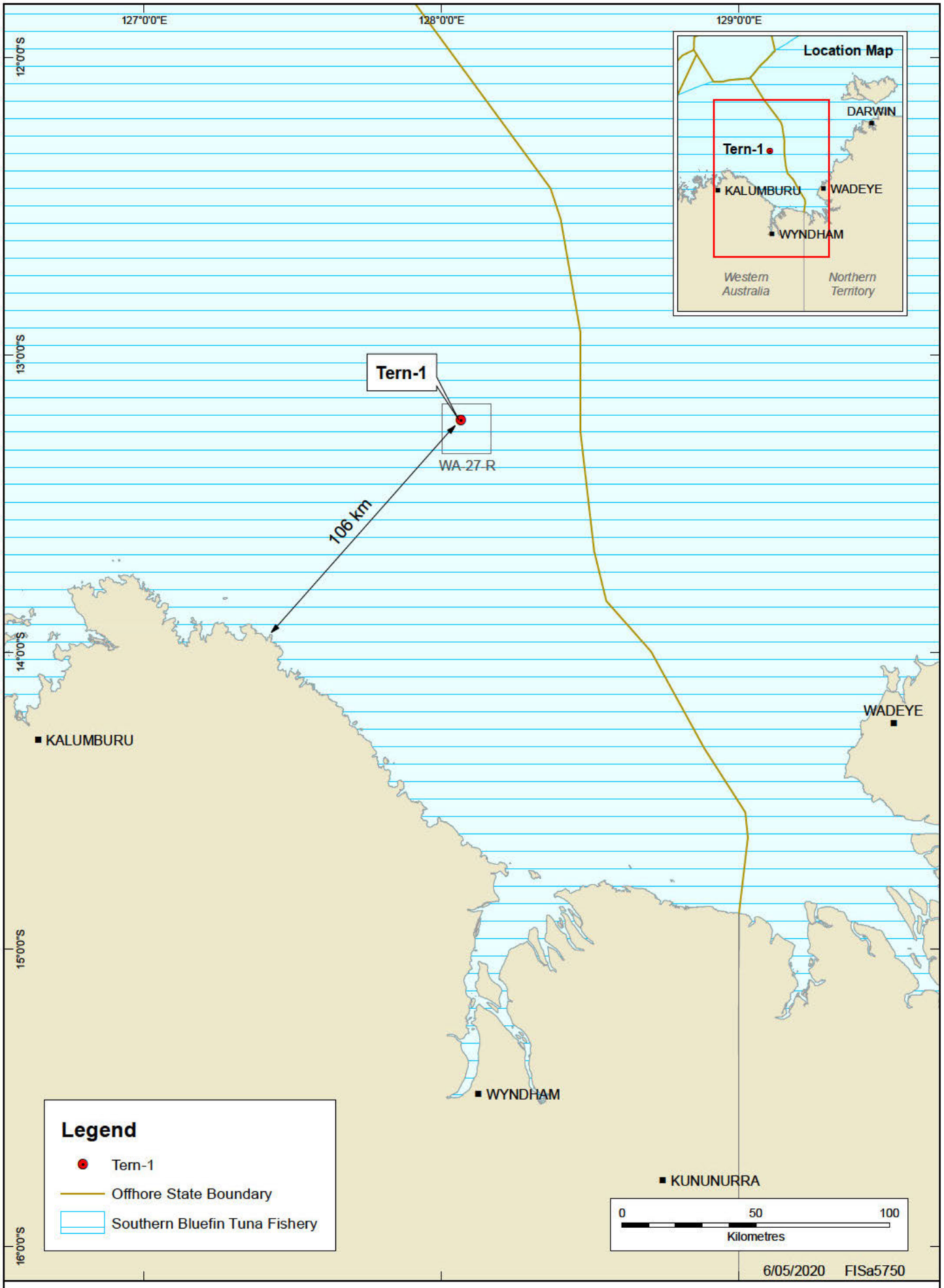
TERN-1

PEARLING - KIMBERLEY DEVELOPMENT ZONE



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TERN-1
SOUTHERN BLUEFIN TUNA FISHERY