Scarborough 4D B1 Marine Seismic Survey Environment Plan

Exploration

October 2023

Rev 9

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1 INTRODUCTION

1.1 Overview

Woodside Energy Scarborough Pty Ltd. (Woodside), as Titleholder under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth) (referred to as the Environment Regulations), proposes to undertake a three-dimensional (3D) marine seismic survey (MSS) within the Northern Carnarvon Basin on the Exmouth Plateau in Petroleum titles WA-63-R, WA-61-L, WA-62-L and WA-61-R. These activities as described in Section 3 will hereafter be referred to as the Petroleum Activities Program.

This EP has been prepared to meet the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

1.2 Purpose of the Environment Plan

In accordance with the objectives of the Environment Regulations, the purpose of this EP is to demonstrate that:

- The potential environmental impacts and risks (planned (routine and non-routine) and unplanned) that may result from the Petroleum Activities Program are identified.
- Appropriate management controls are implemented to reduce impacts and risks to a level that is 'as low as reasonably practicable' (ALARP) and acceptable.
- The Petroleum Activities Program is carried out in a manner consistent with the principles of ecologically sustainable development (ESD) (as defined in Section 3A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)).

This EP describes the process and resulting outputs of the risk assessment, whereby impacts and risks are managed accordingly.

The EP defines activity-specific environmental performance outcomes (EPOs), environmental performance standards (EPSs) and measurement criteria (MC). These form the basis for monitoring, auditing and managing the Petroleum Activities Program to be performed by Woodside and its contractors. The implementation strategy (derived from the decision support framework tools) specified within this EP provides Woodside and NOPSEMA with the required level of assurance that impacts and risks associated with the activity are reduced to ALARP and are acceptable.

1.3 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3**. The spatial boundary of the Petroleum Activities Program has been described and assessed using the Operational Area. The Operational Area defines the spatial boundary of the Petroleum Activities Program, and is further described in **Section 3.3**.

This EP addresses potential environmental impacts from planned activities and any potential unplanned risks that originate from within the Operational Area. Transit to and from the Operational Area by vessels associated with the Petroleum Activities Program and support vessels, as well as port activities associated with these vessels, are not within the scope of this EP. Vessels supporting the Petroleum Activities Program operating outside the Operational Area (e.g. transiting to and from port) are subject to applicable maritime regulations and other requirements and are not managed by this EP.

1.4 Environment Plan Summary

An EP summary is provided in **Table 1-1** as required by Regulation 11(4).

Table 1-1: EP summary

EP summary material requirement	Section of EP
The location of the activity	**Section 3.3**
A description of the receiving environment	**Section 4**
A description of the activity	**Section 3**
Details of the environmental impacts and risks	**Section 6**
The control measures for the activity	**Section 6**
The arrangements for ongoing monitoring of the titleholder's environmental performance	**Section 7.6**
Response arrangements in the oil pollution emergency plan	**Section 7.11**
Consultation already undertaken and plans for ongoing consultation	**Section 5**
Details of the titleholder's nominated liaison person for the activity	**Section 1.7.2**

1.5 Structure of the Environment Plan

The EP has been structured to reflect the process and requirements of the Environment Regulations, as outlined in **Table 1-2**.

Table 1-2: EP process phases, applicable Environment Regulations and relevant section of EP

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
Regulation 10A(a): *is appropriate for the nature and scale of the activity*	Regulation 13: *Environmental Assessment* Regulation 14: *Implementation strategy for the environment plan* Regulation 16: *Other information in the environment plan*	The principle of 'nature and scale' applies throughout the EP	**Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
Regulation 10A(b): *demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable* Regulation 10A(c): *demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	Regulation 13(1)–13(7): *13(1) Description of the activity* *13(2)(3) Description of the environment* *13(4) Requirements* *13(5)(6) Evaluation of environmental impacts and risks* *13(7) Environmental performance outcomes and standards* Regulation 16(a)–16(c): *A statement of the titleholder's corporate environmental policy* *A report on all consultations between the titleholder and any relevant person*	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	**Section 1** **Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
Regulation 10A(d): *provides for appropriate environmental performance outcomes, environmental*	Regulation 13(7): *Environmental performance outcomes and standards*	Environmental Performance Outcomes (EPOs) Environmental Performance Standards (EPSs) Measurement Criteria (MC)	**Section 6**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
performance standards and measurement criteria			
Regulation 10A(e): *includes an appropriate implementation strategy and monitoring, recording and reporting arrangements*	Regulation 14: *Implementation strategy for the environment plan*	Implementation strategy, including: • systems, practices and procedures • performance monitoring • Oil Pollution Emergency Plan (OPEP) and scientific monitoring • ongoing consultation.	**Section 7** **Appendix D**
Regulation 10A(f): *does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the EPBC Act*	Regulation 13 (1)–13(3): *13(1) Description of the activity* *13(2) Description of the environment* *13(3) Without limiting [Regulation 13(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.*	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	**Section 3** **Section 4** **Section 6**
Regulation 10A(g): *(i) the titleholder has carried out the consultations required by Division 2.2A* *(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt,*	Regulation 11A: *Consultation with relevant authorities, persons and organisations, etc.* Regulation 16(b): *A report on all consultations between the titleholder and any relevant person*	Consultation in preparation of the EP	**Section 5**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
because of the consultations are appropriate			
Regulation 10A(h): *complies with the Act and the regulations*	Regulation 15: *Details of the Titleholder and liaison person* Regulation 16(c): *Details of all reportable incidents in relation to the proposed activity.*	All contents of the EP must comply with the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and the Environment Regulations	**Section 1.5** **Section 6.7**

1.6 Description of the Titleholder

Woodside is the Titleholder for this activity, on behalf of a Joint Venture comprising Woodside Energy Scarborough Pty Ltd and Woodside Energy (Australia) Pty Ltd.

Woodside is Australia's leading natural gas producer. Woodside's operations are characterised by strong safety and environmental performance in remote and challenging locations. Wherever Woodside works, it is committed to living its values of integrity, respect, working together ownership, sustainability and courage.

Through collaboration, Woodside leverages its capabilities to progress its growth strategy. Since 1984, the company has been operating the landmark Australian project, the North West Shelf, which is one of the world's premier liquefied natural gas (LNG) facilities. In 2012, Woodside added the Pluto LNG Plant to its onshore operating facilities.

Woodside has an excellent track record of efficient and safe production. Woodside strives for excellence in safety and environmental performance and continues to strengthen relationships with customers, partners, co-venturers, governments, and communities. Further information about Woodside can be found at http://www.woodside.com.au.

1.7 Details of Titleholder and Public Affairs Contact

In accordance with Regulation 15 of the Environment Regulations, details of the titleholder, liaison person and arrangements for the notification of changes are described below.

1.7.1 Titleholder

Woodside Energy Scarborough Pty Ltd
11 Mount Street
Perth, Western Australia
T: 08 9348 4000
ACN: 650 177 227

1.7.2 Nominated Liaison Person

Ryan Felton
Senior Corporate Affairs Adviser
11 Mount Street
Perth, Western Australia
Telephone: 08 9348 4000
Email: feedback@woodside.com.au

1.7.3 Arrangement for Notifying Change

Should the titleholder, titleholder's nominated liaison person, or the contact details for either change, NOPSEMA will be notified in writing within two weeks or as soon as practicable.

1.7.4 Offshore Petroleum and Greenhouse Gas Storage Act

The OPGGS Act controls exploration and production activities beyond three nautical miles (nm) of the mainland (and islands) to the outer extent of the Australian Exclusive Economic Zone (EEZ) at 200 nm.

1.8 Woodside Management System

The Woodside Management System (WMS) provides a structured framework of documentation to set common expectations governing how all employees and contractors at Woodside will work. Many of the standards presented in **Section 6** are drawn from the WMS documentation, which comprises four elements: compass and policies, expectations, processes and procedures, and guidelines, as outlined below (and illustrated in **Figure 1-1)**.

- **Compass and Policies**: Set the enterprise-wide direction for Woodside by governing our behaviours, actions, and business decisions and ensuring we meet our legal and other external obligations.
- **Expectations**: Set essential activities or deliverables required to achieve the objectives of the Key Business Activities and provide the basis for developing processes and procedures.
- **Processes and Procedures**: Processes identify the set of interrelated or interacting activities that transform inputs into outputs, to systematically achieve a purpose or specific objective. Procedures specify what steps, by whom, and when required to carry out an activity or a process.
- **Guidelines**: Provide recommended practice and advice on how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide advice on how activities or tasks may be performed, information that may be taken into consideration, or, how to use tools and systems.

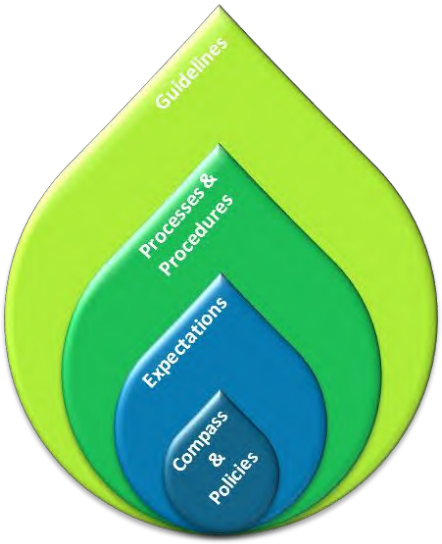


Figure 1-1: The four major elements of the WMS Seed

The WMS is organised within a business process hierarchy based upon key business activities to ensure the system remains independent of organisation structure, is globally applicable and scalable wherever required. These key business activities are grouped into management, support, and value

stream activities as shown in **Figure 1-2.** The value stream activities capture, generate and deliver value through the exploration and production lifecycle. The management activities influence all areas of the business, while support activities may influence one or more value stream activities.

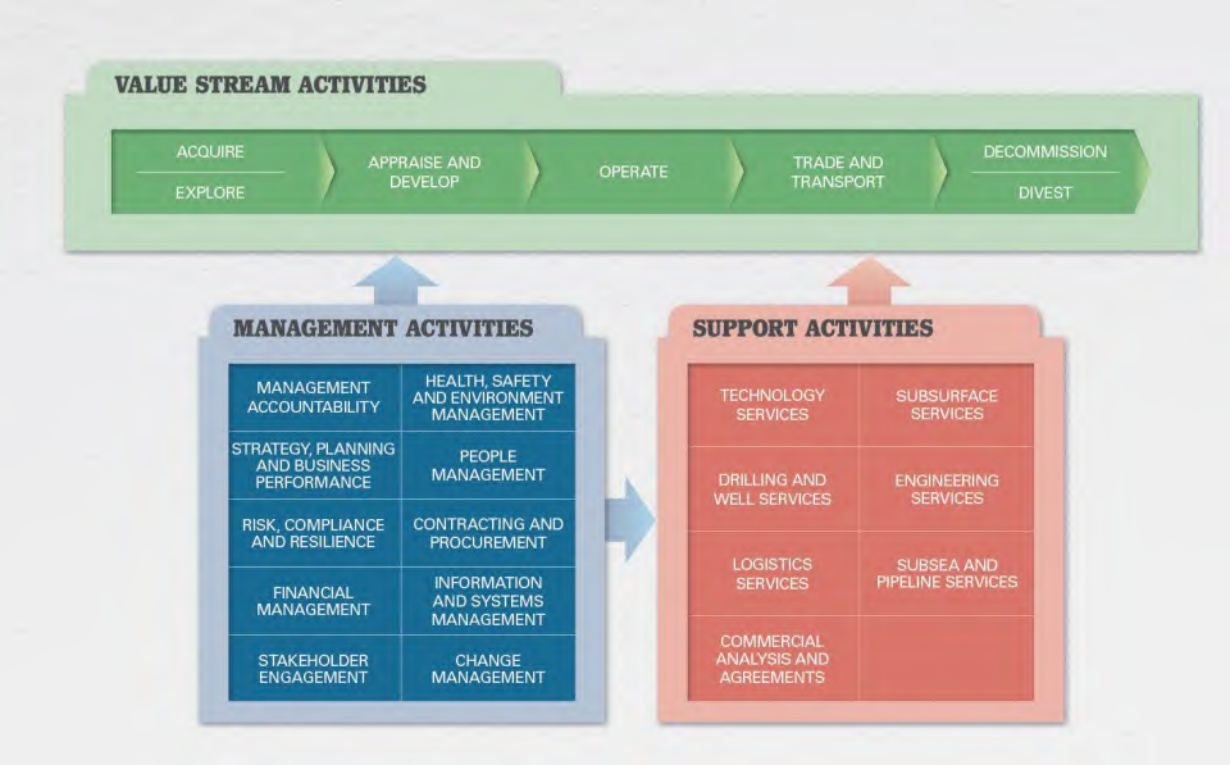


Figure 1-2: The WMS business process hierarchy

1.8.1 Health, Safety and Environment

In accordance with Regulation 16(a) of the Environment Regulations, Woodside's Corporate Environment and Biodiversity Policy is provided in **Appendix A** of this EP.

1.9 Description of Relevant Requirements

In accordance with Regulation 13(4) of the Environment Regulations, a description of requirements, including legislative requirements, that apply to the activity and are relevant to managing risks and impacts of the Petroleum Activities Program are detailed in **Appendix B**. This EP will not be assessed under the WA Environment Protection Act 1986 as the activity does not occur on State land or within State waters.

1.9.1 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009

The Environment Regulations apply to petroleum activities in Commonwealth waters and are administered by NOPSEMA. The objective of the Environment Regulations is to ensure petroleum activities are:

- carried out in a manner consistent with the principles of ecological sustainable development
- carried out in a manner by which the environmental impacts and risks of the activity will be reduced to ALARP
- carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level.

1.9.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act aims to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined in the Act as Matters of National Environmental Significance (MNES). In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA through the Streamlining Offshore Petroleum Environmental Approvals Program (the Program). The Program provides for the protection of the environment by requiring all offshore petroleum activities authorised by the OPGGS Act to be conducted in accordance with an accepted EP, consistent with the principles of Ecological Sustainable Development (ESD).

Impacts on the environment include those matters protected under Part 3 of the EPBC Act. The definition of 'environment' in the Program is consistent with that used in the EPBC Act - this enables the Program to encompass all matters protected under Part 3 of the EPBC Act.

1.9.2.1 Recovery Plans and Threat Abatement Plans

Under s139(1)(b) of the EPBC Act, the Environment Minister must not act inconsistently with a recovery plan for a listed threatened species or ecological community or a threat abatement plan for a species or community protected under the Act. Similarly, under s268 of the EPBC Act:

"A Commonwealth agency must not take any action that contravenes a recovery plan or a threat abatement plan."

In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA via the commitments included in the Program. Commitments relating to listed threatened species and ecological communities under the Act are included in the Program Report (Commonwealth of Australia, 2014).

1.9.2.2 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs), formally known as Commonwealth Marine Reserves, are recognised for conserving marine habitats and the species that live and rely on these habitats. The Director of National Parks (DNP) is responsible for managing AMPs (supported by Parks Australia), and is required to publish management plans for them. Other parts of the Australian Government must not perform functions or exercise powers relating to these parks that are inconsistent with management plans (s362 of the EPBC Act). Relevant AMPs are described in **Section 4.9**. The North-west Marine Parks Network Management Plan (DNP, 2018a) and the South west Marine Parks Network Management Plan (DNP, 2018b) describe the requirements for managing the marine parks that are relevant to this EP.

Specific zones within the AMPs have been allocated conservation objectives as stated below (International Union for Conservation of Nature (IUCN) Protected Area Category) based on the Australian IUCN reserve management principles outlined in Schedule 8 of the EPBC Regulations 2000:

- Special Purpose Zone (IUCN category VI) – managed to allow specific activities through special purpose management arrangements while conserving ecosystems, habitats and native species. The zone allows or prohibits specific activities.
- Sanctuary Zone (IUCN category Ia) – managed to conserve ecosystems, habitats and native species in as natural and undisturbed a state as possible. The zone allows only authorised scientific research and monitoring.
- National Park Zone (IUCN category II) – managed to protect and conserve ecosystems, habitats and native species in as natural a state as possible. The zone only allows non extractive activities unless authorised for research and monitoring.

- Recreational Use Zone (IUCN category IV) – managed to allow recreational use, while conserving ecosystems, habitats and native species in as natural a state as possible. The zone allows for recreational fishing, but not commercial fishing.
- Habitat Protection Zone (IUCN category IV) – managed to allow activities that do not harm or cause destruction to seafloor habitats, while conserving ecosystems, habitats and native species in as natural a state as possible.
- Multiple Use Zone (IUCN category VI) – managed to allow ecologically sustainable use while conserving ecosystems, habitats and native species. The zone allows for a range of sustainable uses, including commercial fishing and mining, where they are consistent with park values.

1.9.2.3 World Heritage Properties

Australian World Heritage management principles are prescribed in Schedule 5 of the EPBC Regulations 2000. No management principles are considered relevant to the scope of this EP given there is no potential impacts to any of these areas.

2 ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process that Woodside follows to prepare the EP once an activity has been defined as a petroleum activity (refer to **Section 1.1**). This includes a description of the environmental risk management methodology that is used to identify, analyse and evaluate risks to meet ALARP and acceptability requirements and to develop EPOs and EPSs. This section also describes Woodside's risk management methodologies applicable to implementation strategies applied during the activity.

Regulation 13(5) of the Environment Regulations requires environmental impacts and risks of the Petroleum Activities program to be detailed and evaluated appropriate to the nature and scale of each impact and risk associated with the Petroleum Activities Program and potential emergency conditions. The objective of the risk assessment process, described in this section, is to identify the risks and associated impacts of an activity so they can be assessed, appropriate control measures applied to eliminate, control or mitigate the impact or risk to ALARP, then determine if the impact or risk level is acceptable.

Environmental impacts and risks include those directly and indirectly associated with the Petroleum Activities Program and include potential emergency and accidental events. This may include environment impacts and risks that are a result of the proposed activity but are not within Woodside's control.

- Planned activities (routine and non-routine) have the potential for inherent environmental impacts.
- Environmental risks are unplanned events with the potential for impact (termed risk 'consequence').

Herein, potential impact from planned activities are termed 'impacts', and 'risks' are associated with unplanned events with the potential for impact (should the risk be realised), with such impacts termed potential 'consequence'.

2.2 Environmental Risk Management Methodology

Woodside recognises that risk is inherent to its business and effectively managing risk is vital to delivering on company objectives, success and continued growth. Woodside is committed to managing all risks proactively and effectively. The objective of Woodside's risk management system is to provide a consistent process for recognising and managing risks across its business. Achieving this objective includes ensuring risks consider impacts across the key areas of exposure: health and safety, environment, finance, reputation and brand, legal and compliance, and social and cultural. A copy of Woodside's Risk Management Policy is provided in **Appendix A.**

The environmental risk management methodology used in this EP is based on Woodside's Risk Management Procedure. This procedure aligns to industry standards such as international standard ISO 31000:2018. The WMS risk management procedure, guidelines and tools provide guidance on specific techniques for managing risk, tailored for particular areas of risk within certain business processes. Procedures applied for environmental risk management include:

- Health Safety and Environment Management Procedure
- Impact Assessment Procedure
- Process Safety Management Procedure.

The risk management methodology provides a framework to demonstrate that the risks and impacts are continually identified, reduced to ALARP and assessed to be at an acceptable level, as required by the Environment Regulations. The key steps of Woodside's Risk Management Process are shown

in **Figure 2-1**. Each step and how it is applied to the scopes of this activity is described in **Sections 2.3 to 2.12.**

Figure 2-1: Woodside's risk management process

2.2.1 Healthy, Safety and Environment Management Procedure

Woodside's Health, Safety and Environment Management Procedure provides the structure for managing health, safety and environment (HSE) risks and impacts across Woodside. It defines the decision authorities for company-wide HSE management activities and deliverables, and to support continuous improvement in HSE management.

2.2.2 Impact Assessment Procedure

To support effective environmental risk assessment, Woodside's Impact Assessment Procedure (**Figure 2-2**) provides the steps needed to meet required environment, health and social standards by ensuring impacts are assessed appropriate to the nature and scale of the activity, the regulatory context, the receiving environment, interests, concerns and rights of stakeholders, and the applicable framework of standards and practices.

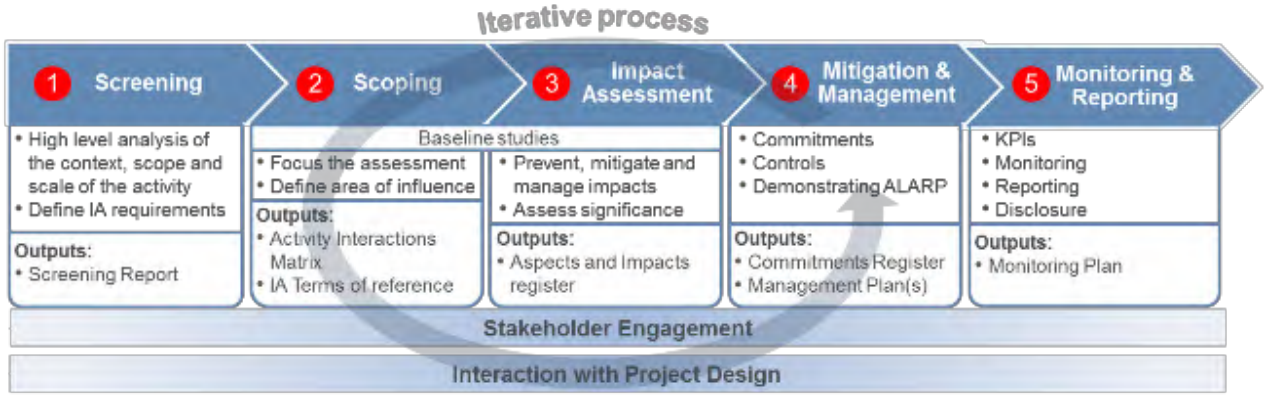


Figure 2-2: Woodside's impact assessment process

2.3 Environmental Plan Process

Figure 2-3 illustrates the EP development process. Each element of this process is discussed further in **Sections 2.3** to **2.12**.

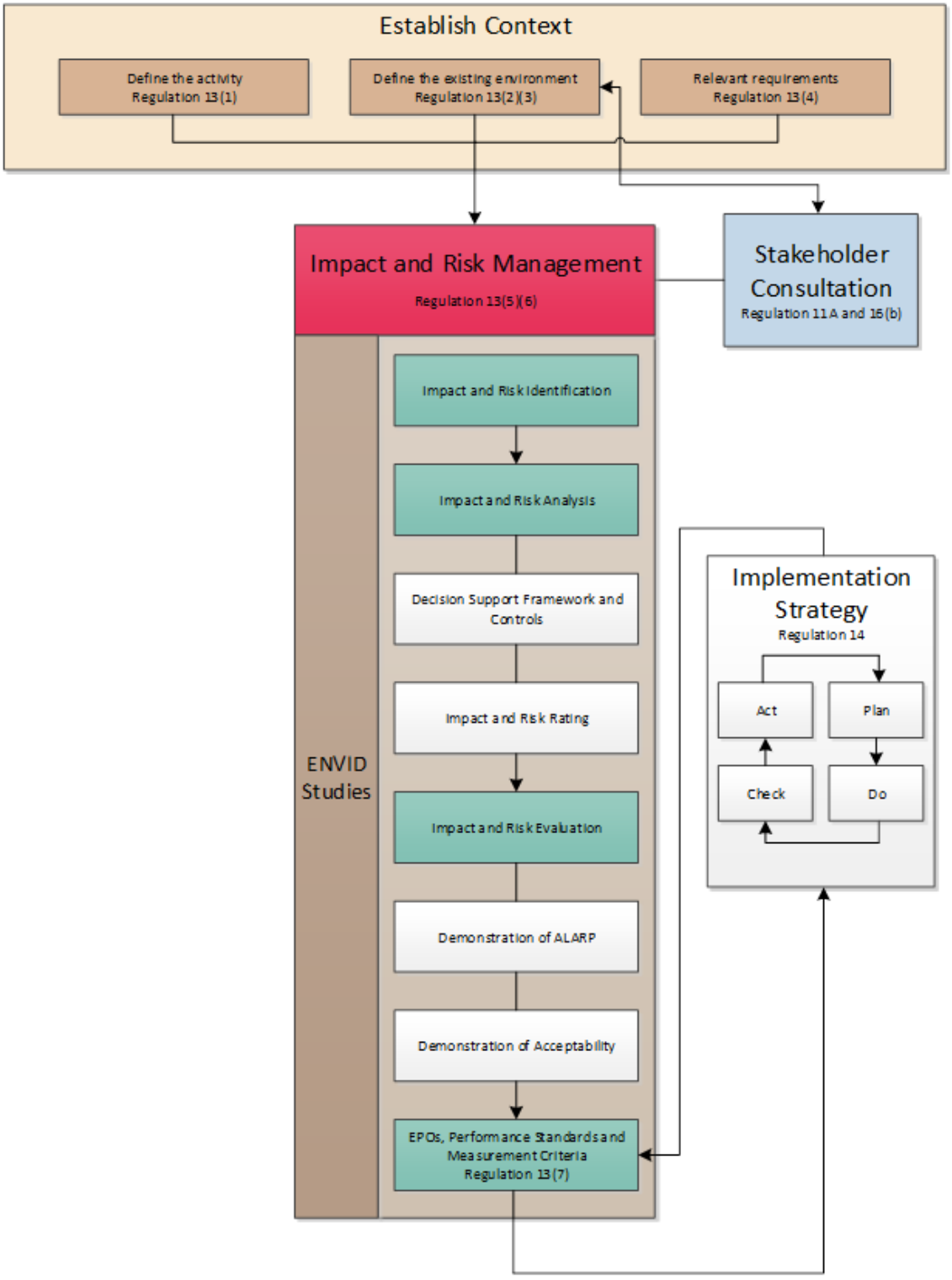


Figure 2-3: Environment Plan development process

2.4 Establish the Context

2.4.1 Define the Activity

This first stage involves evaluating whether the activity meets the definition of a 'petroleum activity' as defined in the Environment Regulations.

The activity is then described in relation to:

- the location
- what is to be performed
- how it is planned to be performed, including outlining operational details of the activity, and proposed timeframes.

The 'what' and 'how' are described in the context of 'environmental aspects' to inform the risk and impact assessment for planned (routine and non-routine) and unplanned (accidents, incidents and emergency conditions) activities.

The activity is described in **Section 3** and referred to as the Petroleum Activities Program.

2.4.2 Defining the Existing Environment

The context of the existing environment is described and determined by considering the nature and scale of the activity (size, type, timing, duration, complexity, and intensity of the activity), as described in **Section 3**. The purpose is to describe the existing environment that may be impacted by the activity, directly or indirectly, by planned or unplanned events.

The existing environment section (**Section 4**) is structured to define the physical, biological, socio economic and cultural attributes of the area of interest, in accordance with the definition of 'environment' in Regulation 4(a) of the Environment Regulations. These sub-sections make particular reference to:

- The environmental, and social and cultural consequences as defined by Woodside (refer to **Table 2-1**), which address key physical and biological attributes, as well as social and cultural values of the existing environment. These consequence definitions are applied to the impact and risk analysis (refer **Section 2.6.2**) and rated for all planned and unplanned activities. Additional detail is provided for evaluating unplanned hydrocarbon spill risk.
- EPBC Act Matters of National Environmental Significance (MNES), including listed threatened species and ecological communities and listed migratory species. Defining the spatial extent of the existing environment is guided by the nature and scale of the Petroleum Activities Program (and associated sources of environmental risk). This considers the Operational Area and wider environment that may be affected (EMBA), as determined by the hydrocarbon spill risk assessments presented in **Section 6.7.1**. MNES, as defined within the EPBC Act, are addressed through Woodside's impact and risk assessment (**Section 6**).
- Relevant values and sensitivities, which may include world or national Heritage Listed areas, Ramsar wetlands, listed threatened species or ecological communities, listed migratory species, and sensitive values that exist in or in relation to Commonwealth marine area or land.
- In categorising the environmental values potentially impacted by the Petroleum Activities Program (as presented in **Table 2-1**), there is standardisation of information relevant to understanding the receiving environment. Potential impacts to these environmental values are evaluated in the risk analysis (refer **Section 2.7**), and risk-rated for all planned and unplanned activities. This provides a robust approach to the overall environmental risk evaluation and its documentation in the EP.

By grouping potentially impacted environmental values by aspect (as presented in **Table 2-1**), the presentation of information about the receiving environment is standardised. This information is then consistently applied to the risk evaluation section to provide a robust approach to the overall environmental risk evaluation and its documentation in the EP.

Table 2-1: Environmental values potentially impacted by the Petroleum Activities Program which are assessed within the EP

Environmental value potentially impacted Regulations 13(2)(3)					
Marine Sediment	***Water Quality***	***Air Quality***	***Ecosystems/ Habitats***	***Species***	***Socio-Economic***

2.4.3 Relevant Requirements

The relevant requirements in the context of legislation, other environmental approval requirements, conditions and standards that apply to the Petroleum Activities Program have been identified and reviewed. Relevant requirements are presented in **Appendix B** and **Section 1.9**.

Woodside's Corporate Environment and Biodiversity Policy is presented in **Appendix A**.

2.5 Impact and Risk Identification

Relevant environmental aspects and hazards have been identified to support the process to define environmental impacts and risks associated with an activity.

The environmental impact and risk assessment presented in this EP has been informed by recent and historic hazard identification studies and workshops (e.g. HAZID/Environmental Hazard Identification [ENVID]), Process Safety Risk Assessment processes, reviews and associated desktop studies associated with the Petroleum Activities Program. Risks are identified based on planned and potential interaction with the activity (based on the description in **Section 3**), the existing environment (**Section 4**) and the outcomes of Woodside's stakeholder engagement process (**Section 5**). The environmental outputs of applicable risk and impact workshops and associated studies are referred to as 'ENVID' hereafter in this EP.

An ENVID workshop was conducted for the marine seismic survey on 20 January 2021. Participants included project environmental advisors, development coordinator, and engineers. The participants' breadth of knowledge, training and experience was sufficient to reasonably assure that the hazards that may arise in connection with the Petroleum Activities Program in this EP were identified.

Impacts and risks were identified during the ENVID for both planned (routine and non-routine) activities and unplanned (accidents, incidents and emergency conditions) events. During this process, risks that are identified as not applicable (not credible) are removed from the assessment. This is done by defining the activity and identifying that an aspect is not applicable.

The impact and risk information is then classified, evaluated and tabulated for each planned activity and unplanned event. Environmental impacts and risk are recorded in an environmental impacts and risk register. The output of the ENVID is used to present the risk assessment and forms the basis to develop performance outcomes, standards and MC. This information is presented in **Section 6,** using the format presented in **Table 2-2**.

Table 2-2: Example of layout of identification of risks and impacts in relation to risk sources

Source of risk	*Evaluation*											
	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/Habitat	Species	Socioeconomic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability
Summary of source of impact/risk												

2.6 Impact and Risk Analysis

Risk analysis further develops the understanding of a risk by defining the impacts and assessing appropriate controls. Risk analysis considered previous risk assessments for similar activities, reviews of relevant studies, reviews of past performance, external stakeholder consultation feedback and a review of the existing environment.

The key steps performed for each risk identified during the risk assessment were:

- Identify the decision type in accordance with the decision support framework.
- Identify appropriate control measures (preventative and mitigative) aligned with the decision type.
- Assess the risk rating or impact.

2.6.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (**Section 2.7.2**), Woodside's HSE risk management procedures include using a decision support framework based on principles set out in the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This concept is applied during the ENVID, or equivalent preceding processes during historical design decisions, to determine the level of supporting evidence that may be required to draw sound conclusions about risk level and whether the risk is ALARP and acceptable (**Table 2-4**). This is to confirm:

- Activities do not pose an unacceptable environmental risk.
- Appropriate focus is placed on activities where the risk is anticipated to be acceptable and demonstrated to be ALARP.
- Appropriate effort is applied to manage risks based on the uncertainty of the risk, the complexity and risk rating (i.e. potential higher order environmental impacts are subject to further evaluation/assessment).

The framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the risk (referred to as Decision Type A, B or C). The decision type is selected based on an informed discussion about the uncertainty of the risk, and documented in ENVID output.

This framework enables Woodside to appropriately understand a risk and determine if the risk is acceptable and can be demonstrated to be ALARP.

2.6.1.1 Decision Type A

Risks classified as a Decision Type A are well understood and established practice. They generally consider recognised good industry practice, which is often embodied in legislation, codes and standards, and use professional judgement.

2.6.1.2 Decision Type B

Risks classified as Decision Type B typically involve greater uncertainty and complexity (and can include potential higher order impacts/risks). These risks may deviate from established practice or have some lifecycle implications, and therefore require further engineering risk assessment to support the decision and ensure the risk is ALARP. Engineering risk assessment tools may include:

- risk-based tools such as cost based analysis or modelling
- consequence modelling
- reliability analysis
- company values.

2.6.1.3 Decision Type C

Risks classified as a Decision Type C typically have significant risks related to environmental performance. Such risks typically involve greater complexity and uncertainty; therefore, requiring adoption of a precautionary approach. The risks may result in significant environmental impact, significant project risk/exposure, or may elicit stakeholder concerns. For these risks, in addition to Decision Type A and B tools, company and societal values need to be considered by performing broader internal and external stakeholder consultation as part of the risk assessment process.

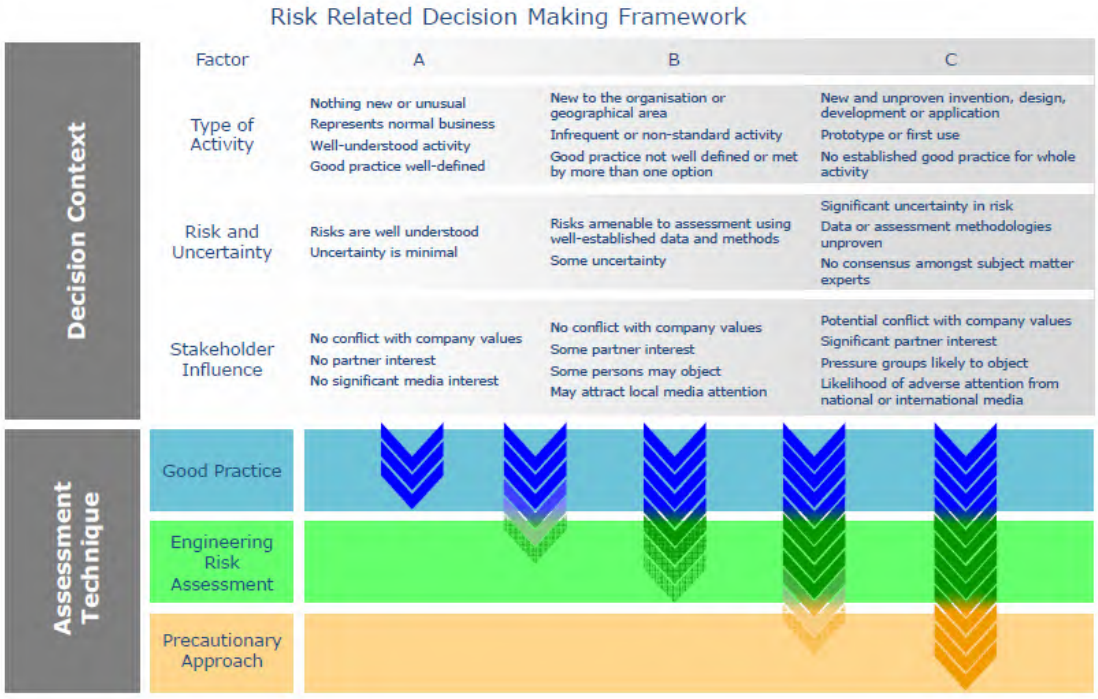


Figure 2-4: Risk-related decision-making framework (Oil and Gas UK 2014)

2.6.2 Decision Support Framework Tools

The following framework tools are applied, as appropriate, to help identify control measures based on the decision type described above:

- **Legislation, Codes and Standards (LCS)** – identifies the requirements of legislation, codes and standards which must be complied with for the activity.
- **Good Industry Practice (GP)** – identifies further engineering control standards and guidelines that may be applied by Woodside above those required to meet the LCS.
- **Professional Judgement (PJ)** – uses relevant personnel with the knowledge and experience to identify alternative controls. Woodside applies the hierarchy of control as part of the risk assessment to identify any alternative measures to control the risk.
- **Risk Based Analysis (RBA)** – assesses the results of probabilistic analyses such as modelling, quantitative risk assessment and/or cost benefit analysis to support the selection of control measures identified during the risk assessment process.
- **Company Values (CV)** – identifies values identified in Woodside's code of conduct, policies and the Woodside compass. Views, concerns and perceptions are to be considered from internal Woodside stakeholders directly affected by the planned impact or potential risk.
- **Societal Values (SV)** – identifies the views, concerns and perceptions of relevant stakeholders and addresses relevant stakeholder views, concerns and perceptions.

2.6.3 Decision Calibration

To determine that alternatives selected and the control measures applied are suitable, the following tools may be used for calibration (i.e. checking) where required:

- **Legislation, Codes and Standards/Verification of Predictions** – verification of compliance with applicable LCS and/or good industry practice.
- **Peer Review** – independent peer review of PJs, supported by risk-based analysis, where appropriate.
- **Benchmarking** – where appropriate, benchmarking against a similar facility or activity type or situation that has been accepted to represent acceptable risk.
- **Internal Stakeholder Consultation** – consultation performed within Woodside to inform the decision and verify CVs are met.
- **External Stakeholder Consultation** – consultation performed to inform the decision and verify societal values are considered.

Where appropriate, additional calibration tools may be selected specific to the decision type and the activity.

2.6.3.1 Control Measures (Hierarchy of Controls)

Risk reduction measures are prioritised and categorised in accordance with the hierarchy of controls, where risk reduction measures at the top of the hierarchy take precedence over risk reduction measures further down:

- **Elimination** of the risk by removing the hazard.
- **Substitution** of a hazard with a less hazardous one.
- **Engineering Controls** include design measures to prevent or reduce the frequency of the risk event, or detect or control the risk event (limiting the magnitude, intensity and duration) such as:
  - Prevention: design measures that reduce the likelihood of a hazardous event occurring.
  - Detection: design measures that facilitate early detection of a hazardous event.

- Control: design measures that limit the extent/escalation potential of a hazardous event.
- Mitigation: design measures that protect the environment if a hazardous event occurs.
- Response Equipment: design measures or safeguards that enable clean up/response after a hazardous event occurs.

- **Procedures and Administration** includes management systems and work instructions used to prevent or mitigate environmental exposure to hazards.
- **Emergency Response and Contingency Planning** includes methods to enable recovery from the impact of an event (e.g. protection barriers deployed near the sensitive receptor).

2.6.4 Impact and Risk Classification

Environmental impacts and risks are assessed to determine their potential significance or consequence. The impact significance or consequence considers the magnitude of the impact or risk and the sensitivity of the potentially impacted receptor (represented by **Figure 2-5**).

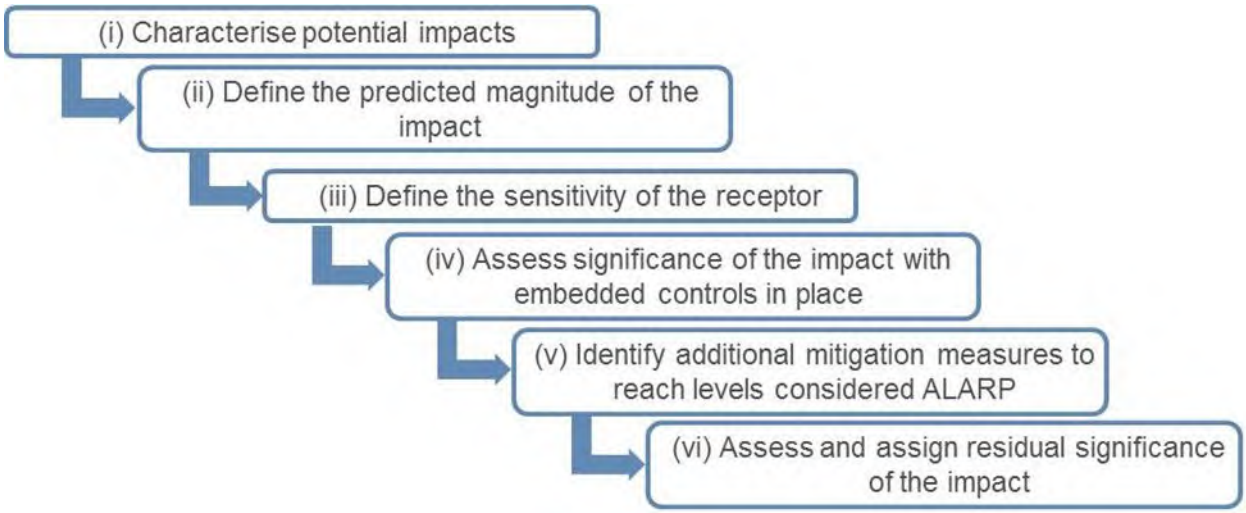


Figure 2-5: Environmental impact and risk analysis

Impacts are classified in accordance with the consequence (**Section 2.4**) outlined in the Woodside Risk Management Procedure and Risk Matrix.

Risks are assessed qualitatively and/or quantitatively in terms of both likelihood and consequence in accordance with the Woodside Risk Management Procedure and Risk Matrix.

The impact and risk information is summarised, including classification, and evaluation information, as shown in the example in **Table 2-2**, evaluated for each planned activity and unplanned event.

Table 2-3: Woodside risk matrix (environment and social and cultural) consequence descriptions

Environment	Social and Cultural	Consequence Level
Catastrophic, long-term impact (more than 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Catastrophic, long-term impact (more than 20 years) to a community, social infrastructure or highly valued areas/items of international cultural significance	***A***
Major, long-term impact (ten to 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Major, long-term impact (five to 20 years) to a community, social infrastructure or highly valued areas/items of national cultural significance	***B***

Environment	Social and Cultural	Consequence Level
Moderate, medium-term impact (two to ten years) on ecosystems, species, habitat or physical or biological attributes	Moderate, medium term Impact (two to five years) to a community, social infrastructure or highly valued areas/items of national cultural significance	***C***
Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Minor, short-term impact (one to two years) to a community or highly valued areas/items of cultural significance	***D***
Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	***E***
No lasting effect (less than one month); localised impact not significant to environmental receptors	No lasting effect (less than one month); localised impact not significant to areas/items of cultural significance	***F***

2.6.5 Risk Rating Process

The risk rating process is performed to assign a level of risk to each risk event, measured in terms of consequence and likelihood. The assigned risk level is therefore determined after identifying the decision type and appropriate control measures.

The risk rating process considers the potential environmental consequences and, where applicable, the social and cultural consequences of the risk. The risk ratings are assigned using the Woodside risk matrix (**Figure 2-6**).

The risk rating process is performed using the following steps:

2.6.5.1 Select the Consequence Level

Determine the worst-case credible consequence associated with the selected event, assuming all controls (preventative and mitigative) are absent or have failed (**Table 2-3**). Where more than one potential consequence applies, select the highest severity consequence level.

2.6.5.2 Select the Likelihood Level

Determine the description that best fits the chance of the selected consequence occurring, assuming reasonable effectiveness of the preventative and mitigative controls (**Table 2-4**).

Table 2-4: Woodside risk matrix likelihood levels

Likelihood Description						
Frequency	1 in 100,000–1,000,000 years	1 in 10,000–100,000 years	1 in 1000–10,000 years	1 in 100–1,000 years	1 in 10–100 years	>1 in 10 years
Experience	**Remote**: Unheard of in the industry	**Highly Unlikely**: Has occurred once or twice in the industry	**Unlikely**: Has occurred many times in the industry but not at Woodside	**Possible**: Has occurred once or twice in Woodside or may possibly occur	**Likely**: Has occurred frequently at Woodside or is likely to occur	**Highly Likely**: Has occurred frequently at the location or is expected to occur
Likelihood Level	**0**	**1**	**2**	**3**	**4**	**5**

2.6.5.3 Calculate the Risk Rating

The risk level is derived from the consequence and likelihood levels determined above in accordance with the risk matrix shown in **Figure 2-6**. A likelihood and risk rating is only applied to environmental risks using the Woodside risk matrix.

This risk level is used as an input into the risk evaluation process and ultimately for prioritising further risk reduction measures. Once each risk is treated to ALARP, the risk rating articulates the ALARP baseline risk as an output of the ENVID studies.

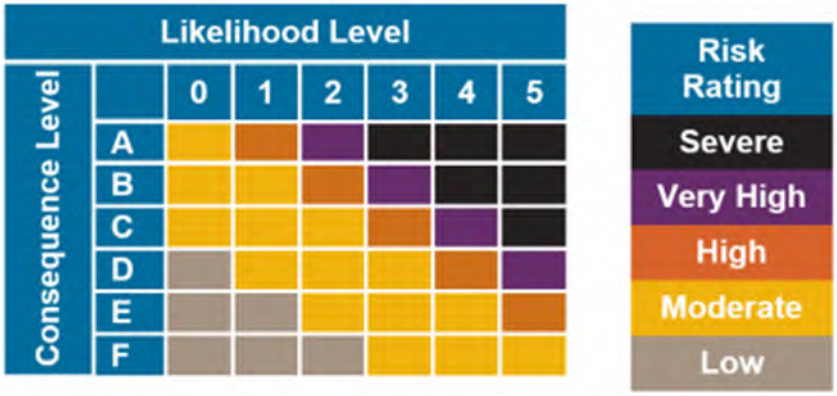


Figure 2-6: Woodside risk matrix – risk level

To support ongoing risk management (a key component of Woodside's Process Safety Management Framework – refer to Implementation Strategy (**Section 6.9**)), Woodside uses the concept of 'current risk' and applies a current risk rating to indicate the current or 'live' level of risk, considering the controls that are currently in place and regularly effective. Current risk rating is effective in articulating potential divergence from baseline risk, such as if certain controls fail or could potentially be compromised. Current risk ratings aid in the communication and visibility of the risk events, and ensures risk is continually managed to ALARP by identifying risk reduction measures and assessing acceptability.

2.7 Impact and Risk Evaluation

Environmental impacts and risks cover a wider range of issues, differing species, persistence, reversibility, resilience, cumulative effects, and variability in severity than safety risks. Determining the degree of environmental risk, and the corresponding threshold for whether a risk/impact has been reduced to ALARP and is acceptable, is evaluated to a level appropriate to the nature and scale of each impact or risk. Evaluation includes considering the:

- Decision Type.
- Principles of ESD – as defined under the EPBC Act.
- Internal context – ensuring the proposed controls and risk level are consistent with Woodside policies, procedures and standards (**Section 6** and **Appendix A**).
- External context – the environment consequence (Section 6) and stakeholder acceptability (Section 5).
- Other requirements – ensuring the proposed controls and risk level are consistent with national and international standards, laws and policies.

In accordance with Environment Regulation 10A(a), 10A(b), 10A(c) and 13(5)(b), Woodside applies the process described in the subsections below to demonstrate ALARP and acceptability for environmental impacts and risks, appropriate to the nature and scale of each impact or risk.

2.7.1 Demonstration of ALARP

Descriptions have been provided in **Table 2-5** to articulate how Woodside demonstrates that different risks, impacts and Decision Types identified within the EP are ALARP.

Table 2-5: Summary of Woodside's criteria for ALARP demonstration

Risk	Impact	Decision type
Low and moderate (below C level consequences)	***Negligible, slight, or minor (D, E or F)***	***A***
Woodside demonstrates these risks, impacts and decision types are reduced to ALARP if: • controls identified meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines • further effort towards impact/risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.		
High, very high or severe (C+ consequence risks)	***Moderate and above (A, B or C)***	***B and C***
Woodside demonstrates these higher order risks, impacts and decision types are reduced to ALARP (where it can be demonstrated using good industry practice and risk-based analysis) that: • legislative requirements, applicable company requirements and industry codes and standards are met • societal concerns are accounted for • the alternative control measures are grossly disproportionate to the benefit gained.		

2.7.2 Demonstration of Acceptability

Descriptions have been provided in **Table 2-6** to articulate how Woodside demonstrates that different risks, impacts and Decision Types identified within the EP are Acceptable.

Table 2-6: Summary of Woodside's criteria for acceptability

Risk	Impact	Decision type
Low and moderate	***Negligible, slight, or minor (D, E or F)***	***A***
• Lower order impacts and risks do not contravene the principles of ESD. Given the classification (Section 2.6.4) of these lower order impacts and risks, they will not threaten: • serious or irreversible environmental damage • the quality of the environment available to future generations • biodiversity and ecological integrity (DAWE, 2003) (refer Section 2.8). • activities do not have a significant impact on MNES (Section 2.9.2) including those with an Indigenous connection with, or traditional use in nearshore areas as defined in Section 4.10.1. • demonstrates these lower order risks, impacts and decision types are 'Broadly Acceptable' if they meet: • legislative requirements including the requirements under the OPGGS Act (2006) Section 280 (2) to carry on those activities in a manner that does not interfere with - (a) navigation; or - (b) fishing - (c) conservation of the resources of the sea and seabed - (d) any activities of another person being lawfully carried on by way of exploration or constructions - (e) the enjoyment of native title rights and interests (within the meaning of the Native Title Act 1993) - to a greater extent the is necessary for the reasonable exercises of the rights and performance of the duties of the titleholder • industry codes and standards • applicable company requirements		

Risk	Impact	Decision type
• and where further effort towards reducing risk (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.		
High, very high or severe	***Moderate and above (D, E or F)***	***B and C***
Woodside demonstrates these higher order risks, impacts and decision types are of an 'Acceptable' level if it can be demonstrated that the predicted levels of impact and/or residual risk, are: • managed to ALARP (as described in **Section 2.7.1**); and • meet the following criteria, appropriate to the nature and scale of each impact and risk: - Impact/risk does not contravene relevant principles of ESD, as defined under the EPBC Act. - Internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards. - External context – stakeholder expectations and feedback have been considered (Section 5). - External context - activities do not have a significant impact on MNES (Section 2.9.2) including those with an Indigenous connection with, or traditional use in nearshore areas as defined in Section 4.10.1. - Other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies, and applicable plans for management and conservation advices, conventions, and significant impact guidelines (e.g. for MNES) have been considered. Where there are significant complexities in assessing and managing impacts to different receptors and for demonstrating how these impacts are acceptable (e.g. significant stakeholder concern for specific receptors, lack of consensus of appropriate controls or standards), acceptability may be demonstrated separately for key receptors. This is not applicable for risks, given the consequence of an unplanned risk event occurring may not be acceptable and, therefore, acceptability is demonstrated in the context of the residual likelihood of an event occurring.		

2.8 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations, and describes the activities to be performed as part of the Petroleum Activities Program under this EP.

2.9 EPBC Act Assessment

To support the demonstration of acceptability, a separate assessment is undertaken across the following three legislative requirements incorporated into the EPBC Act.

2.9.1 Principles of ESD

As part of the demonstration of acceptability a separate assessment is undertaken to demonstrate that the EP is not inconsistent with relevant principles of ESD (refer **Section 2.7.2**).

2.9.2 MNES: Significant Impact Guidelines 1.1

A separate assessment is undertaken to determine if the potential impacts/risks of the activity trigger any relevant criteria listed in the MNES: Significant Impact Guidelines 1.1.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population

- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- introduce disease that may cause the species to decline, or interfere with the recovery of the species.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

2.9.3 Recovery Plan and Threat Abatement Plan Assessment

A separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer **Section 1.9.2.1**). The steps in this process are:

- Identify relevant listed threatened species and ecological communities (**Section 4.6**).
- Identify relevant recovery plans and threat abatement plans (**Section 6.8**).
- List all objectives and (where relevant) the action areas of these plans, and assess whether these objectives/action areas apply to government, the Titleholder, and the Petroleum Activities Program (**Section 6.8**).
- For those objectives/action areas applicable to the Petroleum Activities Program, identify the relevant actions of each plan, and evaluate whether impacts and risks resulting from the activity are clearly not inconsistent with that action (**Section 6.8**).

2.10 Environmental Performance Outcomes, Standards and Measurement Criteria

Regulation 13(7) of the Environment Regulations requires that an EP includes Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and Measurement Criteria (MC) that address legislative and other controls to manage the environmental risks of the activity to ALARP and acceptable levels.

The EPOs, EPSs and MC specified are consistent with legislative requirements and Woodside's standards and procedures. They have been developed based on the Codes and Standards, Good Industry Practices and Professional Judgement outlined in **Sections 2.6** as part of the acceptability and ALARP justification process.

During consultation, a summary of the controls adopted to manage the impacts and risks from the activity is included in the Consultation Information Sheet (Appendix F, 1.1) which is provided directly to relevant persons and available on the Woodside website.

In addition, during face-to-face consultation with Traditional Custodians, the particular controls adopted to manage interests raised are typically discussed by appropriate SMEs at the meeting to seek feedback. These controls may also be jointly adopted to protect the ecological value of a receptor. If additional controls are considered, to manage the risk to identified cultural values, these are discussed with the relevant persons who have raised the value.

Controls which have been adopted to manage the risk to a cultural value identified from literature or which are adaptive in nature may not have not been routinely tested during consultation with traditional custodians, unless the values has been identified by the relevant person themselves. It is not considered appropriate to broadly canvass Traditional Custodian relevant persons to validate cultural values identified from literature (not raised by the relevant person themselves) or associated controls. Instead, Woodside's in-house heritage and First Nations experts have been involved in developing and screening such controls. The EPOs, EPSs and MC are presented throughout this section and in **Appendix D** (Oil Spill Preparedness and Response). A breach of these EPOs or standards constitutes a 'Recordable Incident' under the Environment Regulations (refer to **Section 7**.10)

2.11 Implementation, Monitoring, Review and Reporting

An implementation strategy for the Petroleum Activities Program describes the specific measures and arrangements to be implemented for the duration of the Petroleum Activities Program. The implementation strategy is based on the principles of AS/NZS ISO 14001:2016 Environmental Management Systems, and demonstrates:

- control measures are effective in reducing the environmental impacts and risks of the Petroleum Activities Program to ALARP and acceptable levels.
- EPOs and standards set out in the EP are met through monitoring, recording, audit, management of non-conformance and review.
- all environmental impacts and risks of the Petroleum Activities Program are periodically reviewed in accordance with Woodside's risk management procedures.
- roles and responsibilities are clearly defined, and personnel are competent and appropriately trained to implement the requirements set out in this EP, including in emergencies or potential emergencies.
- arrangements are in place to respond to and monitor impacts from oil pollution emergencies.
- environmental reporting requirements, including 'reportable incidents', are met.
- appropriate stakeholder consultation is performed throughout the activity.

The implementation strategy is presented in **Section 6.9**.

2.12 Stakeholder Consultation

A stakeholder assessment is performed to identify relevant persons (as defined under Regulation 11A of the Environment Regulations). An activity update is issued electronically to relevant stakeholders to provide a reasonable consultation period. Further details and information are provided to any stakeholder if requested.

Each stakeholder response is summarised and assessed and a response, where appropriate, is provided by Woodside.

The stakeholder consultation, along with the process for ongoing engagement and consultation throughout the activity, is presented in **Section 5.** A copy of the full text correspondence with relevant people is provided in **Appendix F.**

3 DESCRIPTION OF THE ACTIVITY

3.1 Project Overview

The proposed Petroleum Activities Program comprises a marine seismic survey (MSS) of the Scarborough field, the 'Scarborough 4D Baseline (B1) MSS', which will be acquired in the Northern Carnarvon Basin on the Exmouth Plateau within Woodside's permit areas WA-61-L, WA-62-L, WA-61-R, WA-63-R, as well as surrounding permit areas WA-530-P, WA-66-R, WA-67-R, WA-68-R, WA-83-R, WA-89-R, WA-268-P, WA-365-P, WA-365-P LL, WA-365-P LK, WA-383-P, WA-474-P, WA-474-P LS, WA-518-P and gazettal block W19-35. Additionally, the proposed activity includes a potential extension to cover the Jupiter field to the north-east, within permit area WA-61-R.

Table 3-1 provides an overview of the key characteristics for the survey. The commencement of the activities is subject to approvals, vessel availability and weather constraints.

Table 3-1: Petroleum Activities Program overview

Item	Description
Petroleum titles	WA-61-L, WA-62-L, WA-61-R, WA-63-R
Location	North Carnarvon Basin
Active Source Area	~5650 km²
Operational Area	~9200 km²
Water depths in Active Source Area	~800–1150 m
Vessels	Four – one seismic survey vessel, one support vessel, one chase vessel and one spotter vessel

3.2 Purpose of the Activity

The objective for the Petroleum Activities Program is to acquire a new marine 3D / Baseline 4D seismic survey over the Scarborough and Jupiter fields, as part of an appraisal program for reservoir management. This new 3D survey will provide an uplift in seismic imaging for the Scarborough field from the 2004 vintage seismic data (HEX-003) and ultimately be used as the baseline for time lapse data in the event of acquisition of future monitoring seismic surveys. This will help inform the optimised management of hydrocarbon reserves.

3.3 Location

The proposed survey is located in Commonwealth waters in north-west Australia (denoted as polygons in **Figure 3-1**). For the purposes of this EP, two areas have been defined for the survey based on the type of activities that will be undertaken and the discharge of the seismic source. The following areas apply:

- Active Source Area.
- Operational Area.

Table 3-3 provides the boundary coordinates for the two areas.

The Operational Area for the Scarborough 4D B1 MSS, located in the North Carnarvon Basin, is approximately:

- 201 km WNW of the Montebello Islands and Barrow Island.
- 188 km north-west of North-west Cape.

- 245 km north-west of Onslow.
- 167 km NNW of the Ningaloo Coast World Heritage Property (WHP).

The southern corner of the Operational Area is located about 33 km from the boundary of the Gascoyne Marine Park (**Figure 4-12**).

3.3.1 Active Source Area

The Active Source Area is defined as the maximum potential area within which seismic acoustic emissions may occur for the purpose of acquiring data. Discharge of the seismic source during vessel run-ins, run-outs, soft starts and full-fold seismic data acquisition will occur within the Active Source Area. Seismic source testing (i.e. bubble tests) will also occur within the Active Source Area. The seismic source will not be discharged outside of the Active Source Area.

It is important to note that the full-power discharge of the source for full-fold seismic data acquisition will take place over smaller, more discrete areas within the Active Source Area. The larger Active Source Area provides Woodside with flexibility as the survey scope is still being defined.

The extent of the Active Source Area is approximately 5650 km^2. Water depths within the Active Source Area range from ~800 m to 1150 m.

3.3.2 Operational Area

The Operational Area includes both the Active Source Area and a surrounding buffer for the purpose of vessel line turns and other vessel manoeuvres. The seismic source will not be discharged within this buffer.

The extent of the Operational Area is approximately 9200 km^2. Water depths within the Operational Area range from ~800 m to 1150 m.

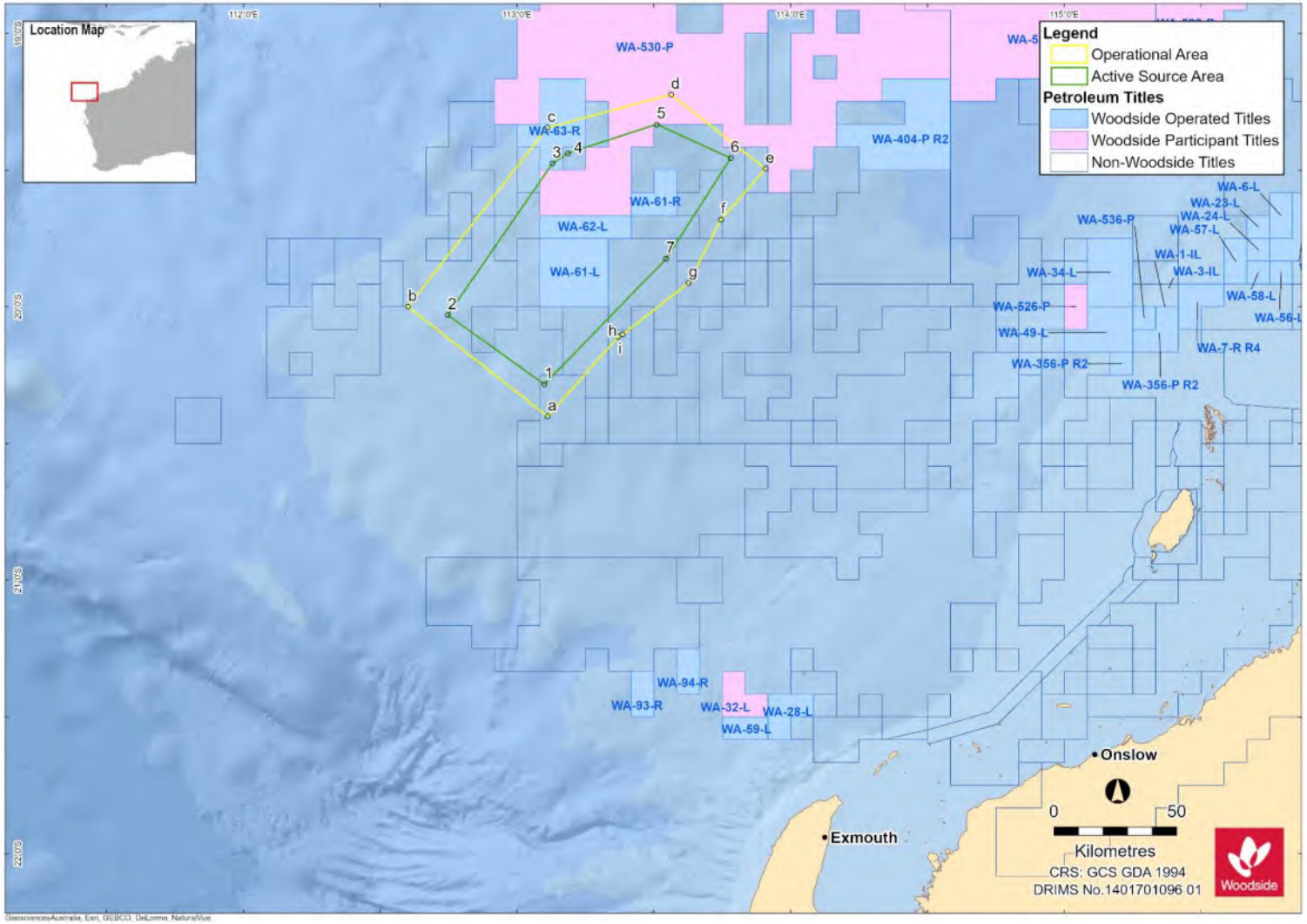


Figure 3-1: Scarborough 4D B1 MSS Areas, including the Jupiter Extension

Table 3-2: Indicative boundary coordinates for the Petroleum Activities Program Active Source Area and Operational Area

Location point (GDA94 Degrees minutes seconds)	Latitude	Longitude
Active Source Area		
1	20°16'59.043"S	113°6'0.387"E
2	20°1'47.096"S	112°44'50.156"E
3	19°28'31.503"S	113°7'47.431"E
4	19°26'15.236"S	113°11'12.497"E
5	19°19'55.308"S	113°30'40.293"E
6	19°27'20.645"S	113°46'53.197"E
7	19°49'26.264"S	113°32'44.0"E
Operational Area		
a	20°24'2.0"S	113°6'45.162"E
b	19°59'57.873"S	112°36'7.851"E
c	19°20'39.38"S	113°6'41.252"E
d	19°13'25.19"S	113°33'49.172"E
e	19°29'41.467"S	113°54'32.011"E
f	19°40'50.544"S	113°44'44.882"E
g	19°54'42.118"S	113°37'40.185"E
h	20°6'2.873"S	113°23'11.168"E
i	20°6'31.786"S	113°22'13.473"E

[1] The final Active Source Area may be subject to slight modifications as the survey scopes become better defined; however, no changes will exceed the Operational Area as defined in this EP.

3.4 Timing

The planned duration for the survey is 80 days. The planned duration includes a maximum of 70 days of seismic data acquisition, plus 10 days of contingency for potential vessel or equipment down time and adverse weather conditions. The exact survey duration is dependent upon the final 4D activity scope.

The survey duration relates to the time that the seismic survey vessel is in the Operational Area with the towed seismic source array and streamers deployed for the purpose of undertaking the Petroleum Activities Program. In the event that the seismic vessel needs to demobilise from the Operational Area (for example, for cyclone avoidance), any time that the vessel is demobilised from the Operational Area will not be counted towards the survey duration. Time that is counted towards the specified survey duration will commence again once the seismic vessel has returned to the Operational Area and the equipment is deployed for the purpose of resuming the Petroleum Activities Program.

The activity is planned to commence in Q2 or Q3 2023 with the earliest potential commencement date for the survey being upon EP acceptance. The acquisition will be completed in Q3/Q4 2023. However, this is subject to the EP acceptance timeline, vessel availability, operational constraints and prevailing weather conditions. Therefore, to manage these potential uncertainties, the start date may vary but the Scarborough 4D B1 MSS will be completed by 31 December 2023.

The confirmed start and end dates will be considered in conjunction with other Scarborough activity EP's to ensure consideration of possible concurrent and cumulative impacts.

The exact start and end dates of the survey will be communicated to stakeholders once confirmed, in accordance with the ongoing stakeholder consultation process described in **Section 5.**

3.5 Activity Components

3.5.1 Survey Method

The marine seismic surveys proposed are typical seismic surveys similar to most others conducted in Australian marine waters (in terms of technical methods and procedures). The surveys will be conducted using a purpose-built seismic vessel.

During the proposed activities, the survey vessel will traverse a series of pre-determined sail lines within the Active Source area at a speed of about 4–5 knots. As the vessel travels along the survey lines, regular pulses of sound will be emitted from a seismic source array and directed down through the water column and seabed. The produced sound waves are attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive hydrophone microphones and potentially micro electro-mechanical system (MEMS) accelerometers arranged along cables (called 'streamers') which are towed behind the survey vessel. The reflected sound is then processed to provide 3D data about the structure and composition of geological formations below the seabed. A summary of the seismic survey parameters is provided in **Table 3-2**.

3.5.2 Seismic Data Acquisition

The seismic vessel will typically acquire the data along a series of adjacent and parallel lines in a "racetrack"-like pattern. At the end of the first line, the vessel will turn in a wide arc to position for another parallel line in the opposite direction, offset several kilometres away from the previous line. Once this next line is complete, the vessel will turn again to position for a line adjacent to the first line and offset by approximately 450 m, being the next sail line separation. This pattern is repeated until the required coverage is completed. The time required to complete each sail line is dependent on the line length, vessel speed and currents. The orientation and length of the sail lines are dependent on the final 4D survey design but will be either orientated 25°/205° or 040.5°/220.5°, with a maximum sail line length of up to 105 km.

As the vessel travels along the sail lines, the seismic source will emit regular acoustic pulses (approximately every 5 seconds with a shot point interval of 12.5 m) (refer to **Table 3-3**).

The 3D seismic data acquired during the survey will serve as a 4D baseline for potential future monitoring surveys, to be acquired at a later date (refer to **Section 3.2**). Measuring the subtle, but time-dependent changes in the reservoir fluid properties on the basis of the seismic signals from the repeat 3D surveys requires very accurate positioning of the acoustic source (shot point) and streamers (receiver points).

3.5.3 Seismic Source

The proposed Petroleum Activities Program will use a seismic source array within the Active Source Area. This consists of a towed configuration of air-powered sources to generate acoustic pulses by periodically discharging compressed air into the water column. Energy from these pulses reflects from the boundaries between geological layers in the sub-surface; the reflected energy of seismic traces is recorded by the receivers located along the towed streamers.

The seismic source will comprise an airgun array with a total volume of up to 3150 in^3 (refer to **Table 3-3**) with an operating pressure of about 13,800 kPa (2000 psi).

The source array will be towed at a depth of 6–8 m (±1 m). The source arrays will be discharged with a shot point interval of 12.5 m horizontal distance (equivalent to approximately every 5–6 seconds)

(refer to **Table 3-3**). The Scarborough 4D B1 MSS will most likely use a triple source configuration ('flip-flop-flap' discharge).

Table 3-3: Survey acquisition parameters

Parameter		Scarborough 4D B1 MSS		
General parameters	Active Source Area	~5650 km²		
	Operational Area	~9200 km²		
	Max. sail line length	~105 km		
	Line separation (nominal)	450 m		
	Line Orientation	25–340.5° / 205–2220.5° North East - South West		
	Water depths in Acquistion Area	~800–1150 m		
	Planned survey duration[1]	80-days		
Acoustic emissions	Source configuration	Triple source (flip/flop/flap) or dual source (flip/flop)		
	Airgun array capacity (approximate)	3150 in³		
	Operating pressure	2000 psi		
	Airgun array tow depth	6–8 m (±1 m)		
	Shot point interval	12.5 m (triple source) or 18.75 m (dual source)		
	Peak frequency range	2-200 Hz		
	Modelled far-field source levels (Koessler *et al*. 2021)	Peak source pressure $L_{S,pk}$ (dB re 1 µPa m)	Per-pulse source SEL ($L_{S,E}$) (dB 1 µPa²m²s)	
			10-2000 Hz	2000-25,000 Hz
	Broadside	248.1	224.1	183.9
	Endfire	246.3	223.2	183.9
	Vertical	254.4	227.4	193.5
	Vertical (surface affected)	254.4	230.2	196.5
Acoustic reception	No. of streamers (approximate)	Up to 14		
	Streamer length (approximate)	Approximately 8000 m		
	Streamer spacing (approximate)	50 to 100 m		
	Maximum width of streamer array (approximate)	Approximately to 1.5 km		
	Streamer tow depth (approximate)	From ~15m to 25 m		

[1] *The acquisition duration for the Petroleum Activities Program is subject to EP acceptance, business approval to commence, vessel availability, operational constraints and prevailing weather conditions.*

3.5.4 Receiver Technology

3.5.4.1 Solid Streamers

The proposed Petroleum Activities Program will use a seismic vessel to tow up to 14 solid streamers (**Table 3-3**). The streamers will be towed at a depth of about 15–25 m, with streamer spacing (separations) of 50 to 100 m. The streamer lengths will be approximately 8000 m, towed approximately 500 m behind the seismic vessel and, therefore, extending approximately 8.5 km behind the vessel. Solid streamers will be used instead of traditional fluid-filled streamers so as to reduce the potential risk of damaged streamers releasing fluid to the environment.

The streamers contain steering devices in the form of remote controlled wings, which enable both precise depth control and horizontal steering. Horizontal streamer steering reduces feathering (where the streamer tends to veer offline due to wind and currents) and enables safe streamer separation control and active steering. Streamer recovery devices (SRDs) will be fitted to the streamers. If the streamers go below about 50 m depth, the SRDs automatically deploy inflatable air bags / buoys to raise the streamer to the surface for retrieval.

3.5.5 Project Vessels

Up to four project vessels (seismic, support, chase and spotter vessel) are expected to be required for Scarborough 4D B1 MSS.

The survey will be conducted using a single seismic vessel. A support vessel, will accompany the seismic vessel to re-supply it with fuel and other logistical and operational supplies (including taking the seismic vessel under tow, if required). A chase vessel will be used to manage interactions with shipping and fishing activities, if required. It is intended that a dedicated spotter vessel with two MFOs aboard will be deployed ahead of the seismic vessel.

Table 3-4 outlines typical parameters of the vessels that will be used during the seismic survey.

The seismic vessel and towed arrays, comprising the acoustic source array and streamer array (including the streamer header buoys, starboard and port deflectors or baravanes, streamers and tail buoys), are surrounded by a Safe Navigation Area (SNA). The SNA will extend to a distance of 3 Nautical miles (Nm) around the seismic vessel and towed equipment (refer to **Figure 3-2**). The support/chase vessel will be used to ensure third party vessels are prevented from entering the SNA.

Note that in addition to the three main project vessels, small work boat(s) and fast rescue craft (FRC) will be launched from the seismic vessel for in-water streamer maintenance. A typical workboat is less than 5 m in length and mainly assists with the deployment, positioning, cleaning and maintenance and recovery of the towed arrays.

Table 3-4: Representative vessel specifications

Specification	Seismic vessel	Support vessel	Chase/spotter vessel(s)
Gross Registered Tonnage (GRT)	~13,000- 22,000	~3000	<400
Length overall	~110 m	~65 m	~22 m
Breadth	~40 m	~20 m	~6 m
Draft (max)	8 m	7 m	~2 m
Persons on board	80	50	4–12
Fuel type	Marine diesel oil (MDO)	MDO	MDO

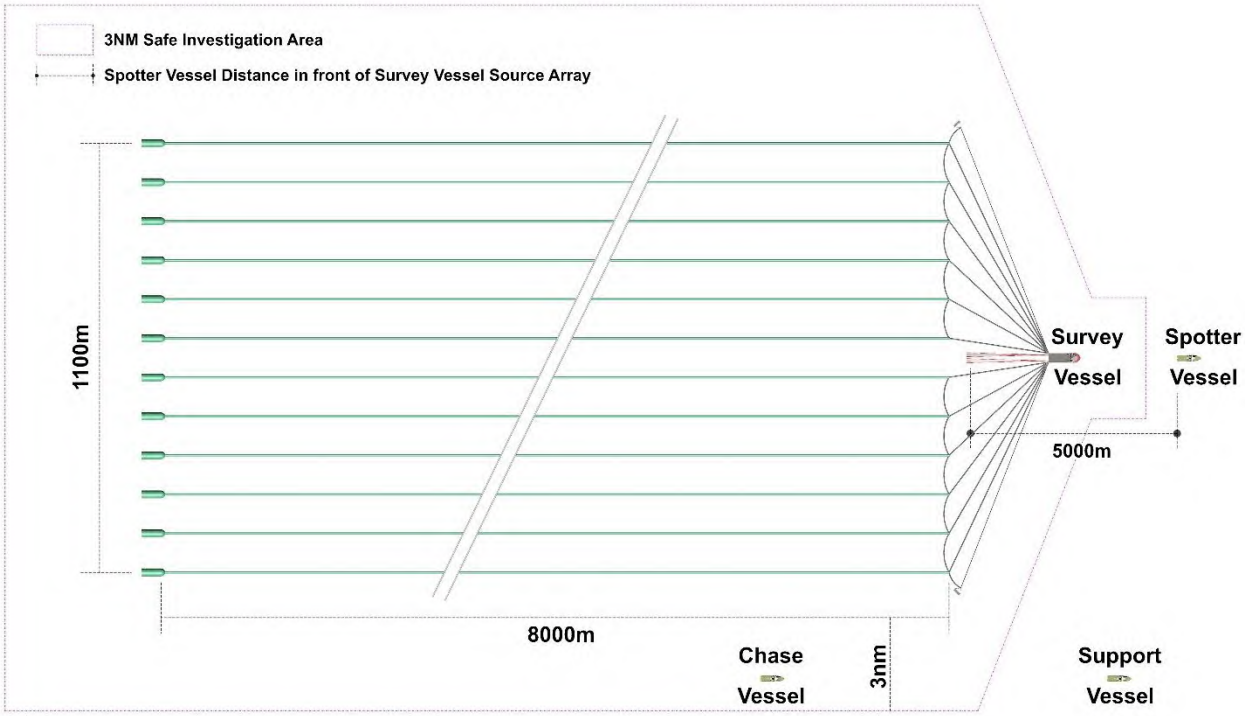


Figure 3-2: Safe Navigation Area surround the seismic vessel and towed arrays (note that streamer lengths and spreads are indicative and may vary)

Potable water, primarily for accommodation and associated domestic areas, will be generated on the seismic and support/chase vessels using a reverse osmosis system. This process will produce brine, which is diluted and discharged at the sea surface in accordance with the controls detailed in **Section 6.6.5**.

The project vessels will also discharge deck drainage from open drainage areas, bilge water from closed drainage areas, putrescible waste and treated sewage and grey water. Any hazardous and non-hazardous waste will be appropriately stored and transported to shore for disposal.

3.5.6 Helicopters

Due to the distance from the coast, if required crew changes will most likely be via a support or chase vessel from the nearest port(s) of call, but may be made by helicopter. If required during the seismic survey (in event of an emergency), helicopters may be used and operated out of the Karratha heliport or Exmouth Aerodrome.

3.5.7 Refuelling

At-sea refuelling (bunkering) of the seismic vessel may occur, depending on fuel consumption during the survey. At-sea refuelling operations will occur within the Operational Area, and in accordance with contractor operational procedures and the control measures outlined in **Section 6.7.3**.

4 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Overview

In accordance with Regulations 13(2) and 13(3) of the Environment Regulations, this section describes the existing environment that may be affected by the activity (planned and unplanned, as described in **Section 3**), including details of the particular relevant values and sensitivities of the environment, which were used for the risk assessment.

The Environment that May Be Affected (EMBA) is the largest spatial extent where unplanned events could have an environmental consequence on the surrounding environment. For this EP, the EMBA is the potential spatial extent of surface and in-water hydrocarbons at concentrations above ecological impact thresholds, in the event of the worst-case credible spill, ecological impact thresholds used to delineate the EMBA are defined in **Section 6.7.1.2**. The worst-case credible spill scenario for this EP is a vessel collision resulting in hydrocarbon release. Note, no shoreline accumulation of hydrocarbons above threshold concentrations (100 g/m^2) resulted from the modelled worst-case credible spill.

Woodside recognises that hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds defined in **Section 6.7.1.2**. These visible hydrocarbons are not expected to cause ecological impacts. In respect of this, an additional socio-cultural EMBA is defined, as the potential spatial extent within which social-cultural impacts may occur from changes to the visual amenity of the marine environment. Receptors relevant to the socio-cultural EMBA include Commonwealth and State marine protected areas (MPAs), National and Commonwealth Heritage Listed places, areas of tourism and recreation, and commercial and traditional fisheries. For this EP, the socio-cultural threshold for surface hydrocarbons encompasses an area fully within the boundaries of the EMBA for ecological impacts. The EMBA and socio-economic EMBA are described in **Table 4-1**.

The EMBA presented does not represent the predicted coverage of any one hydrocarbon spill or a depiction of a slick or plume at any particular point in time. Rather, the areas are a composite of a large number of theoretical paths, integrated over the full duration of the simulations under various metocean conditions.

Table 4-1: Hydrocarbon spill thresholds used to define EMBA for surface and in-water hydrocarbons

Hydrocarbon type	EMBA[1]	Socio-cultural EMBA[1]	Planning area for scientific monitoring
Surface	10 g/m^2 This represents the minimum oil thickness (0.01 mm) at which ecological impacts (e.g. to birds and marine mammals) are expected to occur.	1 g/m^2 This represents a wider area where a visible sheen may be present on the surface and, therefore, the concentration at which socio-cultural impacts to the visual amenity of the marine environment may occur. However, it is below concentrations at which ecological impacts are expected to occur. This low exposure value also establishes the planning area for scientific monitoring (NOPSEMA guidance note: A652993, April 2019).	
Dissolved	50 ppb This represents potential toxic effects, particularly sub-lethal effects to highly sensitive species (NOPSEMA guidance note: A652993, April 2019). As dissolved hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors can be associated with ecological impacts. Therefore, dissolved hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur. The review and results are presented in **Section 6.7.1.**		10 ppb This low exposure value establishes the planning area for scientific monitoring (based on potential for exceedance of water quality triggers) (NOPSEMA guidance note: A652993, April 2019). This area is described further in **Appendix D**. In the event of a spill, DNP will be notified of Australian Marine Parks (AMPs) which may be contacted by

Hydrocarbon type	EMBA[1]	Socio-cultural EMBA[1]	Planning area for scientific monitoring
Entrained	100 ppb This represents potential toxic effects, particularly sub-lethal effects to highly sensitive species (NOPSEMA guidance note: A652993, April 2019). As entrained hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors can be associated with ecological impacts. Therefore, entrained hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur.		hydrocarbons at this threshold **Table 7-5**.
Shoreline	100 g/m^2 This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.	10 g/m^2 This represents the volume where hydrocarbons may be visible on the shoreline but is below concentrations at which ecological impacts are expected to occur.	N/A

[1] *Further details including the source of the thresholds used to define the EMBA in this table are provided in* ***Section 6.7.1.2***

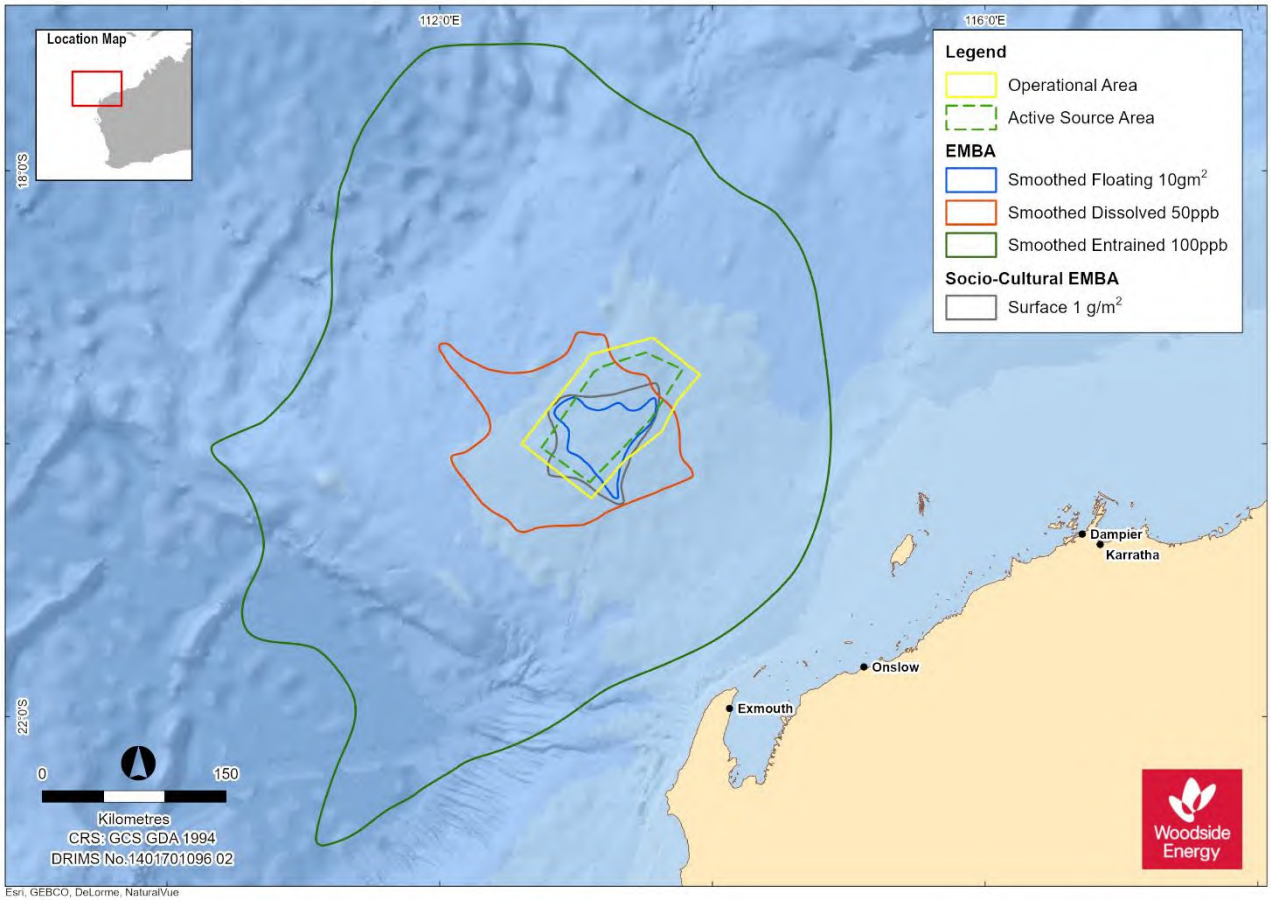


Figure 4-1: Environment that May Be Affected (EMBA) by the Petroleum Activities Program

4.2 Regional Context

The Operational Area is located in Commonwealth waters within the North-west marine region (NWMR), as defined under the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) (Commonwealth of Australia, 2006), in water depths of about 800-1150 m. Within the NWMR, the Operational Area lies within the Northwest Province (**Figure 4-2**). The EMBA partially overlaps with additional provincial bioregions of the NWMR including the Northwest Transition, Central Western Transition, Northwest Shelf Province and Central Western Shelf Transition. The southern tip of the EMBA enters the South-west Marine Region (SWMR), and Central Western Province provincial bioregion. Woodside's Description of Existing Environment (**Appendix H**) summarised the characteristics for the relevant marine bioregions.

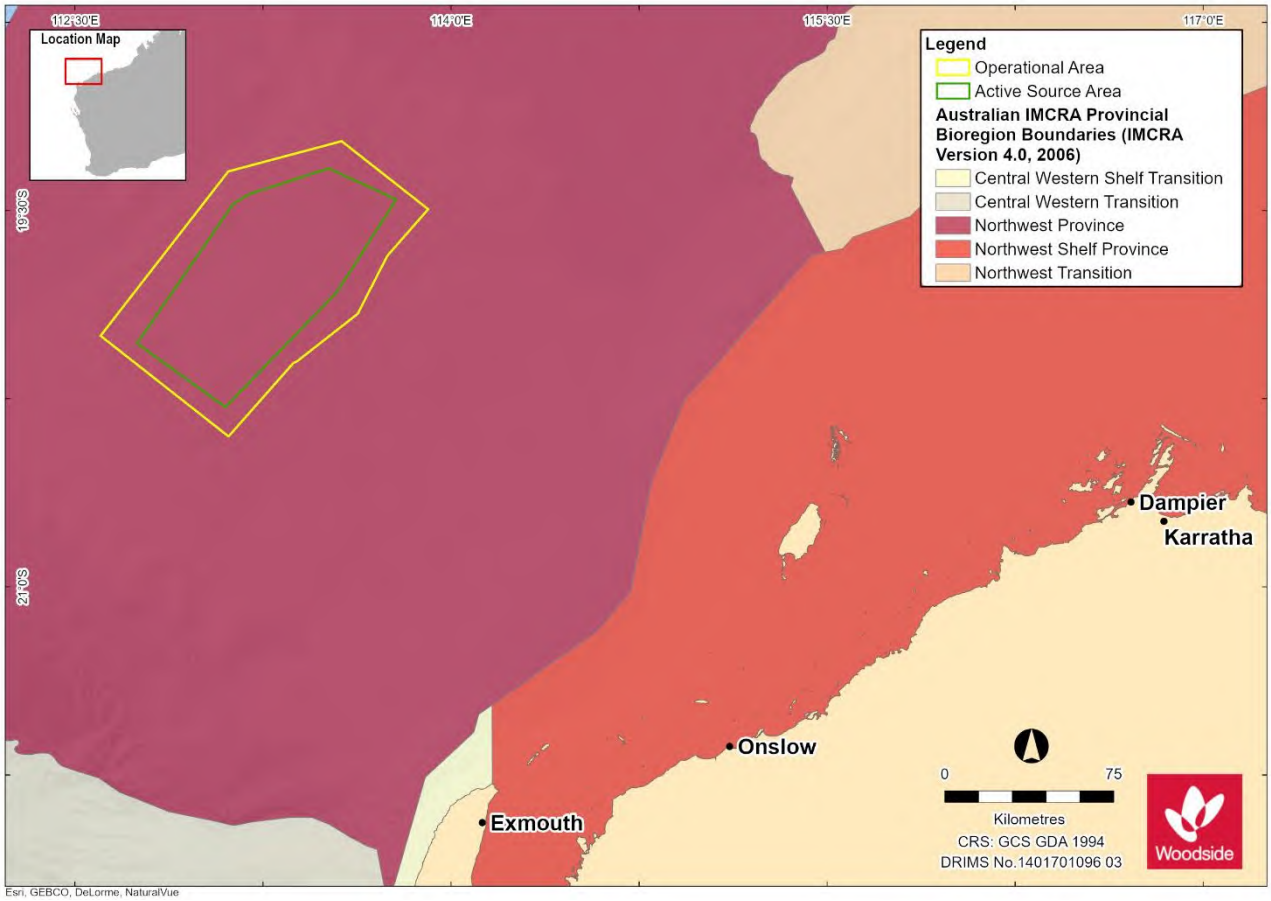


Figure 4-2: Location of the Operational Area and relevant marine bio-regions

4.3 Matters of National Environmental Significance

Table 4-2 and **Table 4-3** summarise the matters of national environmental significance (MNES) overlapping the Operational Area and EMBA, respectively, according to Protected Matters Search Tool (PMST) results (**Appendix C**). It should be noted that the EPBC Act PMST is a general database that conservatively identifies areas in which protected species have the potential to occur.

Additional information on these MNES are provided in subsequent sections of this chapter and described in detail in **Appendix H.**

Table 4-2: Summary of MNES identified by the EPBC Act PMST as potentially occurring within the Operational Area

MNES	Number	Description
World Heritage Properties	None	The closest World Heritage Property is the Ningaloo Coast World Heritage Property, located approximately 168 km SSE of the Operational Area.
National Heritage Places	None	The closest National Heritage Place is the Ningaloo Coast, located approximately 168 km SSE of the Operational Area.
Wetlands of International Importance (Ramsar)	None	The closest Ramsar wetland is Eighty Mile Beach, located approximately 615 km east of the Operational Area.
Commonwealth Marine Area	1	Generally, the Commonwealth Marine Area (EEZ) stretches from 3 nm to 200 nm from the coast. The Operational Area is located within the NWMR.
Listed Threatened Ecological Communities	None	No Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the marine waters of the NWMR (**Appendix H: Section 10.6**).
Listed Threatened Species	14	Threatened species that were identified by the PMST as potentially occurring within the Operational Area are identified in **Sections 4.6.1** to **4.6.4** and described in **Appendix H: Sections 5–8.**
Listed Migratory Species	26	Migratory species that were identified by the PMST as potentially occurring within the Operational Area are identified in **Sections 4.6.1** to **4.6.4** and described in **Appendix H: Sections 5–8.**

Table 4-3: Summary of MNES identified by the EPBC Act PMST as potentially occurring within the EMBA

MNES	Number	Description
World Heritage Properties	None	There are no World Heritage Properties located within the EMBA.
National Heritage Places	None	There are no National Heritage Places located within the EMBA.
Wetlands of International Importance (Ramsar)	None	There are no Ramsar wetlands located within the EMBA.
Commonwealth Marine Area	2	The EMBA overlaps with the NWMR and SWMR.
Listed Threatened Ecological Communities	None	No Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the marine waters of the NWMR (**Appendix H: Section 10.6**).
Listed Threatened Species	27	Threatened species that were identified by the PMST as potentially occurring within the EMBA are identified in **Sections 4.6.1** to **4.6.4** and described in **Appendix H: Sections 5–8.**
Listed Migratory Species	43	Migratory species that were identified by the PMST as potentially occurring within the EMBA are identified in **Sections 4.6.1** to **4.6.4** and described in **Appendix H: Sections 5–8.**

4.4 Physical Environment

The Operational Area is located entirely on the 'Exmouth Plateau' Key Ecological Feature (KEF), in water depths ranging from about 800 to 1150 m (**Figure 4-3**). The Exmouth Plateau is a distinctive geomorphic feature containing topographic features including terraces, canyons and pinnacles (DEWHA, 2008). The topography of the Exmouth Plateau is thought to modify deep water flow and

contribute to upwelling of deep nutrient-rich waters, as well as provide conduits for moving sediment from the plateau surface to the abyss (DoEE n.d.).

Appendix H: Section 2 provides a summary of the physical characteristics of the environment within the Operational Area. The Operational Area is influenced by ocean currents as described in **Appendix H: Section 2.3**, which also provides a summary of the physical characteristics of the environment within the wider EMBA.

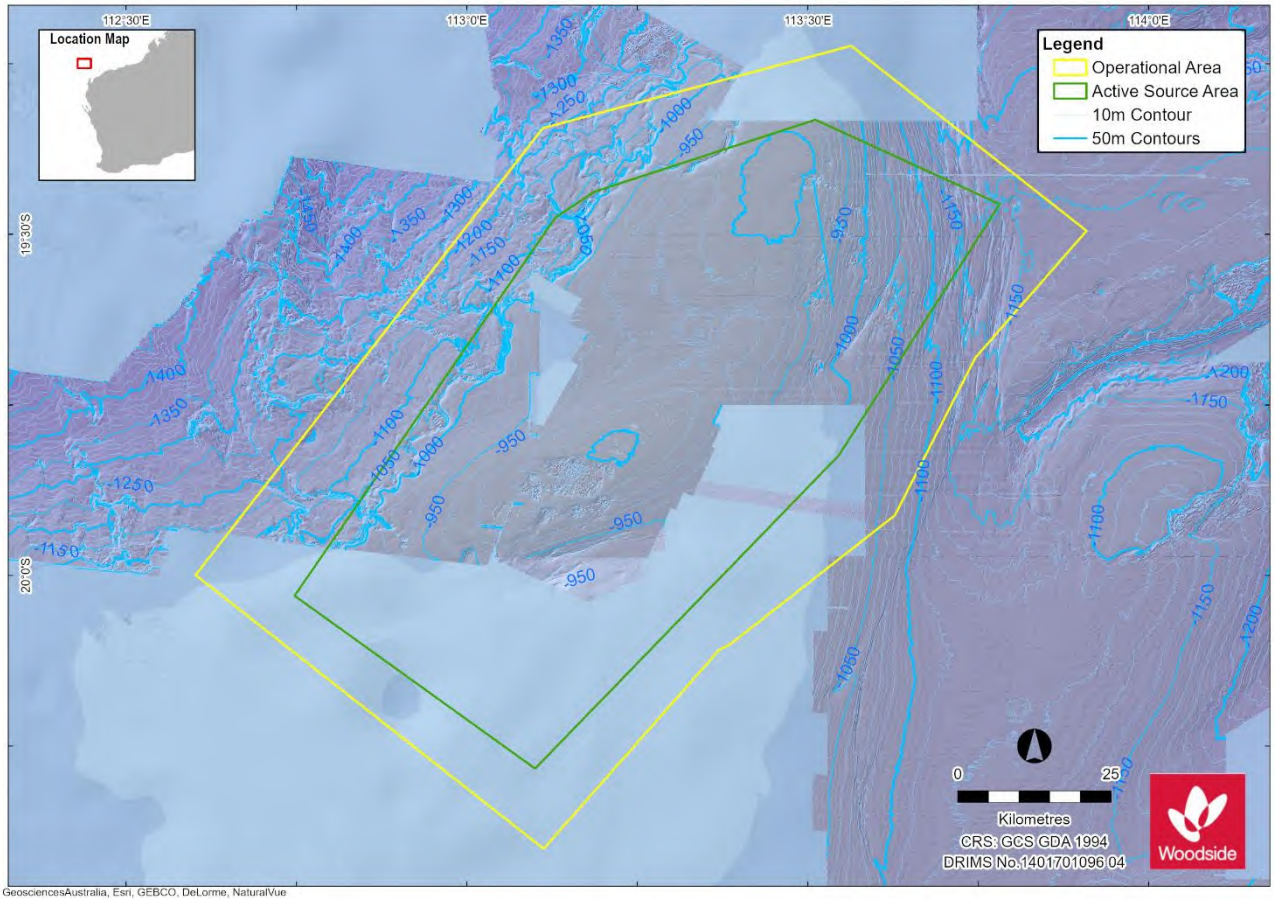


Figure 4-3: Bathymetry of the Operational Area

4.5 Habitats and Biological Communities

The benthic habitat associated with the deep water (>800 m), fine grain soft sediments in the Operational Area include fauna living within the sediments (infauna) and those living on or above the seabed (sessile and mobile epifauna). A remotely operated vehicle (ROV) survey conducted by Woodside at four well-sites (Toro-1, Steel Dragon-1, Hanover South and Anhalt-1) in waters between 821 and 2038 m depths off the coast of WA identified benthic associated species across the four distinct sites (Bryce et al., 2015). At the ROV survey location (Toro-1, located around 115 km SSE of the Operational Area) most consistent with the depths, sediment and geomorphology of the Operational Area, benthic fauna encountered were mostly echinoderms (e.g. sea cucumbers and sea stars), with distinct signs of infaunal bioturbators and potential mounds created by burrowing fish also noted, however abundance was found to be generally low. Benthic filter feeders and other epifauna and infauna are likely to inhabit the Operational Area, however the deep water depths and the presence of mostly fine grained sediments with a lack of hard substrate suggest abundances and diversity will be low, and consistent with much of the broader Northwest Province.

The Operational Area lies within the Exmouth Plateau KEF, an area that contributes to the productivity of the region driven by upwelling of deep nutrient-rich waters. The plateau's surface is rough and undulating at 900–1000 m depth (DoEE, n.d.). The Exmouth Plateau is generally an area of low habitat heterogeneity; however, it is likely to be an important area of biodiversity as it provides an extended area offshore for communities adapted to depths of around 1000 m (DOEE, n.d.). Additionally, the Operational Area overlaps entirely with the Northwest Province, which typically supports a low abundance, richness and diversity of benthic communities (Heyward et al., 2001).

No Critical Habitats or Threatened Ecological Communities as listed under the EPBC Act are known to occur within the Operational Area.

Key habitats and ecological communities within the EMBA are identified in **Table 4-4** and described in **Appendix H**.

Table 4-4: Key Habitats within the EMBA

Habitat/Community	Key locations within the EMBA
Marine primary producers	
Coral	There are no recognised key locations for hard coral habitats within the EMBA. .
Seagrass beds and macroalgae	There are no recognised key locations for seagrass beds and macroalgae habitat/communities within the EMBA.
Mangroves	Shoreline accumulation of hydrocarbons is not expected above ecological thresholds and therefore no mangrove systems occur within the EMBA.
Sandy beaches	Shoreline accumulation of hydrocarbons is not expected above ecological thresholds and therefore no sandy beaches occur within the EMBA.
Salt marshes	Shoreline accumulation of hydrocarbons is not expected above ecological thresholds and therefore no salt marshes occur within the EMBA.
Other communities and habitats	
Plankton	Plankton within the Operational Area is expected to reflect the conditions of the NWMR. Primary productivity of the NWMR appears to be largely driven by offshore influences, with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. Refer to **Appendix H: Section 4.3** for a description of planktonic communities in the NWMR.
Pelagic and demersal fish populations	In the EMBA, fish diversity and abundance is typically correlated with habitat distribution, with complex habitats, such as coral and rocky reefs, hosting more diverse and abundant assemblages. Notable habitats hosting diverse fish assemblages include the Continental slope demersal fish communities KEF. Refer to **Appendix H: Section 5.5** for a description of pelagic and demersal fish populations in the NWMR.
Epifauna and infauna	The EMBA contains deep water habitats dominated by soft, fine grain sediments and sparse benthic biota. The benthic communities are characterised by benthic filter feeders and other epifauna, and infaunal bioturbators. Refer to **Appendix H: Section 5.5** for a description of epifauna and infauna in the NWMR.

4.6 Protected Species

A total of 40 EPBC Act listed species considered to be MNES were identified as potentially occurring within the EMBA of which a subset of 24 species were identified as potentially occurring within the Operational Area. The full list of marine species identified from the PMST reports is provided in **Appendix C**, including several MNES that are not considered to be credibly impacted (e.g. terrestrial species within the EMBA). Criteria for determining species to be considered for impact assessment is outlined in **Appendix H: Section 3.2**. Two conservation dependent species have also been

identified with a potential to occur within the Operational Area and EMBA; the scalloped hammerhead shark and the southern bluefin tuna. Species identified as potentially occurring within the Operational Area and EMBA and Biologically Important Areas (BIAs) or Habitat Critical to their Survival (Habitat Critical) that overlap the EMBA are listed in **Table 4-5** to **Table 4-13**, and a description of species is included in **Appendix H**. **Figure 4-4** to **Figure 4-8** show the spatial overlap with relevant BIAs and Habitat Critical areas and the EMBA.

4.6.1 Fish, Sharks and Rays

Table 4-5: Threatened and Migratory fish, shark and ray species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	N/A	Species or species habitat may occur
Carcharias taurus	Grey nurse shark	Vulnerable	N/A	N/A	Species or species habitat known to occur
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Species or species habitat may occur	Species or species habitat likely to occur
Carcharodon carcharias	Great white shark	Vulnerable	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Isurus paucus	Longfin mako	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Lamna nasus	Mackerel shark	N/A	Migratory	N/A	Species or species habitat may occur
Manta alfredi	Reef manta ray	N/A	Migratory	N/A	Species or species habitat known to occur
Manta birostris	Giant manta ray	N/A	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Pristis clavate	Dwarf sawfish	Vulnerable	Migratory	N/A	Species or species habitat known to occur
Pristis pristis	Freshwater sawfish	Vulnerable	Migratory	N/A	Species or species habitat likely to occur
Pristis zijsron	Green sawfish	Vulnerable	Migratory	N/A	Species or species habitat known to occur

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Rhincodon typus	Whale shark	Vulnerable	Migratory	N/A	Foraging, feeding or related behaviour known to occur
Sphyrna lewini	Scalloped Hammerhead	Conservation Dependant	N/A	Species or species habitat may occur	Species or species habitat likely to occur
Thunnus maccoyii	Southern Bluefin Tuna	Conservation Dependant	N/A	Breeding known to occur	Breeding known to occur

Table 4-6: Fish, shark and ray BIAs within the EMBA

Species	BIA type	Approximate distance and direction of BIA from Operational Area (km)
Whale shark	Foraging (northward from Ningaloo along 200 m isobath)	136 km south-east

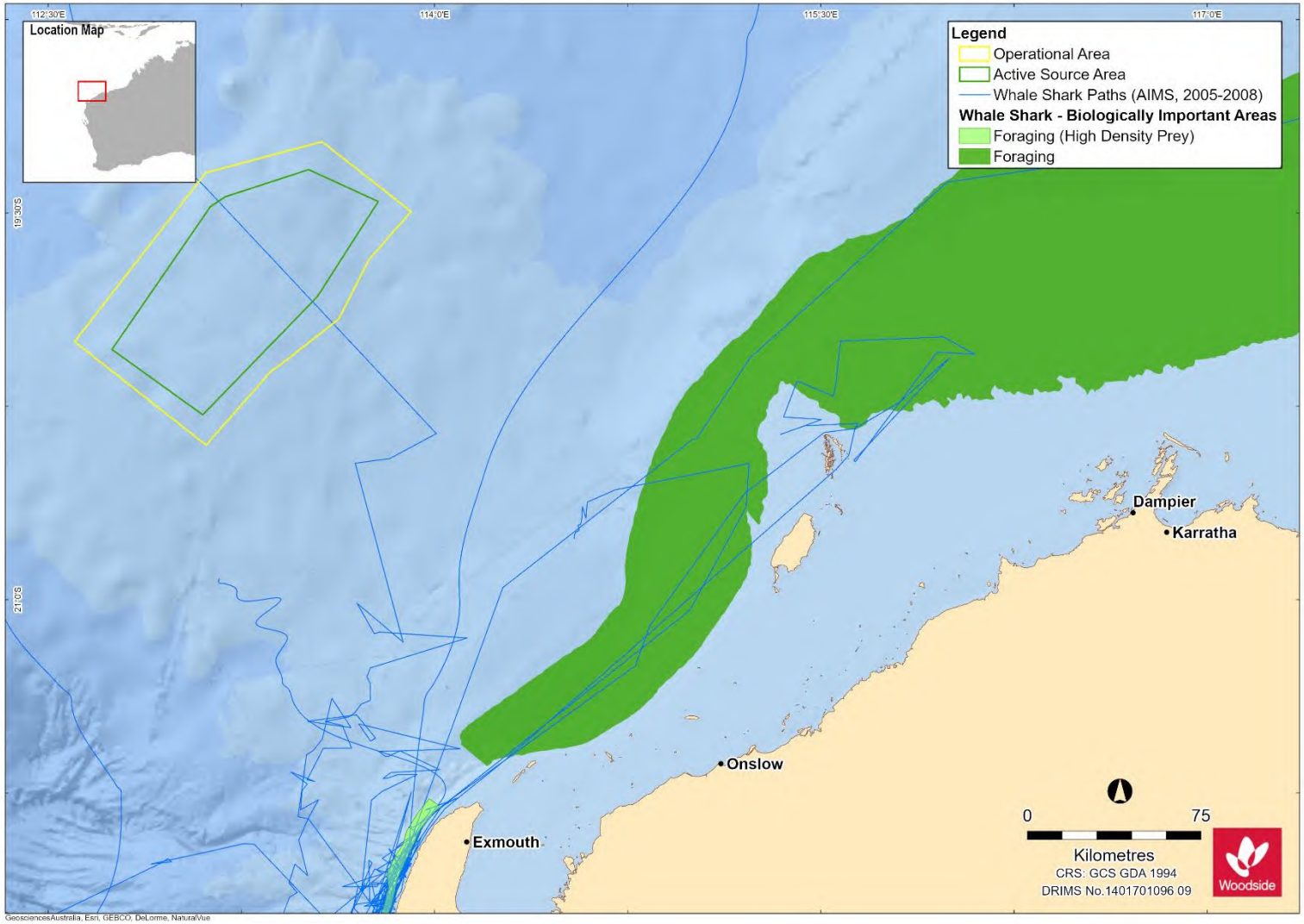


Figure 4-4: Whale shark BIAs and satellite tracks of whale sharks tagged between 2005 and 2008 (Meekan and Radford, 2010)

4.6.2 Marine Reptiles

Table 4-7: Threatened and Migratory marine reptile species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Caretta caretta	Loggerhead turtle	Endangered	Migratory	Species or species habitat likely to occur	Species or species habitat known to occur
Chelonia mydas	Green turtle	Vulnerable	Migratory	Species or species habitat likely to occur	Species or species habitat known to occur
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory	Species or species habitat likely to occur	Species or species habitat known to occur
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	Species or species habitat likely to occur	Species or species habitat known to occur
Natator depressus	Flatback turtle	Vulnerable	Migratory	Species or species habitat likely to occur	Congregation or aggregation known to occur

Table 4-8: Marine turtle BIAs adjacent to the EMBA

Species	BIA type	Approximate distance and direction of BIA from Operational Area
Flatback turtle	Internesting buffer (Montebello Island, Hermite Island, NW Island, Trimouille Island)	135 km south-east
	Internesting buffer (Thevenard Island – South coast)	149 km south-east
Green turtle	Internesting buffer (Montebello Islands)	170 km south-east
	Internesting buffer (north and south Muiron Island)	170 km south-east
	Internesting buffer (Montebello Island, Hermite Island, NW Island, Trimouille Island)	174 km south-east
	Internesting buffer (Middle Island, west coast Barrow Island, west coast and north coast)	181 km south-east
Hawksbill turtle	Internesting buffer (Montebello Island, Hermite Island, NW Island, Trimouille Island)	174 km south-east
	Internesting buffer (Barrow Island)	181 km south-east

Species	BIA type	Approximate distance and direction of BIA from Operational Area
Loggerhead turtle	Internesting buffer (Montebello Islands)	187 km east

Table 4-9: Internesting Habitat Critical to the survival of marine turtle species predicted to occur within or adjacent to the EMBA

Species	Genetic stock	Nesting locations	Approximate distance and direction from Operational Area	Inter-nesting buffer	Nesting period	Hatching period
Green turtle	North West Shelf	Adele Island, Maret Island, Cassini Island, Lacepede Islands, Barrow Island, Montebello Islands (all with sandy beaches), Serrurier Island, Dampier Archipelago, Thevenard Island, North-west Cape, Ningaloo coast	175 km south-east	20 km	Nov–Mar	Jan–May (peak: Feb–Mar)
Flatback turtle	Pilbara	Montebello Islands, Mundabullangana Beach, Barrow Island, Cemetery Beach, Dampier Archipelago (including Delambre Island and Huay Island), coastal islands from Cape Preston to Locker Island.	147 km south-east	60 km	Oct–Mar (peak: Feb-Mar)	Oct–Mar
Hawksbill turtle	Western Australia	Dampier Archipelago (including Rosemary Island and Delambre Island), Montebello Islands (including Ah Chong Island, South East Island and Trimouille Island), Lowendal Islands (including Varanus Island, Beacon Island and Bridled Island), Sholl Island	175 km south-east	20 km	All year (peak: Oct–Feb)	All year (peak: Dec–Feb)
Loggerhead turtle	No overlap within EMBA					
Leatherback turtle	No overlap – nesting located in Northern Territory and North Queensland					
Olive Ridley turtle	No overlap – nesting located in Northern Australia and North Queensland					

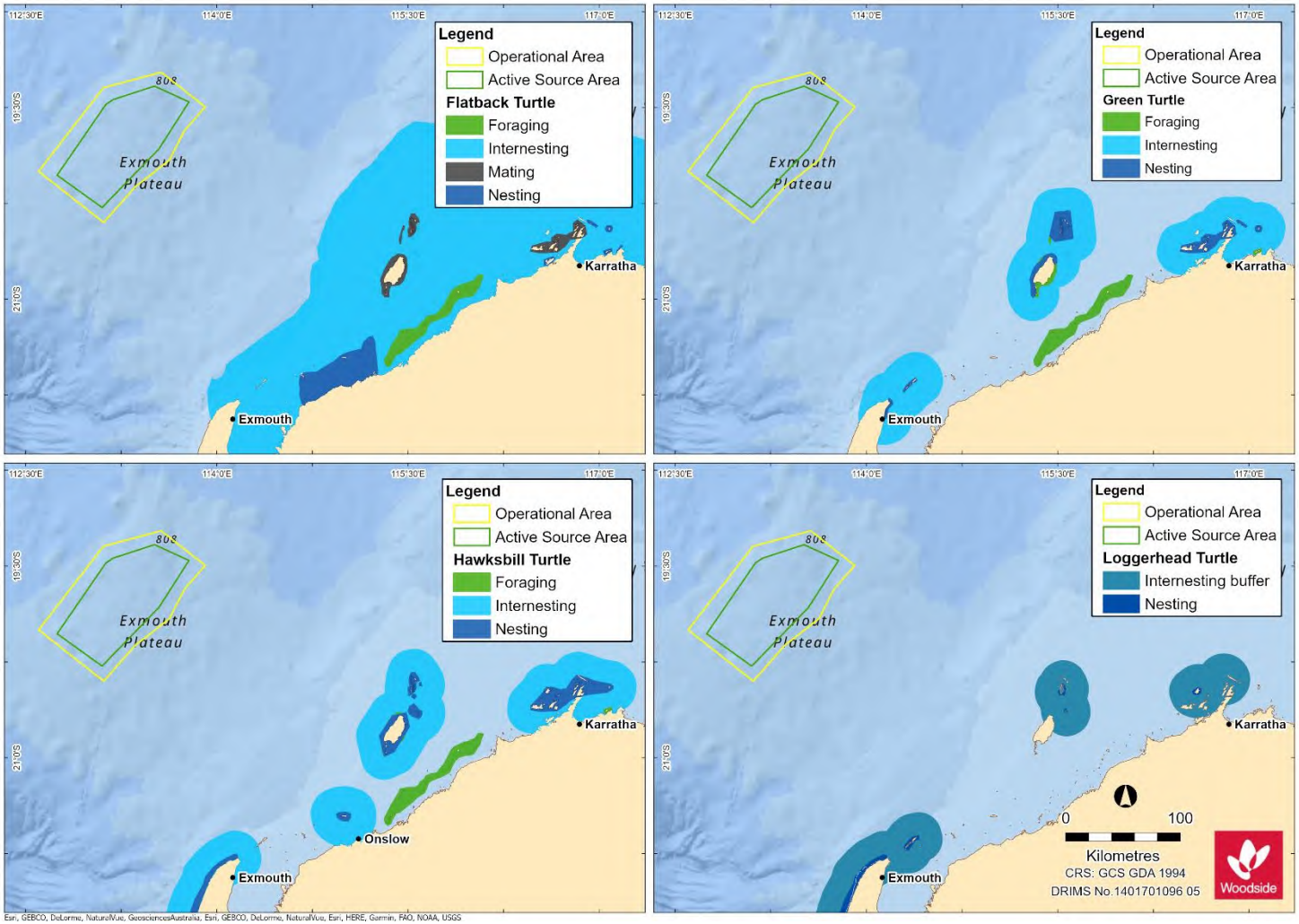


Figure 4-5: Marine reptile BIAs

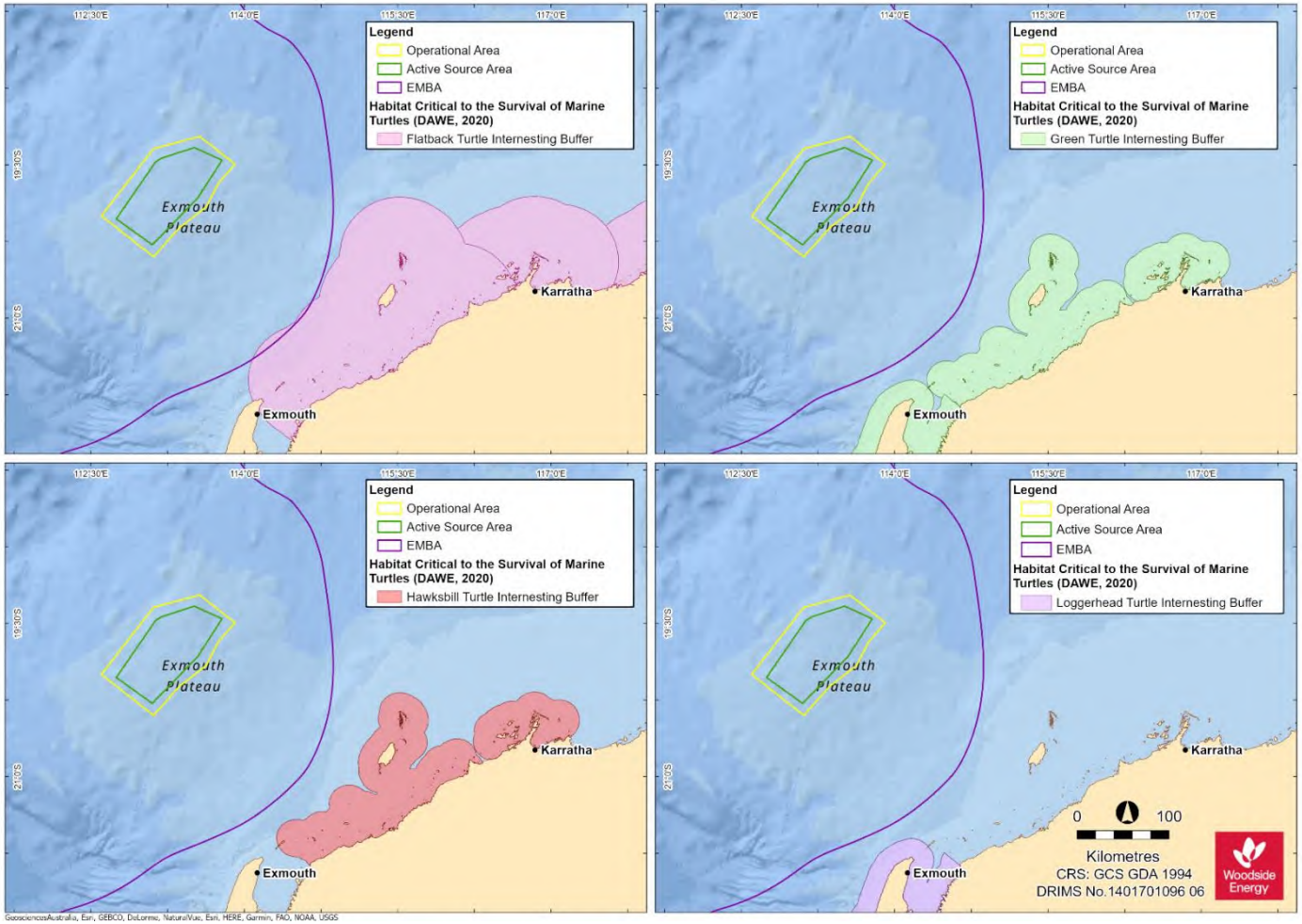


Figure 4-6: Habitat Critical to the survival of marine turtles

4.6.3 Marine Mammals

Table 4-10: Threatened and Migratory marine mammal species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Species or species habitat likely to occur	Foraging, feeding or related behaviour likely to occur
Balaenoptera edeni	Bryde's whale	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Balaenoptera musculus	Blue whale	Endangered	Migratory	Species or species habitat likely to occur	Migration route known to occur
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Species or species habitat likely to occur	Foraging, feeding or related behaviour likely to occur
Eubalaena australis	Southern right whale	Endangered	Migratory	N/A	Species or species habitat mayoccur
Megaptera novaeangliae	Humpback whale	N/A	Migratory	Species or species habitat may occur	Breeding known to occur
Orcinus orca	Killer whale	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Physeter macrocephalus	Sperm whale	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Tursiops aduncus	Spotted bottlenose dolphin (Arafura/Timor Sea)	N/A	Migratory	N/A	Species or species habitat known to occur

Table 4-11: Marine mammal BIAs within the EMBA

Species	BIA type (source: National Conservation Values Atlas (NCVA))	Approximate distance and direction from Operational Area
Pygmy blue whale	Migration (Augusta to Derby, tend to pass along the shelf edge at depths of 500 m to 1000 m; appear close to coast in the Exmouth-Montebello Islands area on southern migration), refer to **Figure 4-7**	14 km south-east
	Foraging (Ningaloo), refer to **Figure 4-7**	154 km south
Humpback whale	Migration (Extends from the coast to out to approximately 10 0 km offshore in the Kimberley region extending south to North-west Cape. From North-west Cape to south of Shark Bay the migration corridor is reduced to approximately 50 km (**Figure 4-8**).	138 km south-east

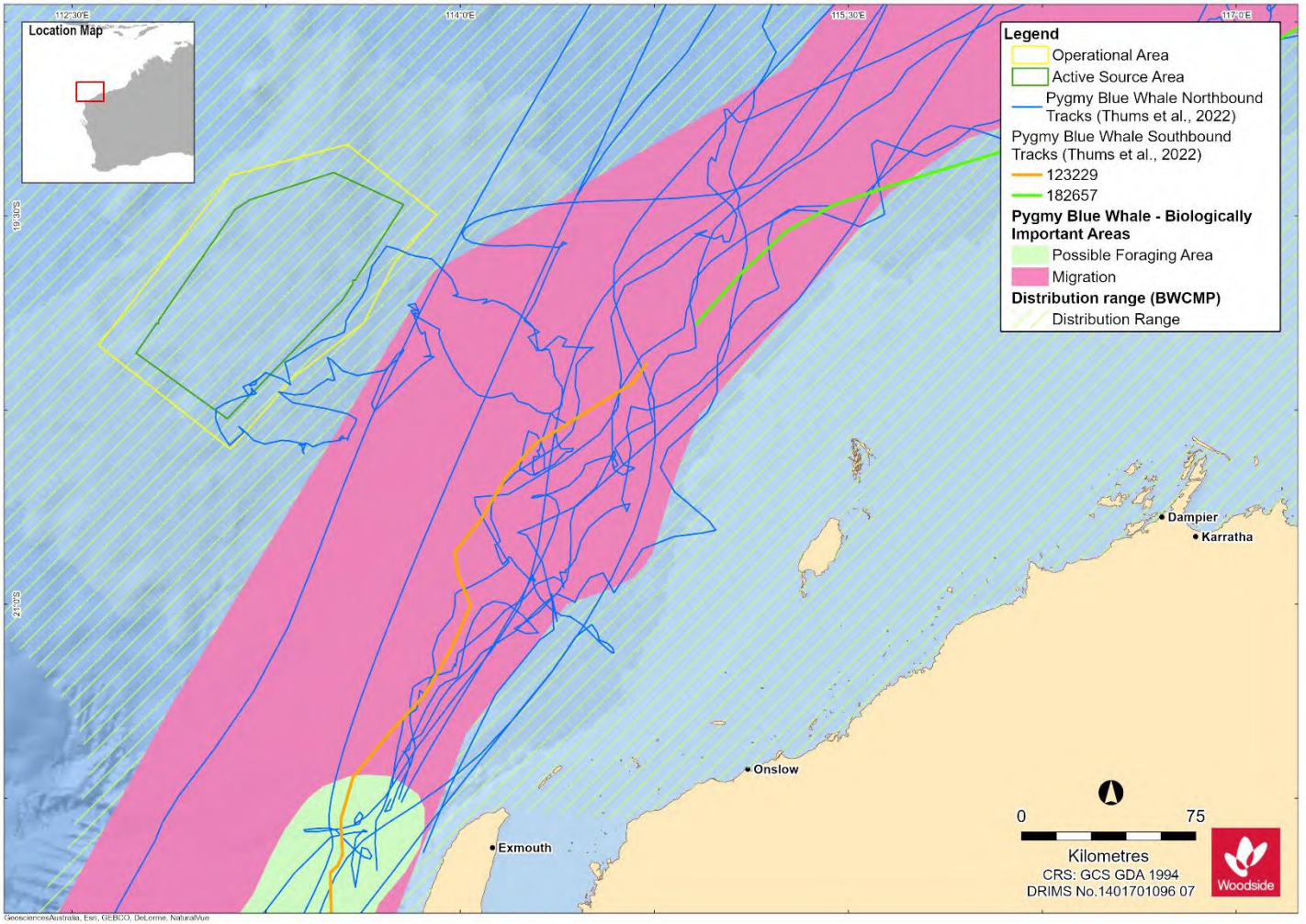


Figure 4-7: Pygmy blue whale BIAs and distribution range (as per the NCVA and Blue Whale Conservation Management Plan (BWCMP), respectively) with reference to the Operational Area and the 20 tracks of satellite tagged pygmy blue whales recorded in the NWMR, of the 22 tracks presented in Thums et al. (2022).

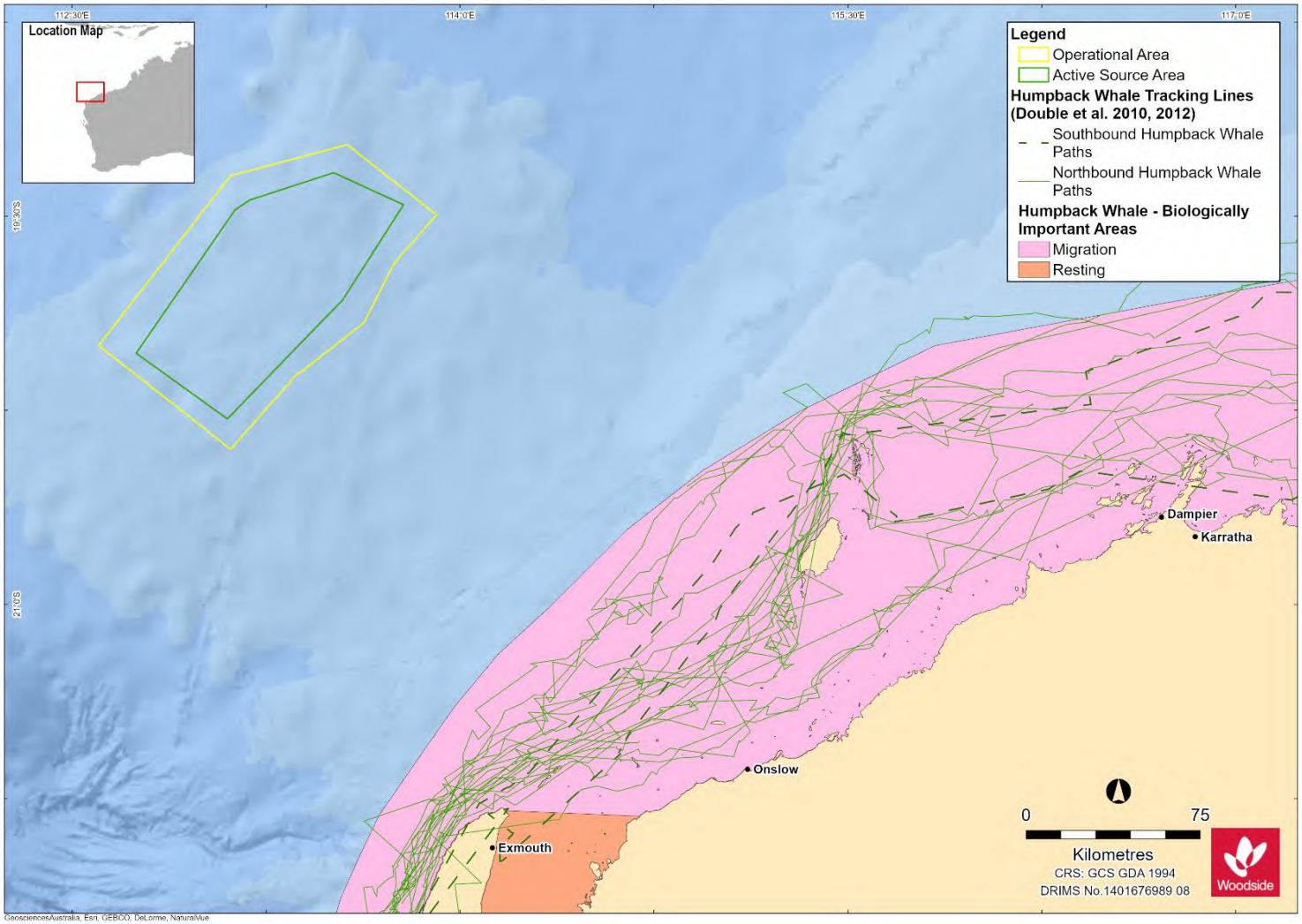


Figure 4-8: Humpback whale BIAs (as per NCVA) and satellite tracks of humpback whales tagged between 2010 and 2012 (Double et al., 2010, 2012a)

4.6.3.1 Pygmy Blue Whale

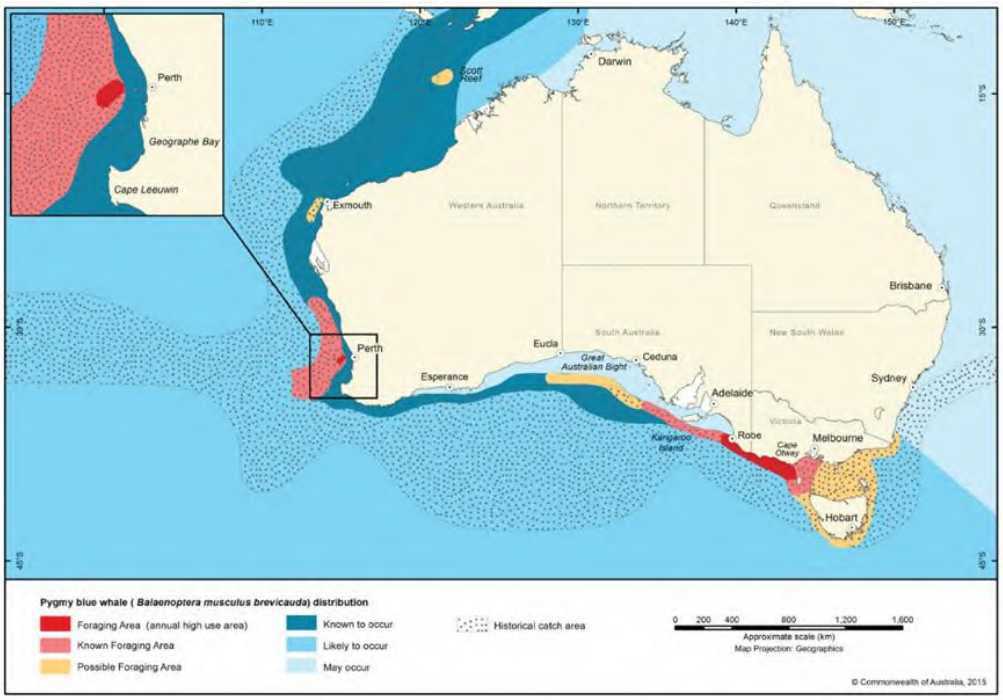
The pygmy blue whale distribution range is a spatially defined area where pygmy blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections (Commonwealth of Australia, 2015). The majority of the important pygmy blue whale migration areas for north-west Australia are within the migratory BIA (**Figure 4-7** and Thums et al. (2022). Thums et al. (2022) does also note that during the northern migration, the satellite tracks show the migrating whales fanning out over a wider and deeper offshore area (within and beyond the migration BIA) and this occurs in line with the northern tip of the Montebello Islands (Thums et al., 2022 and Double et al., 2014; refer to **Figure 4-7**).

The Active Source Area for the Petroleum Activities Program is located ~25 km west of the western boundary of the pygmy blue whale migration BIA, and both the Active Source Area and Operational Area overlap with the pygmy blue whale distribution range (refer to **Figure 4-7**; **Figure 4-9**).

The pygmy blue whale distribution range is a spatially defined area where pygmy blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections (Commonwealth of Australia, 2015). Thums et al. (2022) acknowledged that the majority of important migration areas for north-west Australia were encompassed by the pygmy blue whale migration BIA, as shown by 20 tracks for northbound pygmy blue whale, as presented in **Figure 4-7**. Furthermore, the analysis identified areas off from Ningaloo Reef to the Rowley Shoals as important for foraging (and/or breeding/resting) using the overlay of three modelled metrics (occupancy, number of whales and move persistence) by Thums et al. (2022). These include areas within and to the west of the migration BIA. The possibility that some migrating pygmy blue whales could be opportunistically foraging to the west of the migration BIA is supported by the track of one northbound individual tagged off the North West Cape in early June 2020. This tagged whale spent about 486 hours (20 days) in what appeared to be opportunistic foraging movement behaviour (Thums et al. 2022; AIMS, 2022), over an area that included time in the southern area of the Exmouth Plateau and within the migration BIA, refer to **Figure 4-7**. The area in which the whales have been shown to fan out and migrate beyond the BIA (Thums et al. (2022) is north of the Active Source Area. Two southbound tracked whales also travelled predominantly within the migration BIA (refer to **Figure 4-7**).

Considering the proximity of the pygmy blue whale migration BIA to the Operational Area (14 km) and to the Active Source Area (about 25 km), as well as the recorded presence of an individual, within the distribution range which partially overlapped the Operational Area, it is possible that pygmy blue whales may transit in and around the Operational Area during migratory north and south seasons (April to July and October to January, respectively) (McCauley, 2011; Gavrilov et al., 2018; Thums et al., 2022). However, only transient individuals or small groups are expected occasionally during the north and south bound migratory seasons (April to July and October to January, respectively) (McCauley, 2011, Gavrilov et al. 2018 and Thums et al, 2022).

The Exmouth Plateau KEF (refer to **Section 4.8**) is an area of localised upwelling and may be a source of food for occasional, opportunistic pygmy blue whale foraging. Migrating pygmy blue whales display predominately relatively fast, directed travel (mean travel rate 2.8±0.8 km hr^{-1}) during the northbound peak period of May and June. This is indicating limited foraging behaviour; however it is interspersed with relatively short periods of slower speeds which may be indicative of opportunistic foraging (Thums et al., 2022). By contrast, acoustic detection (McCauley, 2011) suggests that whales are travelling faster during the southbound migration than during the northbound migration. Thums et al. (2022) also noted the rate of southbound travel was faster than on the northern migration (based on the tracks of two whales). However, short periods of putative foraging was noted for one whale.



Foraging Area (Annual high use area)	Blue whales are regularly observed feeding on a seasonal basis
Known Foraging Area	Known foraging occurs in these areas but is highly variable both between and within seasons
Possible Foraging Area	Evidence for feeding is based on limited direct observations or through indirect evidence, such as occurrence of krill in close proximity of whales, or satellite tagged whales showing circling tracks. Blue whales travel through on a seasonal basis, possibly as part of their migratory route

Known to occur	Blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections
Likely to occur	Blue whales are likely to occur based on occasional observations in the area and nearby areas
May occur	Evidence for the presence of blue whales through strandings or rare observations
Historical catch area	Blue whales were caught during the whaling period based on whaling data

Figure 4-9: Important foraging and areas of occurrence for pygmy blue whales as presented in the Blue Whale Conservation Management Plan (Commonwealth of Australia, 2015). Note: Known to occur area in the BWCMP is the same as the distribution range presented in the National Conservation Values Atlas.

4.6.4 Seabirds and Migratory Shorebirds

Table 4-12: Threatened and Migratory seabird and shorebird species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Actitis hypoleucos	Common sandpiper	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Anous stolidus	Common noddy	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Ardenna carneipes	Flesh-footed shearwater	N/A	Migratory	N/A	Species or species habitat may occur
Calidris acuminata	Sharp-tailed sandpiper	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Calidris canutus	Red knot	Endangered	Migratory	Species or species habitat may occur	Species or species habitat may occur
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	N/A	Species or species habitat may occur
Calidris melanotos	Pectoral sandpiper	N/A	Migratory	N/A	Species or species habitat may occur
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	N/A	Species or species habitat likely to occur
Fregata ariel	Lesser frigatebird	N/A	Migratory	Species or species habitat may occur	Species or species habitat likely to occur
Fregata minor	Greater frigatebird	N/A	Migratory	N/A	Species or species habitat may occur
Macronectes giganteus	Southern giant petrel	Endangered	Migratory	Species or species habitat may occur	Species or species habitat may occur
Numenius madagascariensis	Eastern curlew	Critically Endangered	Migratory	N/A	Species or species habitat may occur
Pandion haliateus	Osprey	N/A	Migratory	N/A	Species or species habitat known to occur

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Papasula abbotti	Abbott's booby	Endangered	N/A	N/A	Species or species habitat may occur
Phaethon lepturus	White-tailed tropicbird	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Phaethon lepturus fulvus	Christmas Island White-tailed tropicbird	Endangered	N/A	N/A	Species or species habitat may occur
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	N/A	Foraging, feeding or related behaviour likely to occur
Sternula nereis nereis	Australian fairy tern	Vulnerable	N/A	N/A	Foraging, feeding or related behaviour likely to occur
Thalassarche carteri	Indian yellow-nosed albatross	Vulnerable	Migratory	N/A	Species or species habitat may occur
Thalassarche impavida	Campbell Albatross	Vulnerable	Migratory	N/A	Species or species habitat may occur

N.B. The wedge-tailed shearwater was not identified in the PMST as potentially occurring within the EMBA; however, given a BIA for wedge-tailed shearwater breeding partially overlaps the EMBA, it is considered possible that the species may be encountered within the EMBA.

Table 4-13: Seabird and shorebird BIAs within the EMBA

Species	BIA type	Approximate Distance and Direction from Operational Area (km)
Wedge-tailed shearwater	Breeding and foraging (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	85 km south-east

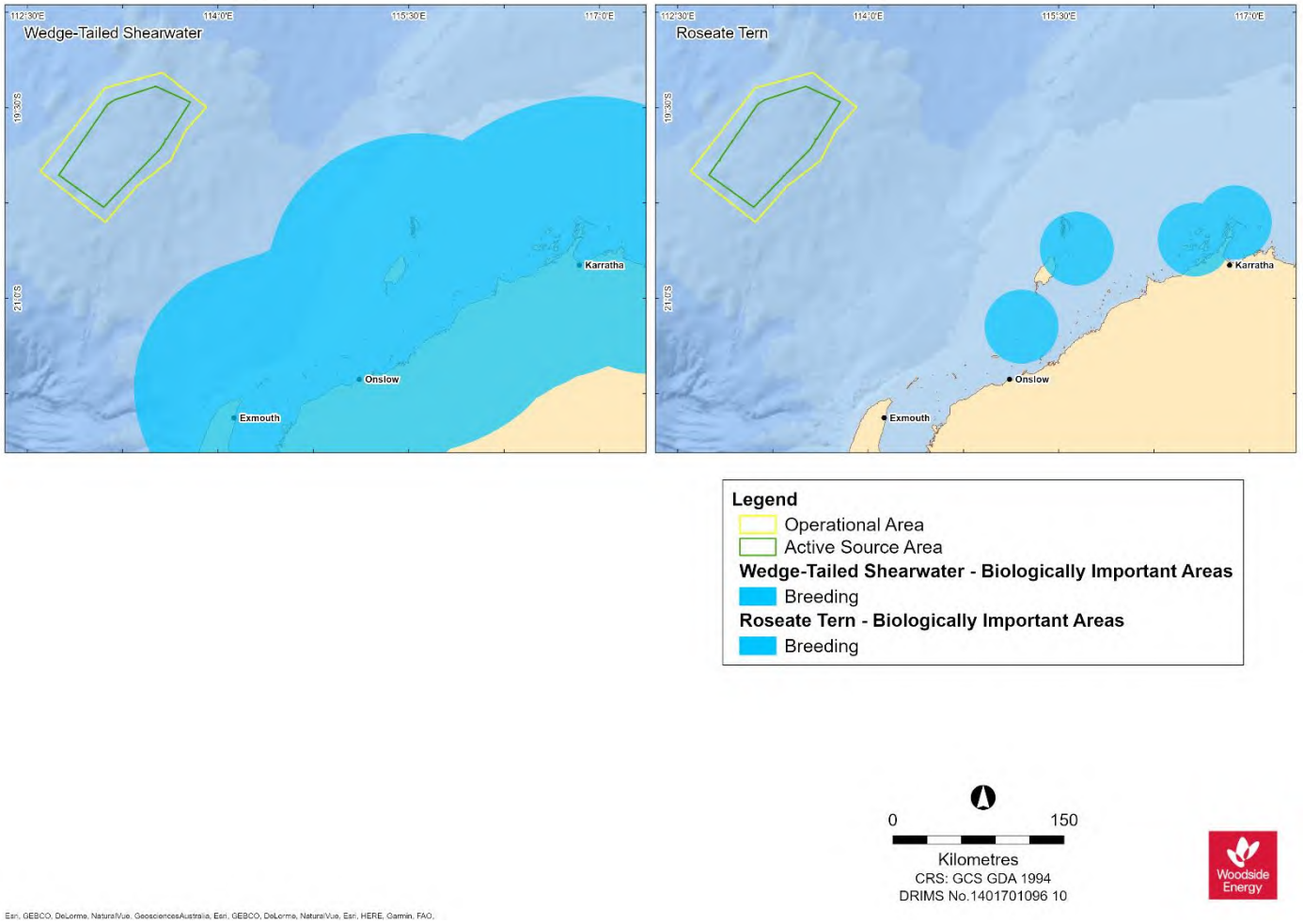


Figure 4-10: Seabird and migratory shorebird BIAs

4.7 Seasonal Sensitivities for Protected Species

Seasonal sensitivities for protected migratory species identified as potentially occurring within the Operational Area are identified in **Table 4-14**. Movement patterns of all protected species identified in **Section 4.6** are described in **Appendix H**.

Table 4-14: Key seasonal sensitivities for protected migratory species identified potentially as occurring within the Operational Area.

Species	January	February	March	April	May	June	July	August	September	October	November	December
Fish, sharks and rays												
Whale shark – foraging (northward from Ningaloo)[1]												
Mammals												
Pygmy blue whale – northern migration (Exmouth, Montebello, Scott Reef)[2]												
Pygmy blue whale – southern migration (Exmouth, Montebello, Scott Reef)[3]												
Humpback whale – northern migration (Jurien Bay to Montebello)[4]												
Humpback whale – southern migration (Jurien Bay to Montebello)[5]												
Marine reptiles												
Green turtle (G-NWS)– various nesting areas[6]												
Flatback turtle (F-Pil)– various nesting areas[6]												
Hawksbill turtle (H-WA)– various nesting areas[6]												

Species	January	February	March	April	May	June	July	August	September	October	November	December
Loggerhead turtle (L-WA)– various nesting areas[6]												
Seabirds												
Wedge-tailed shearwater – various breeding sites[7]												
	Species may be present in the Operational Area											
	Peak period. Presence of animals is reliable and predictable each year											

References for species seasonal sensitivities:

[1] TSSC, 2015; Wilson et al., 2006

[2] DSEWPaC, 2012; McCauley and Jenner, 2010; Double et al., 2012b, 2014

[3] DSEWPaC, 2012; McCauley and Jenner, 2010, Double et al., 2012b, 2014

[4] DEH, 2005; Jenner et al., 2001; McCauley and Jenner, 2001; Double et al., 2012a

[5] McCauley and Jenner, 2001, Jenner et al., 2001, Double et al., 2010

[6] DoEE, 2017a; Chevron, 2015

[7] Johnstone and Storr (1998)

4.8 Key Ecological Features (KEFs)

KEFs within the Operational Area and EMBA are identified in **Table 4-15** and described in **Appendix H. Figure 4-11** shows the spatial overlap with KEFs and the Operational Area and EMBA.

Table 4-15: KEFs within the Operational Area and EMBA.

Key Ecological Feature	Distance and direction from Operational Area to KEF
Exmouth Plateau	Overlaps
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	103 km south-east
Continental slope demersal fish communities	145 km south-east

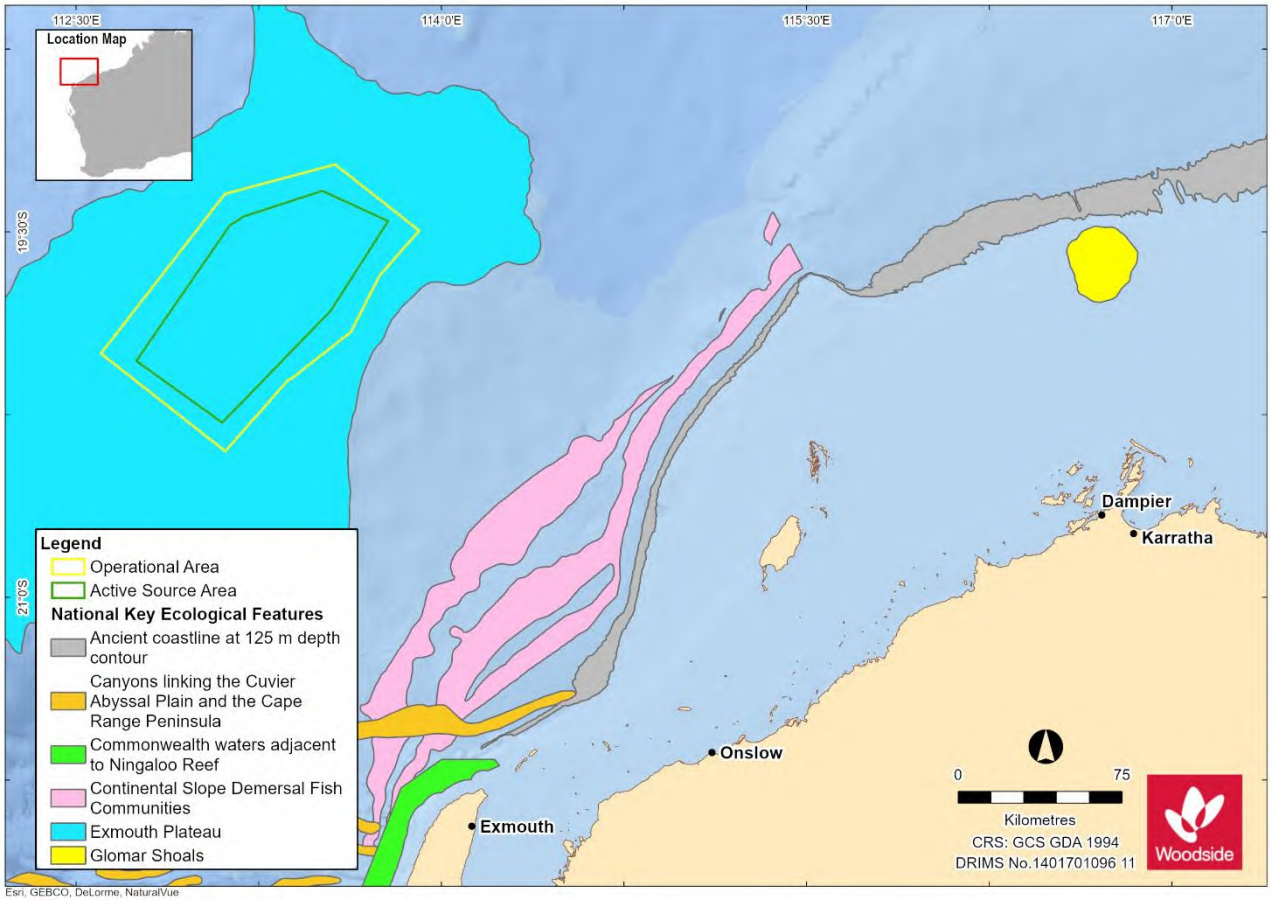


Figure 4-11: KEFs with reference to the Operational Area

4.9 Protected Places

No protected places overlap the Operational Area. Protected places within the EMBA are identified in **Table 4-16** and presented in **Figure 4-12**. **Appendix H** outlines the values and sensitivities of protected places and other sensitive areas in the EMBA.

Table 4-16: Established protected places and other sensitive areas overlapping the EMBA

	Distance and direction from Operational Area to protected place or sensitive area	IUCN category* or relevant park zone overlapping the EMBA
AMPs		
NWMR		
Gascoyne AMP	33 km south	Multiple Use Zone (IUCN VI)
	174 km south	National Park Zone (IUCN II)
	133 km south	Habitat Protection Zone (IUCN IV)
Montebello AMP[1]	170 km east	Multiple Use Zone (IUCN VI)
State Marine Parks and Nature Reserves		
Marine Parks		
None identified	N/A	N/A
Marine Management Areas		
None identified	N/A	N/A
Fish Habitat Protection Areas		
None identified	N/A	N/A
Nature Reserves		
None identified	N/A	N/A
Other sensitive areas		
None identified	N/A	N/A

**Conservation objectives for IUCN categories include:*

Ia: Strict Nature Reserve

Ib: Wilderness Area

II: national Park

III: Natural Monument or Feature

IV: Habitat/Species Management Area

V: Protected Landscape

VI: Protected area with sustainable use of natural resources – allow human use but prohibits large scale development.

IUCN categories for the marine park are provided and, in brackets, the IUCN categories for specific zones within each Marine Park as assigned under the North-west Marine Parks Network Management Plan 2018 (DNP, 2018a) and South-west Marine Parks Network Management Plan 2018 (DNP, 2018b).

[1] The Montebello AMP was not predicted to be contact above hydrocarbon impact thresholds however it was included in the EMBA due to its proximity to the EMBA.

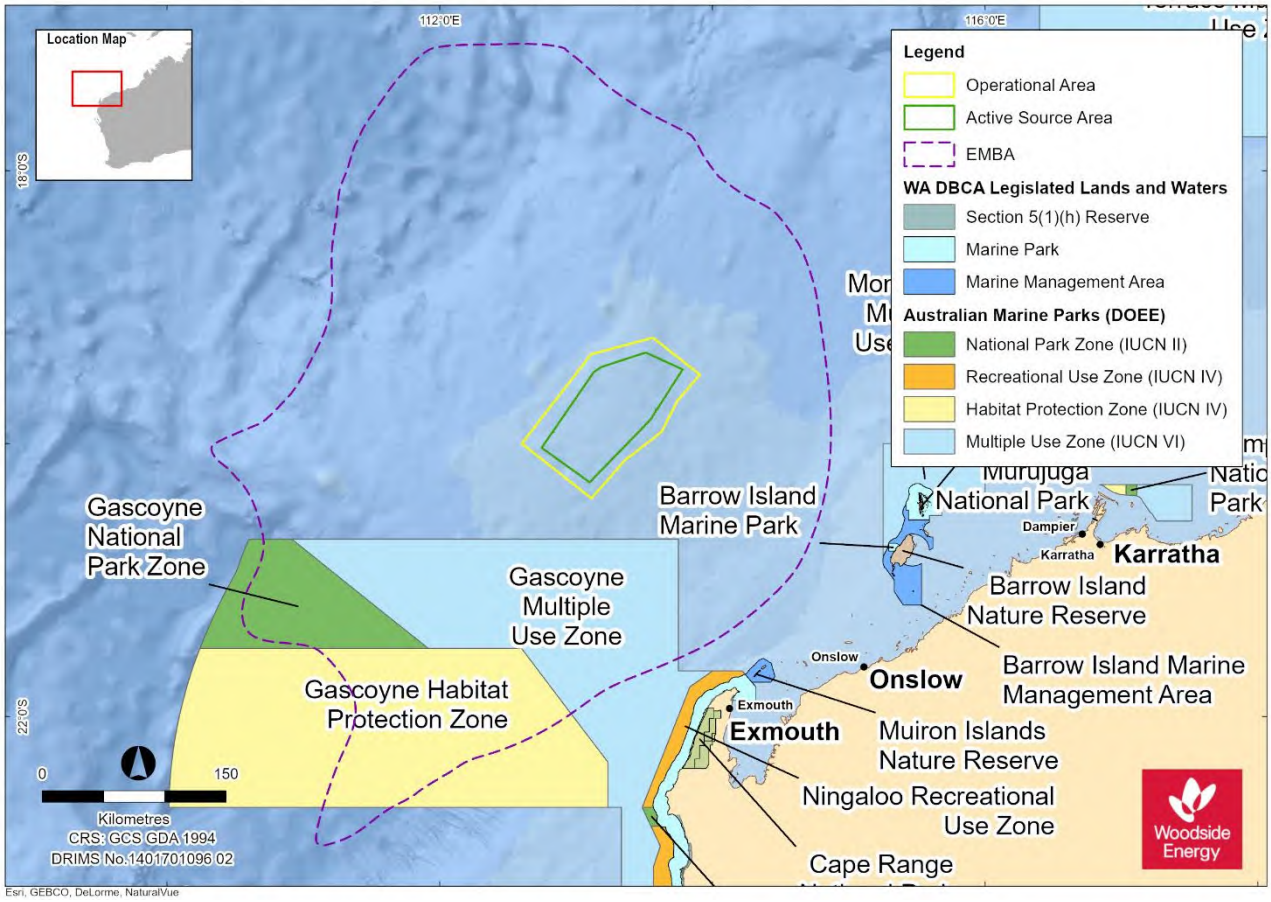


Figure 4-12: Protected Areas with reference to the Operational Area and EMBA

4.10 Socio-Economic Environment

4.10.1 Cultural Features and Heritage Values

4.10.1.1 Background

Woodside recognises the 'environment' for the purpose of the evaluation required under the Environment Regulations includes:

- the heritage value of places; and
- the social, economic, and cultural features of the broader environment.

In this section, the heritage value of places within the Operational Area and EMBA and the cultural features of the Operational Area and EMBA are described.

In line with The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (ICOMOS 2013) (Burra Charter) and associated practice notes, Woodside understands heritage value to refer to the cultural significance of a place to an individual or group. A cultural feature, by contrast, is understood to be comparable to the Burra Charter term “fabric” and refer to a place’s elements, fixtures, contents and objects which have cultural values. Although these features are necessarily physical, the place they inhabit or comprise may have tangible and intangible dimensions (ICOMOS 2013).

Woodside has undertaken archaeological assessments and ethnographic surveys to identify potential cultural values or features that may be impacted by Scarborough activities. These works have not identified heritage places, objects or values which will be impacted by the activities planned under this EP. However, through consultation with relevant persons, Woodside recognises the deep spiritual and cultural connection to the environment[2] that First Nations people hold.

4.10.1.2 First Nations peoples

As a starting point for understanding cultural features of the environment for First Nations groups, Woodside uses the existing systems, such as native title, to identify First Nations groups that may have functions, interests or activities that may be affected. To that end, Woodside identifies native title representative bodies and nominated representative entities (defined in **Section 5.2)**, as well as native title claims, determinations and Indigenous Land Use Agreements (ILUAs) which the EMBA overlaps. Native title claims, determinations and ILUAs are defined under the *Native Title Act 1993* (Cth). While acknowledging that cultural features and heritage values may exist outside of the native title framework, Woodside considers this to be the broadest extent over which First Nations groups have claimed native title rights and interests.

Native title claims are applications made to the Federal Court under the *Native Title Act 1993* for a determination or decision about native title in a particular area. A claim is made by a native title claim group which asserts it holds native title rights and interests in an area of land and/or water, according to its traditional laws and customs. By making a claim, the native title claim group seeks a decision that native title exists so that its native title rights and interests are recognised by the common law of Australia. This is called a native title determination. A determination is a decision by a recognised body, such as the Federal Court or High Court of Australia, that native title either does or does not exist in relation to a particular area (Native Title Tribunal).

[2]Definition of ‘Environment’ in Regulation 4 of the OPPGS (Environment) Regulations are defined as:

a) ecosystems and their constituent parts, including people and communities; and
b) natural and physical resources; and
c) the qualities and characteristics of locations, places and areas; and
d) the heritage values of places; and includes

the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d)

A requirement to establishing a positive determination of native title in court is proving that there is an organised society that occupied the land and/or waters at the time of British annexation. The requirement of an 'organised society' is set out by Justice Toohey in the historic judgment of Mabo v Queensland (No 2) [1992] HCA 23; (1992) 175 CLR 1 ('Mabo'). Justice Toohey had the following to say (at 187):

it is inconceivable that indigenous inhabitants in occupation of land did not have a system by which land was utilized in a way determined by that society. There must, of course, be a society sufficiently organized to create and sustain rights and duties…

Therefore, Woodside understands that native title rights and interests are held communally by an organised society, that native title claims are understood to represent the area over which First Nations groups are claiming these rights and interests, and that native title determinations provide clarity on where native title rights and interests are found to either exist or not exist. Where native title rights or interests are determined to exist, they will be held by a Registered Native Title Body Corporate (section 57, *Native Title Act 1993*) in trust or as agent for native title holders.

ILUAs are voluntary agreements between native title parties and other people or bodies about the use and management of land and/or waters and are registered by the Native Title Registrar in the Register of ILUAs. An ILUA can be made over areas where:

- native title has been determined to exist in at least part of the area; or
- a native title claim has been made; or
- where no native title claim has been made.

While registered, ILUAs operate as a contract between the parties, including relevant native title holders (Native Title Tribunal).

The Native Title Act also provides for a Representative Aboriginal/Torres Strait Islander Body (Native Title Representative Body) to be recognised by the Commonwealth Minister for an area. Native Title Representative Bodies have specialist functions set out in the Native Title Act within the area for which they are the Native Title Representative Body. However, the functions of a Native Title Representative Body are such that they do not hold details on the cultural features or heritage values of an area and therefore do not inform Woodside's understanding of heritage values or cultural features.

For the activity in this EP, there are no native title claims or determinations and no ILUAs overlapping the Operational Area and EMBA (see **Figure 4-13**). Therefore Woodside understands that no native title rights or interests may be impacted by the activity. A summary of native title claims, determinations and ILUAs which are coastally adjacent to the EMBA is set out in **Table 4-17**. Claims and determinations have not been differentiated in this table, as it is acknowledged that rights and interests may exist within either of these.

4.10.1.3 Coastally Adjacent First Nations groups

Woodside understands that First Nations groups are keenly aware of the extent of their rights, interests and responsibilities for Country, and these are generally discrete, defined areas, including areas of sea (Smyth 2007). To identify cultural features and heritage values which may exist outside of native title claim, determination and ILUA areas, Woodside considers native title claims, determinations and ILUAs coastally adjacent to the EMBA to be an instructive means of identifying potentially relevant First Nations groups to be consulted (see **Table 4-17**).

That said, Woodside understands from engagement with stakeholders that extending a native title group's responsibility to areas which those groups have elected to not include in their claims or ILUAs can have significant cultural consequences for First Nations groups and individuals. This may also, over time, build expectations in the broader First Nations community that a group is responsible for maintaining environmental values in areas for which they do not hold traditional knowledge.

Woodside also acknowledges that a First Nations group's relative proximity to the Operational Area or EMBA is not necessarily a meaningful indicator of the connection of First Nations groups to the area, and providing advice over such areas can be culturally dangerous. As a result, caution must be used when conducting broader engagement.

A summary of native title claims, determinations and ILUAs overlapping or coastally adjacent to the EMBA is set out in **Table 4-17**. Claims and determinations have not been differentiated in this table, as it is acknowledged that either of these may indicate the existence of rights and interests.

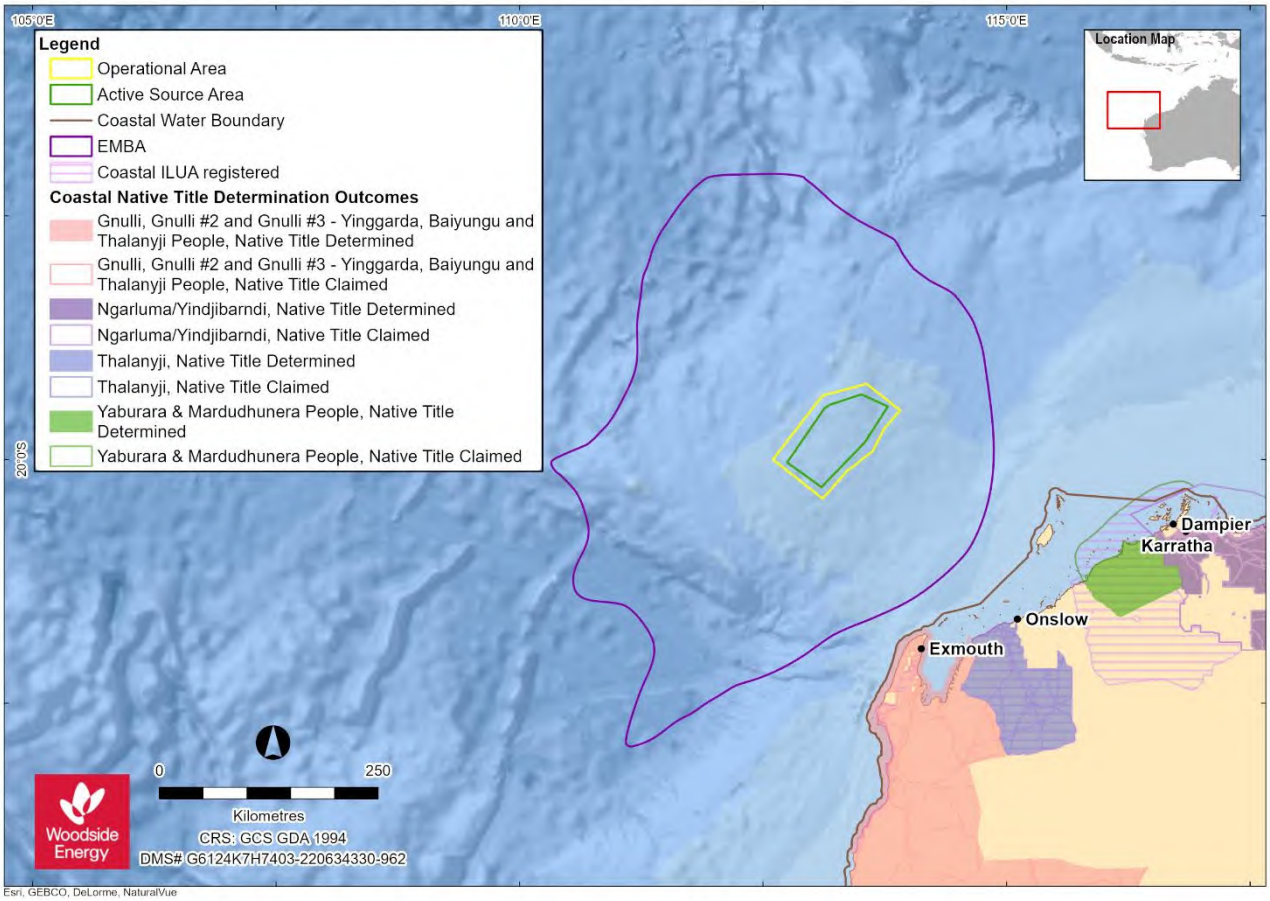


Figure 4-13 : Operational Area and EMBA in relation to native title claims, determinations and ILUAs

Table 4-17 Summary of Native Title Claims, Determinations and ILUAs which overlap or are coastally adjacent to the EMBA.

Claim / Determination / ILUA	Registered Native Title Body Corporate	Overlap with EMBA	Coastally Adjacent to the EMBA
Claim / Determination			
Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People	Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC), Yinggarda Aboriginal Corporation (YAC)	No	Yes
Ngarluma/Yindjibarndi People	Ngarluma Aboriginal Corporation (NAC), Yindjibarndi Aboriginal Corporation	No	Yes
Thalanyji	Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	No	Yes

Claim / Determination / ILUA	Registered Native Title Body Corporate	Overlap with EMBA	Coastally Adjacent to the EMBA
Yaburara & Mardudhunera People	Wirrawandi Aboriginal Corporation (WAC)	No	Yes
ILUA			
Cape Preston Project Deed (YM Mardie ILUA)	WAC	No	Yes
Cape Preston West Export Facility	WAC	No	Yes
KM & YM ILUA	WAC, Robe River Kuruma Aboriginal Corporation	No	Yes
Kuruma Marthudunera and Yaburara and Coastal Mardudhunera Indigenous Land Use Agreement	No representative body specified.	No	Yes
Macedon ILUA	BTAC	No	Yes
Ningaloo Conservation Estate ILUA	NTGAC	No	Yes
RTIO Ngarluma ILUA (Body Corporate Agreement)	NAC	No	Yes
RTIO Kuruma Marthudunera People ILUA	Robe River Kuruma Aboriginal Corporation	No	Yes

4.10.1.4 Marine Parks

Woodside acknowledges that Commonwealth and State Marine Park Management Plans have sought to recognise cultural values of First Nations groups. Australian Marine Parks (AMP) describe this framework in the following way: ‘when making decisions about what can occur in marine parks and what action we will take to protect marine parks, we take values into account’. AMP summarises these values as natural values, cultural values, heritage values and socio-economic values.

Woodside is triggered to undertake an assessment of cultural values within Marine Park Management Plans where the operational area or EMBA overlaps an AMP. Woodside considers the management plans of marine parks that overlap the Operational Area and EMBA to determine whether cultural features and heritage values have been identified and whether there are specified Traditional Custodians or representative bodies referenced to contact regarding potential cultural features and heritage values.

The Operational Area does not overlap any Commonwealth Marine Parks. The EMBA overlaps with features of the Gascoyne AMP managed under the North-West Marine Parks Network Management Plan 2018 (DNP 2018a). The Operational Area and the EMBA do not overlap any State Marine Parks. Where these plans specify identifiable representative bodies who may hold knowledge of heritage values or cultural features—including but not limited to Registered Native Title Bodies Corporate—these bodies are consulted (See **Table 5-2**: Methodology for identifying relevant persons within the EMBA undertaken under subcategory 11 A (1) (d) – by category

). Consultation with these groups may identify heritage values and cultural features beyond those addressed in the marine park management plans. No identifiable representative bodies were specified for the marine parks overlapped by the EMBA (See **Table 4-18**).

The marine park management plans did note for the Gascoyne AMP that the Yamatji Marlpa Aboriginal Corporation (YMAC) is the relevant Native Title Representative Body. YMAC was requested to identify Traditional Custodians who may hold knowledge of heritage values or cultural features (See **Appendix F, Table 1**).

Table 4-18: Summary of Marine Park Management Plans that overlap the EMBA overlap

Marine Park Management Plan	Operational Area Overlap	EMBA Overlap	Specified Bodies
Commonwealth Marine Park Management Plan			
Gascoyne AMP	No	Yes	No identifiable body specified.
State Marine Park Management Plan			
[None]			

4.10.1.5 Sea Country Values

'Sea Country' can be defined as the area of sea over which a First Nations group has interests, cultural value, connection and use. It has been noted that "the saltwater peoples of the north-west are associated with discrete clan estates or tribal areas, often referred to in contemporary Aboriginal English as 'saltwater country' or 'sea country'. 'Country' refers to more than just a geographical area: it is shorthand for all the values, places, resources, stories and cultural obligations associated with that geographical area." (Smyth 2007). "Sea country is valued for Indigenous cultural identity, health and wellbeing" (DNP 2018b). Cultural identity is understood to refer to the fact that "essence of being a 'Saltwater' person is ontological rather than merely technological. That is, it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people" (McDonald and Phillips, 2021).

In terms of seascape extent, McNiven (2004) suggests that "For those mainland groups whose exploitation of the sea was limited to littoral resources, it is likely that seascapes extended no more than c. 20–30 km out to sea, out to the horizon and the limit of human visibility. … However, in some coastal places, clouds that can be seen well over 100 km out to sea are imbued with spiritual significance. For those groups with elaborate canoe technology, seascapes extend well over the horizon." While there is some evidence of traditional watercraft in Australia's North West, the recorded evidence is limited to travel across inland rivers (e.g. Barber and Jackson 2011) or travel between coastal islands (Paterson et al 2019).

Woodside recognises the potential for marine ecosystems to include cultural features as well as environmental values. The link between environmental protection and cultural heritage protection is illustrated in the Australian Government's Indigenous Protected Areas Program. The Indigenous Protected Areas program provides for "areas of land and sea managed by Indigenous groups as protected areas for biodiversity conservation…IPAs deliver environmental benefits…Managing IPAs also helps Indigenous communities protect the cultural values of their Country for future generations…" (DCCEEW, 2023). This intrinsic link concept is also described by MAC (2021) as it relates to the values of the marine environment that are of cultural importance to MAC based on engagement with their Elders and Murujuga Land and Sea Unit Rangers. Elders were clear that all living things in Mermaid Sound are connected and that Mermaid Sound and Dampier Archipelago (Murujuga) are considered one place where the entire environment and all ecosystems hold both cultural and environmental value, with these types of values (cultural and environmental) intrinsically linked (MAC, 2021 as cited in Woodside 2023a).

Cultural features of coastal areas may include marine species that may travel many thousands of kilometres through areas with similar cultural values to multiple First Nations language groups. Some species may travel as far as 5,000 km from Antarctica to the Kimberley region of Western Australia (Double et al., 2010, 2012a), passing First Nations language groups along the entire west coast of Australia. Distribution and migratory patterns of migratory species are described in **Section 4.6** and **Appendix H**.

Sea Country values have been defined using multiple lines of evidence including:

- Desktop assessment of Sea Country values from publicly available sources

- Specific studies including ethnographic surveys and archaeological heritage assessments
- Consultation with First Nations groups and individuals

The process for identifying First Nations groups who may have interests and connection in Sea Country are set out in **Section 4.10.1.3** and **Section 5.9**. The scope of advice Traditional Custodians were encouraged to provide through ethnographic surveys or through project consultation was not limited by reference to any particular boundaries or limits of Sea Country.

Desktop Assessment of Sea Country Values

Cultural features and heritage values identified in publicly available literature

Publicly available sources were assessed for any records of previously identified Sea Country values or cultural features that may overlap with the EMBA or Operational Area. Where cultural features or Sea Country values were identified these are summarised in **Table 4-19** according to the First Nations groups (where identified or inferable) who hold these values.

All cultural features and heritage values restricted to onshore locations or inland waters have been excluded in **Table 4-19**, noting that the closest boundary of the Operational Area is approximately 188 km from the closest landfall at North West Cape, while the closest boundary of the EMBA is about 40 km from closest landfall with no shoreline contact. Where the geographical extent is not specified or unclear it has been included for completeness.

Table 4-19: Cultural features and heritage values identified in publicly available literature

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
Gnulli (Baiyungu, Thalanyji, Yinggarda)	Feature: resources including marine animals. Value: traditional knowledge holds that ancestors live on the land and in the water. Therefore, people have obligations to access and care for these places (e.g. keeping them clean).	Peck on behalf of the Gnulli Native Title Claim Group v State of Western Australia [2019] FCA 2090	Yes Possible (unspecified)	Yes Possible (unspecified)
	Feature: heritage sites in the Ningaloo region include shell middens, artefact scatters, skeletal material/burial sites, camps, meeting places, hunting places and water sources. Feature: resources including gajalbu (emu), bundgurdi (kangaroo), bardurra (bush turkey), majun (marine turtles), turtle eggs, bilygurumarda (osprey), fish, shellfish and plants. Value: mudflats, mangroves and sand dunes provide a critical breeding ground for marine and terrestrial wildlife. Value: the Ningaloo region contains cultural heritage dating back at least 32,000 years, including ceremonial Thalu sites Value: connection to Country is important to the Traditional owners' spirituality and religion. Value: caring for Country - "The southern coastal reserves along the Ningaloo Coast are jointly managed by Traditional Owners and the DBCA. The Joint Management Body ensures that the Traditional Owners have an opportunity to make decisions about environmental management and land use" This document includes information that is marked as information that cannot to be copied, reproduced or used without consent.	DBCA 2020	No Likely to occur (turtles) known to occur (fish) No No Possible (unspecified) No	No Known to occur (turtles) known to occur (fish) No No Possible (unspecified) No -
	Feature: resources including mangrove crabs, gastropods, shellfish, dugong, turtle).	Morse 1993	Likely to occur (turtle; Table 4-7) No (other resources)	Known to occur (turtle; Table 4-7) No (other resources)
Ngarda-Ngarli (Mardudhunera, Ngarluma, Wong-	Feature: archaeological sites on Murujuga. Feature: ceremonial sites. Feature: dreaming sites.	Department of the Environment and Heritage 2006	No No Possible (unspecified)	No No Possible (unspecified)

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
Goo-Tt-Oo, Yaburara and/or Yindjibarndi)	Value: traditional knowledge recalls that the sea is a source of creation for flying foxes.	DEC 2013	Possible (unspecified)	Possible (unspecified)
	Value: petroglyphs are understood as permanent signs left by ancestral beings.		No	No
	Value: petroglyphs depict the law.		No	No
	Value: cultural obligations to look after places of special potency.		Possible (unspecified) – unlikely given distance offshore	Possible (unspecified) – unlikely given distance offshore
	Value: petroglyphs are important in initiation and education.		No	No
	Value: the sea is acknowledged a starting point for songlines, including the flying fox songline.	MAC 2023a	Possible (unspecified)	Possible (unspecified)
	Feature: resources including fishes, turtles and dugong.	Water Corporation 2019	Likely to occur (turtle; Table 4-7) Known to occur (fish) No (dugongs; Appendix C)	Known to occur (turtle; Table 4-7) Known to occur (fish) No (dugongs; Appendix C)
	Value: traditional knowledge recalls a sea serpent which travelled from the coast to inland pools.		Possible (unspecified)	Possible (unspecified)
	Value: traditional knowledge recalls a water serpent from the ocean now lives in an inland pool. He created many sites and punishes law breakers.	Barber and Jackson 2011	Possible (unspecified) – unlikely given distance offshore	Possible (unspecified) – unlikely given distance offshore
	Value: In a separate account a sea serpent punishing people was driven back to the sea by a freshwater serpent.		Possible (unspecified)	Possible (unspecified)
	Value: traditional knowledge recalls Manggan created the seas.	NAC n.d.	Yes	Yes
	Value: traditional knowledge recalls Pannawonica Hill being carried from the sea near Barrow Island or Murujuga by a spirit bird.	Hook et al 2004	No	No
	Value: traditional knowledge recalls Murujuga is where ancestral beings emerged from the sea and brought the Law.	Australian Heritage Council 2012	Possible (unspecified) – unlikely given distance offshore	Possible (unspecified) – unlikely given distance offshore

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
	Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel. Feature: Submerged First Nations archaeological sites in Flying Foam Passage.	Benjamin et al 2020	No No	No No
	Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel. Feature: Submerged First Nations archaeological sites in Flying Foam Passage.	Benjamin et al 2023	No	No
	Value: traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean.	Milroy and Revell 2013	Possible (unspecified)	Possible (unspecified)
	Value: traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean.	Japingka Aboriginal Art Gallery 2023	Possible (unspecified)	Possible (unspecified)
	Feature: submerged waterholes related to the Kangaroo songline. Value; traditional knowledge holds that Songlines continue beyond the current coast and across the submerged landscape.	Kearney et al 2023	No (feature restricted to Ancient Landscape) Possible (unspecified)	No (feature restricted to Ancient Landscape) Possible (unspecified)
	Value: songlines are captured through storytelling, rock art, songs and dance, and in the landmarks themselves. Value: Murujuga is the start of many songlines, including the Seven Sisters.	Bainger 2021	No No	No Possible (unspecified)
	Value: songlines at Murujuga date back to times when the sea-level was lower.	MAC 2023b.	Possible (unspecified) – unlikely given distance beyond Ancient Landscape	Possible (unspecified)
	Feature: rock art Feature: sacred sites.	Weerianna Street Media Production 2017.	No Possible (unspecified) – unlikely given distance beyond Ancient Landscape	No Possible (unspecified)

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
	Feature: resources including fish, turtles. Feature: fish traps exist throughout the archipelago. Feature: shell middens exist on coastal margins. Feature: submerged archaeological sites. Value: Law emerged from the sea and travelled inland.	Leach 2020	Likely to occur (turtle; Table 4-7) Known to occur (fish) No No No (feature restricted to Ancient Landscape) Possible (unspecified)	Known to occur (turtle; Table 4-7) Known to occur (fish) No No No (feature restricted to Ancient Landscape) Possible (unspecified)
	Feature: archaeological sites on Murujuga.	McDonald 2023	No	No
	Feature: archaeological sites on Murujuga.	McDonald 2015	No	No
	Feature: archaeological sites on Enderby Island.	McDonald et al 2022a	No	No
	Feature: archaeological sites on Rosemary Island.	McDonald et al 2022b	No	No
	Feature: petroglyphs on Murujuga.	Mulvaney 2015.	No	No
	Feature: resources including mangrove seeds, turtles, turtle eggs). Value: it is recalled that ceremonies were conducted on islands.	Smyth 2007	Likely to occur (turtle; Table 4-7) No (other resources) No (onshore)	Known to occur (turtle; Table 4-7) No (other resources) No (onshore)
	Feature: petroglyph and other archaeological sites at Murujuga.	Dortch et al 2019.	No	No
Thalanyji	Feature: resources including fish, shellfish, crabs, crustaceans, sea urchins, turtle, dugong and flora and fauna associated with mangrove communities. Feature: archaeological sites on Barrow Island. Value: connection to Country.	Commonwealth of Australia 2002	Likely to occur (turtle; Table 4-7) Known to occur (fish) No (dugongs, other resources) No (onshore) Possible (unspecified)	Known to occur (turtle, Table 4-7) Known to occur (fish) No (dugongs, other resources) No (onshore) Possible (unspecified)

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	EMBA
	Feature: resources include turtles, eggs, fish, shellfish and plants.	DBCA et al. 2002	Likely to occur (turtle; Table 4-7) Known to occur (fish) No (other resources)	Known to occur (turtle, Table 4-7) Known to occur (fish) No (other resources)
	Value: traditional knowledge recalls a water snake is located in inland waters.	Hayes on behalf of the Thalanyji People v State of Western Australia [2008] FCA 1487	No (inland waters)	No (inland waters)
	Value: connection to Country. Value: transfer of knowledge. Value: access to Country.	DBCA 2022	Possible (unspecified) Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified) Possible (unspecified)
	Value: access to Barrow and possibly Montebello Islands.	Hook et al 2004	No	No
	Feature: artefact scatters are located in coastal sand dunes. Feature: burials are located in coastal sand dunes. Value: traditional knowledge recalls a water snake is located in inland waters.	Hook 2020.	No No No	No No No
	Feature: archaeological sites are located on Barrow Island.	Ditchfield et al. 2018	No	No
	Feature: thalu ceremonial sites for the increase of turtle, shark, ray, fish, squid, octopus, hill kangaroo and emu. Feature: ceremonies. Value: connection to Country. Value: transfer of knowledge. Value: access to Country.	DBCA 2022	No No Yes Yes Yes	No No Yes Yes Yes
	Feature: archaeological sites are located at Barrow and Montebello Islands. Feature: archaeological evidence of the use of resources including fish, turtles, marine mammals, crocodiles, crabs and sea urchins.	Dortch et al. 2019.	No No	No No
	Feature: archaeological sites are located on Barrow Island.	Paterson 2017	No	No

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
Unspecified	Feature: the ocean can include sacred sites and songlines.	Smyth 2008	Possible (unspecified) – unlikely given distance offshore	Possible (unspecified)
	Value: people have kin relationships to important animals, plants tides and currents.		Possible (unspecified)	Possible (unspecified)
	Feature: archaeological sites in submerged landscapes.	Bradshaw 2021	No (feature restricted to Ancient Landscape)	No (feature restricted to Ancient Landscape)
	Value: Sea Country has customary law defining ownership and management rights and responsibilities.	Muller 2008	Possible (unspecified)	Possible (unspecified)
	Value: knowledge of Sea Country. Value: connection to Sea Country. Value: care for Sea Country. Value: the extent of Sea Country is determined by the travels of dreaming ancestors. This is recorded and conveyed through songlines.	Kearney et al 2023	Possible (unspecified) Possible (unspecified) Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified) Possible (unspecified) Possible (unspecified)
	Feature; archaeological sites indicate that islands were occupied prior to sea level rise.	DBCA 2020	No	No

First Nations Group	Features and Values	Source	Potential for overlap	
			Operational Area	**EMBA**
	Value: Sea Country includes values, places, resources, stories and cultural obligations. Value: activities relating to resources included: Dugong hunting; Turtle hunting; Turtle egg collecting; Seabird egg collecting; Spearing fish; Reef trapping fish; Herding fish; Line fishing; Collecting fish in stone fish traps; Poisoning fish; Gathering shellfish and other marine resources.	Smyth 2007	Possible (unspecified) Possible (unspecified) – unlikely given distance offshore	Possible (unspecified) Possible (unspecified) – unlikely given distance offshore
	Value: people have kinship relationships with every plant and animal. Value: certain species, including fish and seafood, must not be eaten during initiation rituals due to their sacredness to the creation being Barrimirndi. Breaking this law may lead to cyclones.	Juluwarlu 2004	Possible (unspecified) No	Possible (unspecified) No
	Feature: tangible and intangible heritage. Feature: archaeological evidence of varied occupation and adaptation. Value: a distinct way of life centred around the use of limited water and coastal resources.	Macfarlane and McConnell 2017	Possible (unspecified) No (feature restricted to Ancient Landscape) No	Possible (unspecified) No (feature restricted to Ancient Landscape) No

Studies of Cultural Features and Heritage Values

First Nations Archaeological Heritage Assessment

Woodside understands that communal cultural connection may exist between Traditional Custodians and land and waters. It is understood from the onshore archaeological record that First Nations people have occupied the Australian continent for at least 65,000 years (Clarkson et al 2017) and in many places maintain a strong continuing connection that is said to extend back in First Nations cosmology to the beginning of time.

It is understood that the sea level has risen significantly during the 65,000 years of First Nations occupation, and areas that were once inhabited are now submerged on the continental shelf (Veth et al 2019; UWA 2021). Woodside also understands that, at its lowest level during First Nations occupation, sea level was between 125 m (O'Leary et al 2020, Veth et al 2019, Williams et al 2018) and 130 m below current levels (Benjamin et al 2020, Benjamin et al 2023, UWA 2021). Archaeological material preserved on the Ancient Landscape has the potential to provide further information about the earliest periods of human occupation (Veth et al 2019; UWA 2021).

Recent archaeological discoveries demonstrate that the now submerged landscape was occupied and inhabited, and can retain archaeological material from this time (Benjamin et al, 2020; Benjamin et al 2023; see Ward et al 2022 for an opposing view).

In recognition of this, Woodside considers the Ancient Landscape between the mainland and the Ancient Coastline KEF (see **Figure 4-11**) as an area where potential First Nations archaeological material may exist on the seabed, as this covers the full extent of this possible First Nations occupation. The Operational Area and EMBA do not overlap the Ancient Landscape.

Known First Nations heritage places including archaeological sites may be protected subject to declarations under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, *Underwater Cultural Heritage Act 2018* or EPBC Act 1999. However, these Acts only extend protection to First Nations heritage places specified by declaration or otherwise included on a statutory list. Woodside understands that there is no First Nations archaeology known to exist anywhere within Commonwealth waters, and no areas subject to declarations or prescriptions under these Acts are located within the EMBA.

For this EP, a search of DPLH's Aboriginal Cultural Heritage Inquiry System was undertaken, which showed no registered Aboriginal sites in the EMBA (see **Appendix K**).

Where First Nations archaeological material is identified within the EMBA, Woodside will discuss the management of this material with appropriate Traditional Custodian group(s), starting with any adjacent Native Title Body Corporate.

First Nations Ethnographic Heritage Assessment

Ethnographic surveys are a form of heritage survey conducted by anthropologists or ethnographers to understand cultural features of heritage significance and heritage values within a landscape. This is distinguished from an archaeological survey (which focusses on the material remains of human culture) and consultation (which is not confined to an assessment of heritage, is not limited to values of a landscape and may be conducted without an ethnographic methodology).

Ethnographic surveys are *undertaken to identify Aboriginal cultural heritage sites and values that are identifiable as tangible and intangible elements that are important to the Aboriginal people of the State, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition.*

To achieve this, an ethnographic survey is undertaken with an Aboriginal person or persons who in accordance with Aboriginal tradition, holds particular knowledge about the Aboriginal cultural heritage and has traditional rights, interests and responsibilities in respect of the Aboriginal cultural heritage (Mott 2023).

Woodside seeks to undertake ethnographic surveys where planned impacts overlap an area where a First Nations group has an established cultural jurisdiction over an area of land or sea. Cultural jurisdiction is essential to ensure ethnographic survey participants "*in accordance with Aboriginal tradition, hold particular knowledge about the Aboriginal cultural heritage*", and may be established through a number of mechanisms, including prescription under heritage legislation, recognition through the determination of Native Title rights, or through land access agreements including ILUAs or ILUA-like agreements.

Where ethnographic surveys are requested during broader consultation in which a relevant person articulates their cultural jurisdiction, Woodside will assess this request and, where appropriate undertake surveys. Surveys may not be appropriate, for example, where another party has established cultural jurisdiction or an adequate ethnographic survey has already been carried out over the area.

As ethnographic surveys are dependent on the participation of traditional knowledge holders, it is not possible to meaningfully conduct ethnographic surveys proactively over areas for which cultural jurisdiction is not established or unclear.

To supplement understanding of the area subject to MAC's cultural jurisdiction nearshore, Woodside commissioned an ethnographic survey to support the Scarborough Project (McDonald and Phillips 2021), including the Operational Area (See **Table 4-19**). An ethnographic survey determines both the tangible and intangible cultural heritage which may be associated with a particular story, person/peoples, animals, plants, area, features or objects. Typical results from surveys of this nature may include the identification of songlines, ceremonial places such as 'thalu' sites for managing environmental resources, or places where activities such as birthing, initiation or other significant activities are performed. As a form of heritage survey, distinct from more general consultation, surveys were limited to discussions of the relevant landscape. However, participants were not restricted in the types of tangible and intangible cultural heritage they were encouraged to identify.

The survey was conducted by MAC as representatives of Traditional Custodians for the onshore and nearshore aspects of the Scarborough Project. MAC appointed their preferred heritage consultants to meet on Country with the MAC Circle of Elders to discuss the project and identify any cultural values (McDonald and Phillips 2021). The resulting report is owned by MAC and was approved by the Circle of Elders prior to being provided to Woodside. Representatives from the Mardudhunera, Ngarluma, Yaburara, Yindjibarndi and Wong-Goo-Tt-Oo Peoples—all five First Nations groups represented by MAC (MAC 2022)—participated in this survey (McDonald and Phillips 2021). The scope of works for this survey defines the purpose of this survey as follows:

The ethnographic consultation aims at providing an understanding of the cultural heritage values associated with the submerged landscape.

Specifically, the survey and reporting will provide Woodside understanding of the cultural values within the coastal, nearshore and offshore proposed Scarborough trunkline and associated works areas.

The scope of the assessment was informed by the Scarborough project's development footprint as provided in **Figure 4-14**, however a landscape-scale approach was undertaken, considering heritage values that may be identified by participants well beyond this footprint. No boundary was imposed on the participants, and participants were not restricted in the types of heritage value they were encouraged to identify. As an indication of the breadth of the cultural landscape that the survey considered, cultural features and heritage values were identified more than 60 km from the development footprint. Participants were shown an introductory video explaining the key parameters of the Scarborough project including the proposed pipeline (McDonald and Phillips 2021).

The survey identified ethnographic sites onshore, but these are outside the Operational Area and EMBA and hence scope of this EP (McDonald and Phillips 2021). It is not appropriate or practical to request Traditional Custodians to list all ethnographic values onshore which they have not identified

as potentially impacted, however some identified in the report included stories related to Eaglehawk Island and several sites at Withnell Bay. Some of these sites have spiritual connections throughout the landscape including to Cape Preston and Depuch Island. It was not proposed in the report that the Project would pose any risk to these sites or values, which are located well outside the EMBA. It was noted that some traditional knowledge of ethnographic values may have been lost through the effects of colonisation generally, and as a result of the Flying Foam Massacre in particular (McDonald and Phillips 2021).

Figure 4-14: Scarborough Development Location considered in the 2020 ethnographic survey (McDonald and Phillips 2021)

Future Ethnographic Surveys

McDonald and Phillips (2021) represents the findings of Phase I of a planned two-part ethnographic survey, and recommends that the Phase II ethnographic survey be initiated. The second phase goes beyond industry standard by engaging with neighbouring First Nations groups to identify potential ethnographic values that traverse traditional group boundaries. Per Appendix F, Table 1, Woodside has communicated its commitment to the Phase II survey to MAC on multiple occasions, is ready to progress these at MAC's earliest availability, and believes it has taken all reasonable steps to progress the Phase II survey. MAC has not yet elected to progress this work.

Phase I of the ethnographic survey was run by MAC, and the scope of this survey required "Full recording and significance assessment. The consultant is to provide advice as to whether there are cultural values within and nearby the footprint area..." Discussion with MAC's then CEO has confirmed that MAC do not consider that they have failed to deliver on this scope. The survey was conducted with members of MAC's Circle of Elders, who are recognised as cultural authorities for Murujuga, and the final report was approved by the Circle of Elders prior to being provided to Woodside.

Therefore, Woodside understands the Phase I works to adequately describe and assess the cultural, spiritual, aesthetic and social values held by Traditional Custodians for the project area and surrounding land and seascape. Woodside does not consider the Phase II works to be necessary to the construction of the Scarborough Project.

Woodside has also conducted extensive engagement with appropriate representatives as determined by MAC over the course of several years, as well as a number of neighbouring First Nations groups and representatives as detailed in **Section 5.** As reported in the section below, this consultation with MAC has resulted in the detailing of cultural values beyond the heritage values that may be identified through ethnographic survey, and in greater detail than the results of ethnographic survey to date. On 21 July 2023, MAC advised by letter that MAC "have no concerns at this point in time" regarding the proposed activities subject to this EP.

Beyond MAC, no First Nations group has articulated cultural jurisdiction over any area of waters subject to impacts from planned activities. BTAC has stated that their Sea Country extends "out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands." These locations are outside of the extent of planned impacts. A review of publicly available literature has been undertaken to seek clarity on the extent of Sea Country for Thalanyji people in Section below and has not identified any areas recorded as Thanlyji Sea Country which overlap the extent of proposed impacts

Woodside has offered support, through ongoing consultation, for initiatives proposed by Traditional Custodians to record Sea Country values (see Program of Ongoing Engagement with Traditional Custodians, Appendix J).

Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received (including any relevant new information on cultural values from the Phase II survey or other sources), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see **Section 7.7**).

Consultation Feedback to Inform Existing Environment

Summary of Values raised during consultation

A summary of the topics/interests and values raised by First Nations groups through consultations on this Petroleum Activities Program, or raised in context of general Scarborough Project activities or other activities are provided in **Table 4-20**.

First Nations cultural values are communally held. This is reflected in Vision 3 of Dhawura Ngilan that "Aboriginal and Torres Strait Islander heritage is managed... according to community ownership" (Heritage Chairs of Australia and New Zealand 2020). Dhawura Ngilan also specifically notes that

"Aboriginal and Torres Strait Islander... intangible knowledge systems, which are held in songlines and language, are endangered. This knowledge is held by Elders and the community..." Through consultation Registered Native Title Bodies Corporate and nominated representative corporations have identified or raised topics relating to environmental values of cultural interest. Woodside recognises the deep spiritual and cultural connection to the environment[3] that First Nations people hold.

The Program of Ongoing Engagement with Traditional Custodians (Appendix J) provides a mechanism for ongoing dialogue between Woodside and Traditional Custodians, beyond that required by regulation 11A. The program enables Woodside to manage the potential impacts and risks to cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians. As an example, Woodside is developing a framework for ongoing consultation with BTAC and other groups (Appendix J). Should feedback be received (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see **Section 7.7**).

[3] Definition of 'Environment' in Regulation 4 of the OPPGS (Environment) Regulations are defined as:

a) ecosystems and their constituent parts, including people and communities; and
b) natural and physical resources; and
c) the qualities and characteristics of locations, places and areas; and
d) the heritage values of places; and includes

the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d)

Table 4-20: Feedback Received via Consultation to Inform Existing Environment Description

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
BTAC representing some of the Gnulli native title claimants (Baiyungu and Thalanyji people)	Raised specific to PAP (See Appendix F; Table 1) Raised in context of general Scarborough Project activities	Value: Cultural obligation to care for the environmental values of Sea Country Sea Country extends *"out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands"*	Possible (unspecified) No (refer to further description below)	Possible (unspecified) No (refer to further description below)
Murujuga Aboriginal Corporation representing Ngarda-Ngarli people (Mardudhunera, Ngarluma, Wong-Goo-Tt-Oo, Yaburara and Yindjibarndi)	Raised in context of Nearshore Scarborough Project activities	Value: Mermaid Sound – Ecosystem health	No	No
		Feature: Whale Value: A whale Thalu is an increase at a totemic site that brings whales into beach Value: Whales and other species of totemic importance need to be protected, including their populations, biodiversity, and migration patterns Value: Whales are culturally important species that migrate through Mermaid Sound. Humpback whales in particular	Likely to occur (Table 4-10) Possible (unspecified) Likely to occur May occur	Likely to occur (Table 4-10) Possible (unspecified) Known to occur Known to occur
		Feature: Dolphins Value: There are cultural ceremonies associated with communicating with dolphins	May occur Possible (unspecified)	May occur Possible (unspecified)
		Feature: Dugongs Value: Dugongs are a food source associated with seagrasses near Gidley Island	No (Appendix C) No (Appendix C)	No (Appendix C) No (Appendix C)
		Feature: Fish Value: There are Thalu ceremonies associated with increasing fish stocks	Known to occur Possible (unspecified)	Known to occur Possible (unspecified)
		Feature: Sea snakes Specifically mentioned as culturally important species	May occur (Appendix C)	May occur (Appendix C)

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		Feature: Flatback, green, hawksbill, loggerhead and leatherback turtles Turtles are culturally important species that moves through Mermaid Sound. Turtles are most often seen in shallower areas and where there are seagrasses Most beaches are nesting sites for turtles, including those on Gidley and Legendre Islands Value: The songline associated with the turtle comes from Fortescue to Withnell Bay. This song is sung by four or five tribes for day and night without consuming food or water	Likely to occur (turtles; Table 4-7) No No No (songline geographically restricted nearshore)	Known to occur (turtles; Table 4-7) No No No (songline geographically restricted nearshore)
		Interest: Coral Fish are attracted to areas with coral Concerned about coral bleaching because corals are important. Beautiful colours. They also attract a lot of other things Fish carry coral spawn like bees pollinate flowers. If fish were looked after, the corals would get brighter and brighter (by transmitting nutrients and performing other ecosystem services, fish can be symbiotic with corals) Spawning events should be avoided (associated with full moon). Locations identified during consultation include Withnell Bay; Conzinc Bay; south west of Legendre Island	No (Table 4-4)	No (Table 4-4)
		Feature: Seagrass Seagrasses provide protection for animals Locations identified during consultation include Conzinc Island; between Angel and Gidley Island.	No (Table 4-4)	No (Table 4-4)

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		Value: Mangroves would have provided shelter, crabbing, digging for shellfish, could be turtle nurseries Locations identified during consultation include Conzinc Bay north end; Flying Foam Passage; Searipple Passage; north-east bay of West Lewis Island	No (Table 4-4)	No (Table 4-4)
		Interest: Macroalgal communities, which are important primary production sites, habitats, and food sources (not explicitly identified by elders)	No (Table 4-4)	No (Table 4-4)
		Interest: Subtidal soft-bottom communities, which support invertebrate diversity (not explicitly identified by elders)	No (Table 4-4)	No (Table 4-4)
		Interest: Intertidal sand and mudflat communities, which are important primary production sites, support invertebrate diversity and provide food for shorebirds (not explicitly identified by elders)	No	No
		Interest: Rocky shores, which are habitats for intertidal organisms and provide food for shorebirds (not explicitly identified by elders)	No	No
		Feature: Fish traps There are known fish traps in Conzinc Bay, and others would have or do exist in coastal areas of islands, such as Angel and Gidley Islands. People still use the Conzinc Bay fish traps regularly for catching mangrove jack, trevally and other fish	No No	No No
		Value: Squidding (harvesting of squid from the ocean) around Conzinc Island	No	No
Ngarluma Aboriginal Corporation (NAC)	No values raised	-	-	-
Ngarluma Yindjibarndi Foundation Limited (NYFL)	No values raised	-	-	-

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
Nganhurra Thanardi Garrbu Aboriginal Corporation representing Baiyungu and Thalanyji people	Raised specific to PAP (See Appendix F; Table 1) Raised in context of general Scarborough Project activities	Interest: Whales - query regarding noise impacts, monitoring and operational responses to whale sightings	Likely to occur (whale; Table 4-10)	Known to occur (whale; Table 4-10)
	Raised in context of decommissioning activities	Interest: Whale sharks – query regarding activity timing Interest: Marine parks – query regarding risks from activity in relation to decommissioning	No No	Known to occur (Table 4-5) Yes (Gascoyne AMP)
Robe River Kuruma Aboriginal Corporation (RRKAC)	Raised in context of general Scarborough Project activities	Feature: Underwater heritage	No (feature restricted to Ancient Landscape)	No (feature restricted to Ancient Landscape)
Save Our Songlines, [redacted] and [redacted]	Raised specific to PAP (See Appendix F; Table 1) Raised in context of general Scarborough Project activities	Feature: Songlines, dreaming and energy lines (unspecified)	Possible (unspecified)	Possible (unspecified)
		Feature: Whales – including migratory patterns	Likely to occur (Table 4-10)	Known to occur (Table 4-10)
		Interest: Turtles – including migration patterns	Likely to occur (Table 4-7)	Known to occur (Table 4-7)
		Interest: Dugongs – unspecified	No (Appendix C)	No (Appendix C)
		Interest: Plankton – unspecified	Known to occur	Known to occur
		Interest: Seagrass – Unspecified	No (Table 4-4)	No (Table 4-4)
		Interest: Where saltwater and freshwater meet	No	No
	Raised in Concise Statement and Affidavit[4] in context of	Value: Caring for Country [redacted] asserts holders of women's lore with cultural obligations to protect, preserve and	Possible (unspecified)	Possible (unspecified)

[4] https://www.fedcourt.gov.au/__data/assets/pdf_file/0003/112278/6-Applicants-Concise-Statement.pdf

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
	Scarborough seismic activities[5]	promote the environment, animals and plants threatened by the Activity (specific to Seismic) [redacted] asserts the spiritual health and wellbeing of Murujuga and all the plants and animals present on Murujuga and connected to the songlines in and around Murujuga		
		Feature: Whales [redacted] asserts the following values: “Whales carry important songlines, the whale Dreaming, and connection between land and sea” "As the biggest animal on earth, the whale has the greatest heart connection to songlines, people and animals and carries the songlines around the ocean, connecting places." “Whale Dreaming story has a strong connection to the heart centre in each person, this story helps people to open up and to realise, understand and raise awareness of the environment and everything humans are connected to.” "In their own families, female whales have a caretaker or midwife role, and those who are connected to the Whale Dreaming and carry the women's lore also have obligations as caretakers of the earth." "The women's lore that [redacted] and [redacted] carry is the songline of the whale, which is important for sustaining the creation of all animals and humans." "[redacted] and [redacted] connect to the whales like this through their songlines, they sing to the whales, the whales feel that song and the	Likely to occur (whale; Table 4-10) Possible (songlines, unspecified)	Known to occur (whale; Table 4-10) Possible (songlines, unspecified)

[5] Information from publicly available sources to support consultation with SOS, [redacted]

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		connection through their hearts, regardless of the distance." "the whales tell [redacted] and [redacted] a story, and [redacted] and [redacted] are the people who feel and who are connected to that story. [redacted] and [redacted] have that feeling of connection inside them all the time, they live and breathe it, they are in and everything about it." "Because each animal uses songlines for migration, breeding and feeding, the disruption or distortion to the songlines causes the animals to become disoriented, confused or lost."		
		Interest: Whales Interest: Pygmy Blue whales "Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales iii. whales' sonar communications systems, particularly between mothers and calves, from sound and vibrations emitted by the Activity v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon); and vi. vehicle collision and/ or entanglement with marine fauna"	Likely to occur (whale; Table 4-10)	Known to occur (whale; Table 4-10)

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		Interest: Turtles "Other animals, such as turtles, dolphins, dugongs, and krill follow the whale's songlines, because they're all connected together - the whale creates a path for the other animals like 'grading a road'." “Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to: ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon); and vi. vehicle collision and/ or entanglement with marine fauna"	Likely to occur (Table 4-7**)**	Known to occur (Table 4-7)
		Interest: Dugongs “Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to: v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)”	No (Appendix C)	No (Appendix C)
		Interest: Pelagic fish “Potential impacts on marine species and natural environment, relevant to the natural environment,	Known to occur	Known to occur

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		relevant to the Applicant's interests, including but not limited to: ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales"		
		Interest: Sharks "Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to: ii. behavioural changes (leaving or avoiding the area where the Activity occurs) to turtles, pelagic fish (such as tuna and billfish), sharks, pygmy blue whales v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)"	Likely to occur (Table 4-5**)**	Likely to occur (Table 4-5**)**
		Interest: Plankton "Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to: i. chronic mortality to some marine organisms, including zooplankton	Known to occur	Known to occur
		Interest: Water quality "Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to:	Yes	Yes

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		iv. potential operational discharges associated with the presence of ships in the area, including potential impacts to water quality v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)		
		Interest: Seabirds "Potential impacts on marine species and natural environment, relevant to the natural environment, relevant to the Applicant's interests, including but not limited to: v. potential impacts on water quality and consequent potential impacts on marine fauna such as whales, dugongs, sharks, rays, and seabirds from the risk of unplanned chemical discharges (non-hydrocarbon)	May occur (Table 4-12)	May occur (Table 4-12**)**
		Value: Where saltwater and freshwater meet "The places where the saltwater from the sea and the freshwater from the land connect are where the biggest energy lines[6] are, and that connection is a core of creation relevant to a Dreaming story."	No	No
		Value: Rock Art "Rocks at Murujuga symbolise stories, the totems (the depicted artwork) - whether representing plants or animals - and tell a story of their history, and how long they've been there."	No	No
		Value: Bungarra, Eagle, Kangaroo Identified totemic species	No	No

[redacted] and Save our Songlines have referred to and described Energy Lines which Woodside Interprets to be the same as Songlines. This document will refer to songlines from this point forward.

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		Value: Murujuga "When [redacted] and [redacted] and their people stand on Country they are connected to their songlines through the rocks. As holders of women's lore, [redacted] and [redacted] put healing energy into the rocks and use that to heal the songlines." "[redacted] and [redacted] connect to their bloodline, old people and songlines through Country, including the rocks at Murujuga, which are encrypted with ancient stories that keep connection to the bloodline and songlines alive and well."	No	No
Wirrawandi Aboriginal Corporation representing Ngarda-Ngarli (Mardudhunera and Yaburara)	Raised in context of general Scarborough Project activities	Interest: Whales - query with regard to whale migration and timing of Project activities; impact of noise on whale communication Interest: Turtles - query with regard to turtle monitoring programs Interest: Underwater heritage – query with regard to where sites have been recently found	Likely to occur (Table 4-10) Likely to occur (Table 4-7**)** No	Known to occur (Table 4-10) Known to occur (Table 4-7**)** No
	Raised in context of decommissioning activities	Interest: Rock Art – query whether air emissions from activities impacts rock art and controls to minimise potential impacts	No	No
Yamatji Marlpa Aboriginal Corporation (YMAC)	No values raised	-	-	-
Yindjibarndi Aboriginal Corporation	No values raised	-	-	-
Yinggarda Aboriginal Corporation representing Yinggarda People.	Raised in context to Scarborough project activities.	Interest: Whales – query with regard to potential impacts to whale migration patterns and impacts from vessel collision	Likely to occur (Table 4-10)	Known to occur (Table 4-10)
		Value: Shark Bay Mullet – important resource	No (coastal species)	No (coastal species)
		Interest: Dugong – raised in context of Shark Bay	No	No

Relevant First Nations Group /Individuals	Consultation context	Description of Feature and Value / Interest	Potential for overlap	
			Operational Area	EMBA
		Interest: Seagrass being food source for Dugong	No (**Table 4-4)**	No (**Table 4-4)**

Further Information regarding BTAC's Sea Country Values

During consultation, BTAC, on behalf of the Thalanyji People, advised it has a cultural obligation to care for the environmental values of Sea Country (refer to Appendix F, Table 1).

In correspondence from 20 February 2023 relating to the Scarborough Project, BTAC advised that:

- BTAC seeks support from Woodside to enable BTAC to define and articulate its values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community. This would enable BTAC and Woodside to collaborate to develop effective management plans that can provide adequate protection to Sea Country values; and
- BTAC seeks support from Woodside to obtain technical support to review the information and provide BTAC and its members with feedback on the project risks to Sea Country and help BTAC contemplate the potential management controls that could be developed to protects its values and interests

Woodside has agreed to BTAC's request, and the resulting offer of technical support is detailed in Appendix F, Table 1. However, Woodside's offer for technical support has not yet been accepted.

BTAC noted that this Sea Country extends "out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands." In the absence of further advice from BTAC, Woodside understands from this description that BTAC's interests extend to the Montebello Marine Park Multiple Use Zone in the vicinity of the islands.

While an ethnographic survey has not been requested, a review of publicly available literature has been undertaken to seek clarity on the extent of Sea Country for Thalanyji people. This review identified a number of heritage research projects undertaken for the Montebello and Barrow Islands which acknowledge the support of BTAC (e.g. Manne and Veth 2015, Veth et al. 2017), though no information regarding Sea Country values, or the extent of Sea Country, were identified.

Publicly available heritage assessment reports elsewhere on Thalanyji Country tend to rely on established native title boundaries (e.g. Chisholm 2013) or draw on historic maps, particularly those compiled by Norman Tindale and published in 1947 (e.g. Hook et al. 2020. An early 1940's map by Tindale shows "Ṫalaindji" (Thalanyji) Country as exclusively terrestrial and further west than areas typically recognised today as Thalanyji Country (Tindale 1940). This map also shows the Noala people as custodians of the Onslow area and defines Barrow and the Montebello Islands as "Mardudunera" (Mardudhunera) Country—it is unclear from the map if the boundary of Mardudhunera is proposed to represent an extent of Sea Country, or merely note that these islands are part of Mardudhunera Country. A further refined version of this map was produced in 1974 which shows "Talandji" in a location more closely aligned with contemporary understanding of Thalanyji Country and removes the apparent extent of Mardudhunera over Barrow and the Montebello Islands (Tindale 1947). This definition of Thalanyji Country is still confined to the mainland in this map. A more contemporary attempt at mapping traditional Country is shown in The AIATSIS Map of Indigenous Australia (Horton 1996). This map similarly confines Thalanyji Country to terrestrial areas west of Onslow and leaves Barrow and the Montebello Islands unmarked as an area with "No published information available". It is also noted that "This map is based on data collected up to 1994 and is not intended to show precise areas or boundaries" (Horton 1996).

Collective assessments of Sea Country in the Pilbara (Lincoln and Hedge 2019, YMAC et al. 2010) were also found to rely on existing native title boundaries. It is noted in the Pilbara Sea Country Plan (YMAC et al. 2010) that:

> *Although some differences remain, between and among native title groups, there is now a general sense that most groups have coalesced into final forms that will, in future, be the groups that exercise rights and interests in their respective areas. many of these rights and interests will relate directly to native title. however, there is also a more broadly based appreciation of the need to accept and discharge responsibilities for land and*

> *marine management within native title areas regardless of whether native title per se is affected.* (YMAC et al. 2010, emphasis added).

The office of the Registrar of Indigenous Corporations records four corporations using the name Thalanyji:

- Buurabalayji Thalanyji Aboriginal Corporation
- Buurabalayji Thalanyji Aboriginal Corporation RNTBC
- Onslow Thalanyji Aboriginal Corporation
- Wurrumalu Thalanyji Aboriginal Corporation

The only currently operative organisation, and the only organisation with an identified website, is Buurabalayji Thalanyji Aboriginal Corporation RNTBC. This website states that "Thalanyji Country spreads out across the Ashburton River coastal plain south to Tubridji Point, then across to Yannarie River and upstream to Emu Creek, across the range hills of southwest Pilbara to Henry River and Cane River in the north" (BTAC 2021). This description includes coastal areas but provides no description of the extent of Sea Country.

A search of the National Native Title Tribunal register of applications and determinations identified four historic Native Title claims with the name Thalanyji:

- Thalanyji People (WC1995/002)
- Thalanyji People #2 (WC1996/082)
- Thalanyji (WC1999/045)
- Thalanyji 2 (WC2010/004)

Most of these claims were dismissed, and Woodside makes no assessment of the merits of these claims.

The area of WC1995/002, as defined in the map forming Attachment 1 to the Native Title Application,[7] does not include any areas of Sea Country. WC1996/082 does not include a publicly available map on the National Native Title Tribunal website. The Native Title Application[8] does describe the area covered by the claim, including "This country extends from the Tubridji Point on the coast south west of Onslow and tracking south to Yanarrie River." and "The area also includes the waters and associated islands between Tubridji point and Cane River. These islands were visited by Thalanyji People." The extent of this Sea Country from the coast is unclear, but would presumably include islands as distant as Airlie Island, approximately 30 km from the shore.

The area of WC1999/045, as defined in the map forming Attachment C to the Native Title Application,[9] includes an area of water extending approximately 30 km from the mainland coast in encompassing a number of islands, including Airlie Island, Ashburton Island, Bessieres Island, Direction Island, Flat Island, Locker Island, Round Island, Serrurier Island, Table Island, Thevenard

[7] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1995_002/Attachment%20A-%20Thalanyji%20Map.pdf

[8] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1996_082/SNTAExtract_WC1996_082.pdf

[9] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC1999_045/1999_11_09%20Attachment%20B%20Map%20of%20Claim%20Area.pdf

Island, Tortoise Island, and the Twin Islands. The area also includes the south-most of the Mangrove Islands, but does not include the other Mangrove Islands.

The area of WC2010/004, as defined in the map forming Attachment C to the Native Title Application[10] includes localised areas of sea up to approximately 5 km beyond the coast.

In none of these applications do the extent of asserted interests extend to Barrow, Mackerel or the Montebello Islands. The furthest extent of a claim is the approximate 30 km margin extended from the mainland coast for WC1999/045. If this margin is precautionarily applied to the coasts of the Montebello Islands (as the closest islands to the operational area which were identified by BTAC in defining their Sea Country) this would not exceed beyond the Montebello Multiple Use Zone within the vicinity of the islands.

In summary, the publicly available information considered in this section does not record any instances of Thalanyji Sea Country extending beyond the Montebello Multiple Use Zone within the vicinity of the islands. The Montebello Islands, Barrow Island or the Mackerel Islands or the Montebello Marine Park Multiple Use Zone, or the islands indicated in WC1999/045 are outside of the PAA and EMBA for the activity.

Woodside has developed a robust understanding of Thalanyji Sea Country cultural values and heritage features through publicly available information (**Section 4.10.1.5**) and consultation with BTAC under Regulation 11A. Woodside considers that it has taken all reasonable steps to identify cultural features and heritage values of Thalanyji people in the EMBA.

If further guidance from BTAC is received as part of ongoing consultation which changes Woodside's understanding of the extent of Thalanyji Sea Country, Woodside's Management of Change and Management of Knowledge process with EPO 18 will be applied to manage potential impact to newly identified cultural values or features to ALARP and Acceptable levels. This estimation does not limit the extent of consultation with BTAC or the features and values they are encouraged to identify and communicate.

4.10.1.6 Summary of Cultural Features and Heritage Values

Woodside has developed a robust understanding of cultural features and heritage values relevant to the activity through examination of publicly available information, studies and consultation with relevant persons under Regulation 11A.

Table 4-21 consolidates the cultural features and heritage values identified in **Section 4.10.1.5** and confirms whether there is any potential for these to exist within the PAA or EMBA. As previously described, topics which have been raised in the context of an interest linked to the natural environment are impact and risk assessed in **Sections 6.6** and **6.7**.

As cultural features are physical elements of a place, these can generally be assessed for impacts; where a feature is avoided, it is not impacted. Heritage values relate less to what is significant and more to why something is significant; interaction between heritage values and the PAA can only be reliably informed by consultation with Traditional Custodians where they are willing to share the necessary knowledge. Assessment of heritage values beyond cultural features alone is addressed in **Section 6.9** subject to these caveats.

[10] http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/NTDA%20Extracts/WC2010_004/WC2010_004%202.%20Map%20of%20Application%20Area.pdf

Table 4-21: Summary of cultural features and heritage values

Identified cultural features and heritage values (including interests)	Context	EP Source				Potential for overlap	
		Consultation Feedback	***First Nations Archaeological Heritage Assessment***	***Ethnographic Heritage Assessment***	***Desktop Literature Assessment***	***Operational Area***	***EMBA***
Archaeological heritage							
None identified – refer to **Studies of Cultural Features and Heritage Values** No archaeological sites have been identified beyond terrestrial or intertidal areas, with the exception of two sites at Murujuga outside the EMBA, specifically in Cape Bruguieres channel and Flying Foam Passage (Benjamin et al. 2020; Benjamin et al 2023). While it is recognised that there is the potential for submerged archaeological sites on the Ancient Landscape as noted in **Table 4-20**, both the PAA and EMBA do not overlap the Ancient Landscape.							
Intangible values							
Songlines	Ethnographic survey noted dreaming tracks from locations onshore and to islands outside of the EMBA, but was not able to determine the routes of any dreaming tracks that may extend across the submerged landscape.	✓	X	✓	✓	Possible (unspecified)	Possible (unspecified)
Creation/ dreaming sites, sacred sites and ancestral beings	Ethnographic survey noted some sites associated with creation/dreaming or ancestral beings are known on land outside the EMBA. Publicly available literature talks to creation/dreaming and ancestral beings, including water serpents, connected to or originating from the sea generally, but cannot be confirmed to relate to features within the EMBA.	✓	X	✓	✓	Possible (unspecified)	Possible (unspecified)
Cultural obligations to care for Country	Cultural obligation to care for the environmental values of Sea Country. Exclusion of Traditional Custodians from Sea Country or decision making processes may inhibit ability to care for Country.	✓	X	X	✓	Possible (unspecified)	Possible (unspecified)

Identified cultural features and heritage values (including interests)	Context	EP Source				Potential for overlap	
		Consultation Feedback	***First Nations Archaeological Heritage Assessment***	***Ethnographic Heritage Assessment***	***Desktop Literature Assessment***	***Operational Area***	***EMBA***
Knowledge of Country/ customary law and transfer of knowledge	The preservation and transmission of knowledge is dependent on the preservation of the environment generally. Exclusion of Traditional Custodians from Sea Country may inhibit the transfer of knowledge.	✓	X	✓	✓	Possible (unspecified)	Possible (unspecified)
Connection to Country	Connection to Country may be damaged where people are displaced or disrupted (e.g. during colonisation) or where there is a loss of technical skills or environmental knowledge	✓	X	X	✓	Possible (unspecified)	Possible (unspecified)
Access to Country	Limitations on Traditional Custodians accessing or enjoying areas of Sea Country	✓	X	X	✓	Possible (unspecified)	No (No limitations on access beyond the PAA)
Kinship systems and totemic species	Traditional Custodians have connection to species through kinship and totemic systems. An individual may have obligation to care for or not consume a species to which they are kin.	✓	X	X	✓	Possible (unspecified)	Possible (unspecified)
Resource collection	Fishing, hunting, gathering of marine species	✓	X	X	✓	No	Possible (unspecified)
Marine ecosystems and species							
Marine species	Generally raised in consultation and literature	✓	X	X	✓	Yes	Yes

Identified cultural features and heritage values (including interests)	Context	EP Source				Potential for overlap	
		Consultation Feedback	*First Nations Archaeological Heritage Assessment*	*Ethnographic Heritage Assessment*	*Desktop Literature Assessment*	*Operational Area*	*EMBA*
Whales	Generally raised in consultation Thalu species of totemic importance Linked to songlines and dreaming stories Humpback whales in particular	✓	X	X	X	Likely to occur (whales; Table 4-10)	Known to occur (whales; Table 4-10)
Dolphins	Cultural ceremonies associated with communicating with dolphins	✓	X	X	X	May occur	May occur
Marine turtles	Culturally important species and migration Turtles and turtle eggs as a resource Law run through the sea, including turtles	✓	X	X	✓	Likely to occur (turtles; Table 4-7)	Known to occur (turtles; Table 4-7)
Sea snakes	Culturally important species	✓	X	X	X	Possible	Possible
Fish	Culturally important species Fish as a resource Law run through the sea, including fish There are Thalu ceremonies associated with increasing fish stocks Fish, including sharks and rays raised as a natural environment interest	✓	X	X	✓	Known to occur	Known to occur
Seabirds	Interest only, raised as a natural environment interest as a potential impacted receptor of impacts to water quality	✓	X	X	X	May occur	May occur
Plankton	Interest only, raised as a natural environment interest	✓	X	X	X	Yes	Yes
Water quality	Interest only, raised as a natural environment interest	✓	X	X	X	Yes	Yes

Identified cultural features and heritage values (including interests)	Context	EP Source				Potential for overlap	
		Consultation Feedback	*First Nations Archaeological Heritage Assessment*	*Ethnographic Heritage Assessment*	*Desktop Literature Assessment*	*Operational Area*	*EMBA*
Subtidal soft-bottom communities	Interest only, raised as a natural environment interest regarding invertebrate diversity	✓	X	X	X	Yes	Yes
Marine Park	Interest only; raised in context of decommissioning activities	✓	X	X	X	No	Yes

Further context: Intangible cultural heritage

Intangible cultural heritage have been identified through consultation with First Nations people as culturally important (refer to **Section 4.10.1**). Cultural knowledge, as expressed through songlines, dreaming, dance and other cultural practices, can be associated with tangible objects and physical sites that are culturally important to First Nations people (Ardler 2021; Bursill et al. 2007). Intangible cultural heritage can also be embodied in the practices, representations, expressions, knowledge, uses and skills associated with physical sites (UNESCO 2003). As a result, physical features may have intangible dimensions (ICOMOS 2013).

Songlines

Oral Songlines are often described by First Nations people as the law of the land and make up part of the Dreaming (Neale and Kelly 2020:30). Songlines are viewed in Western academia as a framework for relating people to land and consist of a series of invisible, interconnected routes across the landscape that mark significant sites for First Nations people (Higgins 2021:723). Songlines demonstrate First Nations peoples' strong connections to land by revealing sacred knowledge that is place-specific (Roberts 2023:5). The land's physical features are instrumental in maintaining songlines because this is how ancestral spirits journeyed through, and interacted with, the physical landscape leaving sacred knowledge behind. The interconnection between the physical and spiritual is where songlines become intrinsically tied to significant places across Country. As a result, geographical landforms are recorded within songlines and become sacred places. Such landforms can include inter alia: rocks, mountains, rivers, caves and hills (Higgins 2021:724). Songlines can become lost, fragmented or broken when there is a loss of Country or forced removal from Country (Neale and Kelly 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge.

In Australia, songlines can stretch thousands of kilometres, making up a complex and organic network of stories containing cultural knowledge of First Nations communities across the land (Neale and Kelly 2020:35). Songlines can also extend out to Sea Country and contain cultural knowledge that is tied to geographic features, atmospheric phenomena and marine plants and animals. Often songlines containing references to a seascape or Sea Country make mention of mythical events occurring around marine life, fishing areas, submerged rocks or coral. Songlines that embody seascapes can reflect how a group may relate to, or value, Sea Country—for example connections to nearby islands that they once inhabited in their songlines (Smyth and Isherwood 2016:307). Songlines can also be used as proof of long-standing connection to land and support a legal entitlement to land rights (Higgins 2021:74). Examples where songlines contain strong references to Sea Country are more common in Pacific Islander and Torres Strait Islander communities, who often refer to seascapes and skylines in their songlines in order to communicate sacred knowledge that assists in safe navigation of the ocean (Neale and Kelly 2020:83-84).

The routes of any songlines in the EMBA have not been provided by Traditional Custodians through consultation.

Creation/Dreaming Sites, Sacred Sites and Ancestral Beings

The only sources located by Woodside with detailed descriptions of the location ancestral beings or creation/dreaming/sacred sites placed these on land or within inland water sources such as rivers or pools. However, some ancestral beings are noted to live within or originate from the sea generally, and some creation stories talk to the creation of features from or in the sea. Additionally, every place on shore or at sea must be assumed to have been created on some level in First Nations cosmology.

Cultural Obligations to Care for Country

Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. In the literature reviewed by Woodside, caring for Country was noted to include, but is not limited to,

maintenance of the physical environment and ecosystem. It may also have cultural, spiritual and ritual dimensions such as caring for ancestral beings or ensuring cultural safety. Thalu are places where increase ceremonies are performed to enhance or maintain populations of plants, animals or phenomena. All mentions of active ceremonial sites were confined to onshore locations, though the values may extend offshore where e.g., a thalu relates to marine species populations.

Knowledge of Country/Customary Law and Transfer of Knowledge

Knowledge of and familiarity with the features of Sea Country is itself a value. The inherent potential for restricted or secret knowledge makes this difficult to assess even through consultation with Traditional Custodians. However, aspects such as limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge. Further, connection to Country may be damaged where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge (McDonald and Phillips, 2021).

Transfer of knowledge includes continuing traditional practices to pass on practical skills. This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

Connection to Country

Connection to Country describes the multi-faceted relationship between First nations people and the landscape, which is envisioned as having personhood and spirit. It is also an aspect of personal identity for many First nations people. In the case of Sea Country this can mean identifying as a Saltwater person, where "essence of being a 'Saltwater' person is ontological… it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people" (McDonald and Phillips, 2021).

Access to Country

Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Being on Country can be an important way of expressing or maintaining connection to Country (Australian Indigenous HealthInfoNet n.d.). Access is also a value in its own right, as a continuation of traditional Sea Country access and use.

Kinship Systems and Totemic Species

Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). Kinship arises from totemic associations within First Nations "skin group" systems. It is forbidden for an individual to kill or eat a species who is from the same "skin group" (Juluwarlu 2004). They may also have certain obligations linked to the discussion of caring for Country below. It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu 2004).

Resource Collection

A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations.

Further Context: Marine Ecosystems and Species

Marine Mammals

Whales, and in particular humpback whales, have been identified through consultation with First Nations people as culturally important species, with totemic importance including their populations, biodiversity, and migration patterns. Cultural ceremonies associated with communicating with dolphins have also been raised by MAC through consultation.

Whale symbology expressed through stories, music, and dance can reflect a group's connections with the sea, as well as marine fauna, which then comprise a group's cultural values (Ardler 2021; Bursill et al. 2007; Cressey 1998). Whales also speak to a broader connection that exists between First Nation people and their surrounding environment. Beyond mythology and symbolism, whales can be connected with various economic and social functions associated with everyday life. Cultural knowledge of whales, whale migration, behaviour and the related marine environment may all be important in ensuring the continuation of these socio-economic functions and other related activities that remain valuable to First Nations people (Fijn 2021:47).

Details pertaining to whales and dolphins, their distribution, migration patterns and populations are described in **Section 4.6.3**, with further details in **Appendix C** (Master Existing Environment).

Marine Reptiles

Turtles and sea snakes have been identified through consultation with First Nations people as culturally important species, with turtles identified as a resource. First Nations people that identify marine reptiles as species of totemic importance or integral to songlines may place high cultural value on their protection. No marine reptiles related songlines have been identified as per **Section 4.10.1.6** that have the potential to interact with the Operational Area or EMBA. Note the only songline related to marine reptiles (turtles) was shared by MAC, and was geographically restricted from Fortescue to Withnell Bay, in Mermaid Sound (MAC 2021 as cited in Woodside 2023a).

Turtle symbology expressed through stories, music, and dance can reflect an individual or group's connections with the sea, as well as marine fauna, and comprise First Nations' cultural values (Ardler 2021; Bursill et al. 2007). Beyond mythology and symbolism, turtles can be connected with various economic and social functions associated with everyday life including hunting and settlement location. Turtles speak to a broader connection that exists between First Nation people and their surrounding environment, including cultural values associated with food security (Delisle et al.2018:250).

Cultural knowledge of turtles at a population level (turtle migration, behaviour and the related marine environment) may all be important in ensuring the continuation of cultural functions and activities that remain valuable to First Nations people (Fijn 2021:47; Delisle et al.2018). Details pertaining to marine reptiles, their distribution, and populations are described in **Section 4.6.2**, with further details in **Appendix C** (Master Existing Environment).

Fish

Fish have been identified through consultation with First Nations people as a culturally important species, with fish generally being identified as a resource.

First Nations may identify cultural values associated with fish species as important to maintaining both tangible (physical cultural sites) and intangible (cultural knowledge) cultural heritage. Tangible cultural heritage associated with fish can include important cultural sites such as midden sites, fish traps and thalu sites. Traditional fish traps require traditional knowledge of the surrounding environment and may involve specialised techniques which have been developed in adaptation to location conditions over time (Fijn 2021:63).

Intangible cultural heritage associated with fish include songlines, dreaming, art, song and dance. Cultural values relating to fish, and other marine fauna, can collectively capture 'Sea Country' which refers to a seascape that Traditional Custodians view, interact with or hold knowledge of. As a result, fish may be culturally value in relationship with broader marine environmental values that are of cultural importance to First Nations people (Smyth 2007).

Details pertaining to fish, sharks and rays are described in **Section 4.6.1**, with further details in **Appendix C** (Master Existing Environment).

Natural Environment Interests

First Nations people have advised through consultation that they have a general interest in environmental management and ecosystem health, including understanding changes in water quality as a result of the Petroleum Activities Program and potential resultant affects on marine species and benthic communities in the Operational Area and EMBA. This includes marine mammals, marine reptiles, fish, seabirds, plankton and subtidal soft bottom communities, which are described in context of their distribution and populations in **Sections 4.5** and **4.6**, with further details in **Appendix C** (Master Existing Environment).

4.10.1.7 Historic Sites of Significance

There are no known sites of historic heritage of significance within the Operational Area. **Appendix H** describes heritage sites within the EMBA.

4.10.1.8 Historic Underwater Heritage

A search of the Australasian Underwater Cultural Heritage Database, which records all known Maritime Cultural Heritage (shipwrecks, aircraft, relics and other underwater cultural heritage) in Australian waters does not contain records of sites within the Operational Area, but does include nine sites within the EMBA. The closest Underwater Cultural Heritage site is the wreck of the *Wild Wave*, a Chinese sailing vessel sunk off the Montebello Islands, approximately 150 km east of the Operational Area.

4.10.1.9 World, National and Commonwealth Heritage Listed Places

No listed World, National and Commonwealth heritage places overlap the Operational Area or EMBA.

4.10.2 Commercial Fisheries

A number of Commonwealth and State fishery management areas are located within the Operational Area and EMBA. The Annual Fishery Status Reports published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) were used to identify if Commonwealth managed fisheries that have fished within the Operational Area in the last 5 years. FishCube data were also requested from the WA Department of Primary Industries and Regional Development (DPIRD) for the most recently available 5-year period of fishery catch and effort data (2018-2022) to analyse the potential for interaction with State managed fisheries within the Operational Area (DPIRD, 2022). Data from Fishcube and ABARES was reviewed from the last 5 years as a subset of past fishing effort. This was deemed an appropriate period to represent potential future fishing effort over the lifecycle of this EP (1 year). In addition, any impacts to fish are expected to be temporary in nature (See Section 6.1 and Section 6.2) and therefore not extending beyond the life of the EP. This information was used to determine relevant fisheries for consultation who may be impacted by proposed petroleum activities. **Table 4-22** provides an assessment of the potential interaction and provides further detail on the fisheries that have been identified through desk-based assessment and consultation (**Section 5**).

Table 4-22: Commonwealth and State Managed Commercial Fisheries Management Areas overlapping the Operational Area and EMBA

Fishery	Potential for interaction × no potential for interaction ✓ potential for interaction		
	Operational Area	**EMBA**	**Description**
Commonwealth Managed Fisheries			
North West Slope Trawl Fishery	×	✓	The North West Slope Trawl Fishery management area overlaps the EMBA. Between one to six vessels have been active in the fishery since 2005. Fishery Status Reports indicate most recent activity inside the EMBA occurred in the 2020-2021 season (Patterson et al., 2021). Fishery Status Reports indicate there has been no activity inside the Operational Area in the last 5 years. Accordingly, Woodside considers it a possibility that interactions with the fishery may occur in the EMBA.
Western Deepwater Trawl Fishery	×	✓	The Western Deepwater Trawl Fishery overlaps the Operational Area and the EMBA. Fishery Status Reports indicate most recent activity overlapping the EMBA occurred in the 2020-2021 season (Patterson et al., 2021). Fishery Status Reports indicate most recent activity overlapping the Operational Area occurred in the 2016 – 2017 season (Patterson et al. 2017). Accordingly, Woodside considers it a possibility that interactions with the fishery may occur in the EMBA.
Western Tuna and Billfish Fishery	×	×	The Western Tuna and Billfish Fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. However, in the last five years (2016 – 2021), fishing effort has concentrated south of Carnarvon (Patterson et al., 2021). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Southern Bluefin Tuna Fishery	×	×	The Southern Bluefin Tuna Fishery spans the Australian Fishing Zone, however since 1992, the majority of Australian catch has concentrated in south-eastern Australia. (Patterson et al., 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Western Skipjack Tuna Fishery	×	×	The Western Skipjack Tuna Fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is not currently active and no fishing has occurred since 2009 (Patterson et al., 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
State Managed Fisheries			
Pilbara Line Fishery	×	✓	The Pilbara Line Fishery licensees are permitted to operate anywhere within Pilbara waters (Newman et al., 2021), overlapping the Operational Area and EMBA. The fishery is active in the EMBA, with one 60 NM Catch and Effort System (CAES) block reporting up to four licences across the 2017 – 2022 seasons (DPIRD, 2022). FishCube data is not available at the 10 NM CAEs block scale for this fishery (DPIRD, 2022). Accordingly, Woodside considers it a possibility that interactions with the fishery may occur within the EMBA.
Marine Aquarium Fish Managed Fishery	×	✓	The Marine Aquarium Fish Managed Fishery management area overlaps the Operational Area and EMBA, however generally collects fish for display in water depths of less than 30 m. The fishery is active in the EMBA, with one 60 NM CAES block reporting less than three licences across the 2017 – 2021 seasons (DPIRD, 2022). FishCube data reported no active fisheries at 10 NM CAES block overlapping the Operational Area (DPIRD, 2022). Woodside considers it a possibility that interactions with the fishery and the Petroleum Activities Program may occur in the EMBA.

Fishery	Potential for interaction × no potential for interaction ✓ potential for interaction		
	Operational Area	**EMBA**	**Description**
West Coast Deep Sea Crustacean Managed Fishery	×	✓	The West Coast Deep Sea Crustacean Managed Fishery is permitted to fish in waters deeper than the 150 m isobath, overlapping the Operational Area and EMBA. The fishery is active in the EMBA with two 60NM CAES blocks overlapping the EMBA reported less than 3 vessels in the 2021 – 2022 seasons (DPIRD, 2022). FishCube data reported no fishing effort at 10 NM CAES blocks in the last five years overlapping the Operational Area (DPIRD, 2022). Woodside considers there to be potential for interaction with the fishery in the EMBA.
Mackerel Managed Fishery (Areas 2 and 3)	×	✓	The Mackerel Managed Fishery overlaps the Operational Area and EMBA. FishCube data reported active fishing by up to three vessels in one CAES block between the 2017 – 2022 seasons (DPIRD, 2022). FishCube data reported no fishing effort at 10 NM CAES blocks in the last five years overlapping the Operational Area (DPIRD, 2022). Accordingly, Woodside considers there to be potential for interaction with the fishery in the EMBA.
Pilbara Crab Managed Fishery	×	×	The Pilbara Crab Managed Fishery management area overlaps the Operational Area and EMBA. However, FishCube data reported no fishing effort within the Operational Area or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
West Coast Rock Lobster Fishery	×	×	The Western Rock Lobster Fishery management area overlaps the EMBA (DPIRD, 2022). However, FishCube data reported no fishing effort within the Operational Area or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program (DPIRD, 2022).
South West Coast Salmon Managed Fishery	×	×	The South West Coast Salmon Fishery management area overlaps the Operational Area and EMBA. However, FishCube data reported no fishing effort within the Operational Area or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Pearl Oyster Managed Fishery	×	×	The Pearl Oyster Managed Fishery management area overlaps the EMBA (DPIRD, 2022). However, FishCube data reported no fishing effort within the Operational Area or EMBA in the last five years (2017 – 2022) (DPIRD, 2022). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program (DPIRD, 2022).
Charter based commercial operators			
Tour Operators	×	✓	Fishing Tour Operators are permitted to operate across WA state waters and are required to report monthly logbook records of client fish catches. FishCube data reports consistent fishing effort across three 60 NM CAES blocks that overlap the EMBA (DPIRD, 2022). Fishing effort was reported by up to 17 vessels across the 2017 – 2022 seasons (DPIRD, 2022). FishCube data reported no active tour operators at 10 NM CAES blocks overlapping the Operational Area in the last 5 years (DPIRD, 2022). FishCube data indicate tour operator fishing effort highest around Ningaloo and Murion Islands and at Barrow Island and the Montebello Islands, east of the EMBA. Accordingly, Woodside considers it a possibility that interactions with tour operators will occur within the EMBA.

4.10.3 Traditional Fisheries

There are no traditional, or customary, fisheries within the Operational Area, as these are typically restricted to shallow coastal waters and/or areas with structures such as reefs. However, it is recognised that Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef and the adjacent foreshores have a known history of fishing when areas were occupied (as from historical records). Areas that are covered by registered native title claims are likely to practice Aboriginal fishing techniques at various sections of the WA coastline.

4.10.4 Tourism and Recreation

Current FishCube data (2018- 2022) indicates that no tour operators use the waters within the Operational Area (DPIRD, 2022). The Operational Area is considered too far offshore for recreational fishing or tourism activities to occur. Additionally, the wider EMBA does not overlap with any recognised tourism or recreational areas, however, it is adjacent to the Montebello Islands (200 km east of the Operational Area), where fishing, surfing, snorkelling and diving activities occur year round.

It is acknowledged that there are growing tourism and recreational sectors in WA. These sectors have expanded in area over the last couple of decades. Potential for growth and further expansion in tourism and recreational activities in the Pilbara and Gascoyne regions is recognised, particularly with the development of regional centres and a workforce associated with the resources sector (Gascoyne Development Commission, 2012).

4.10.5 Oil and Gas

The Operational Area is situated within a region of established oil and gas operations, with additional infrastructure in the broader North West Shelf region.

There are no oil and gas facilities owned or operated by other petroleum titleholders located within 50 km of the Operational Area (**Figure 4-15**). **Appendix H** describes current oil and gas development within the EMBA.

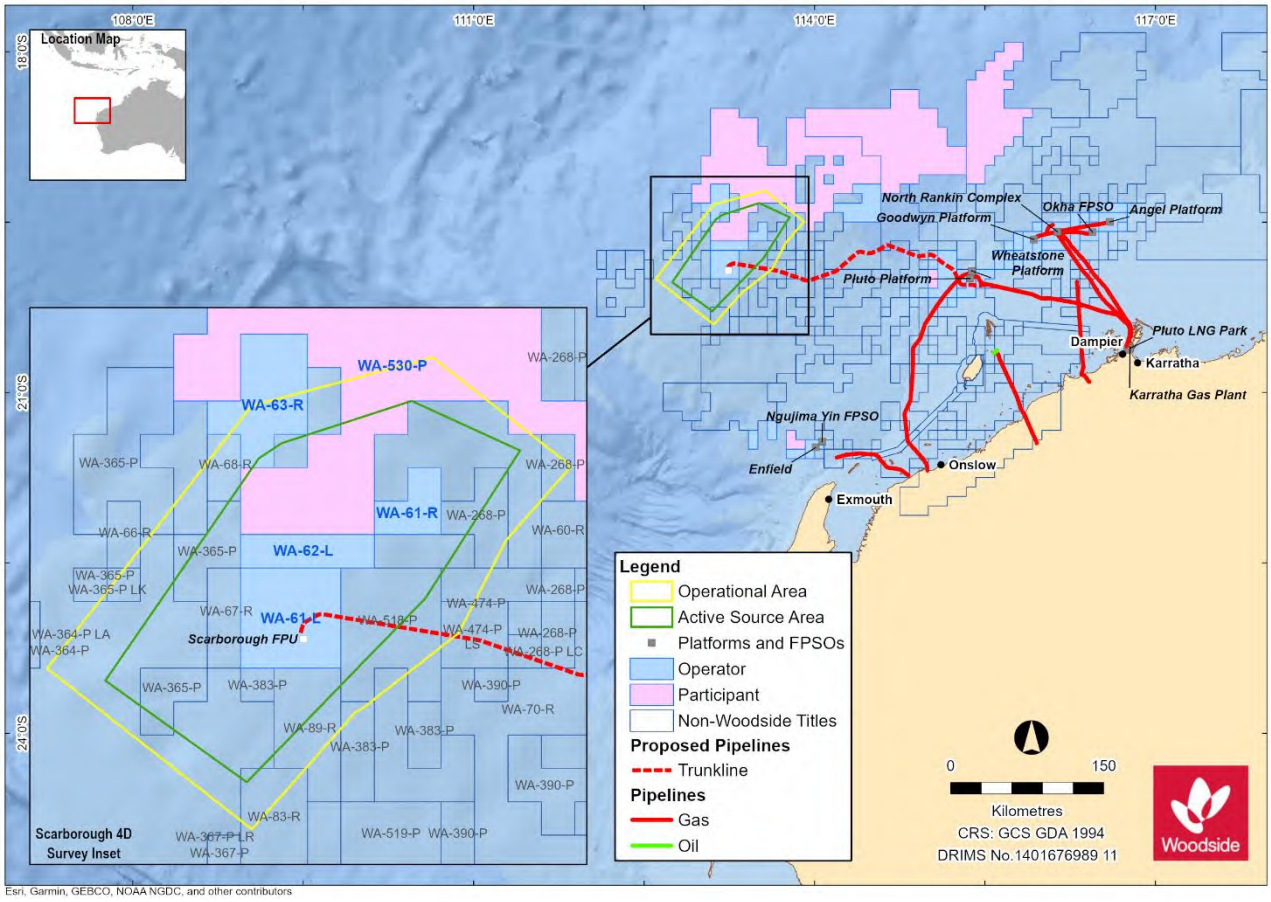


Figure 4-15: Oil and gas Infrastructure in relation to the Operational Area

4.10.6 Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of shipping fairways across the NWMR off WA to reduce the risk of vessel collisions with offshore infrastructure. It is noted that none of these fairways intersect with the Active Source Area; the nearest fairway intersects the north-east corner of the Operational Area (**Figure 4-16**). Vessel tracking data suggest shipping traffic is concentrated within or close to the fairway in the north-east of the Operational Area and is mostly associated with international vessel movements between Australia and Asia.

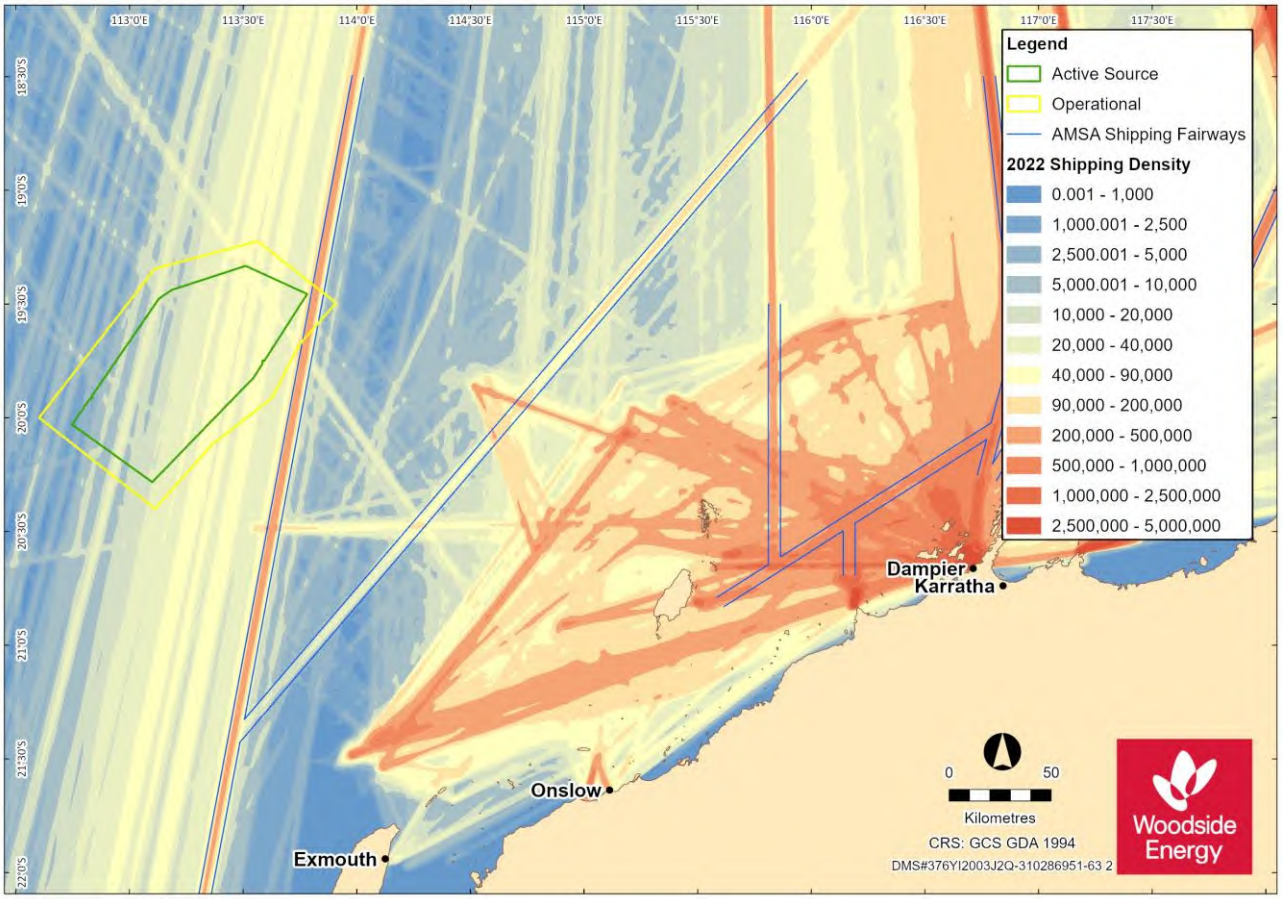


Figure 4-16: Vessel density map for the Operational Area, derived from AMSA satellite tracking system data (vessels include cargo, LNG tanker, passenger vessels, support vessels, and others/unnamed vessels)

4.10.7 Defence

There are designated defence practice and training areas in the offshore marine waters off Ningaloo and the North-west Cape in the EMBA. The Operational Area lies within the northern tip of one of these defence training areas, the North West Exercise Area (NWXA) accessed by Royal Australian Air Force (RAAF) Base Learmonth (**Figure 4-17**). The Learmonth Air Weapons Range (AWR) practice area is located approximately 20 km south of the Operational Area. The closest site where unexploded ordnance is known to occur is 20 km north-west of Bessieres Island, located approximately 190 km from the Operational Area, and outside of the EMBA. Defence areas overlapping the Operational Area are presented in **Figure 4-17**.

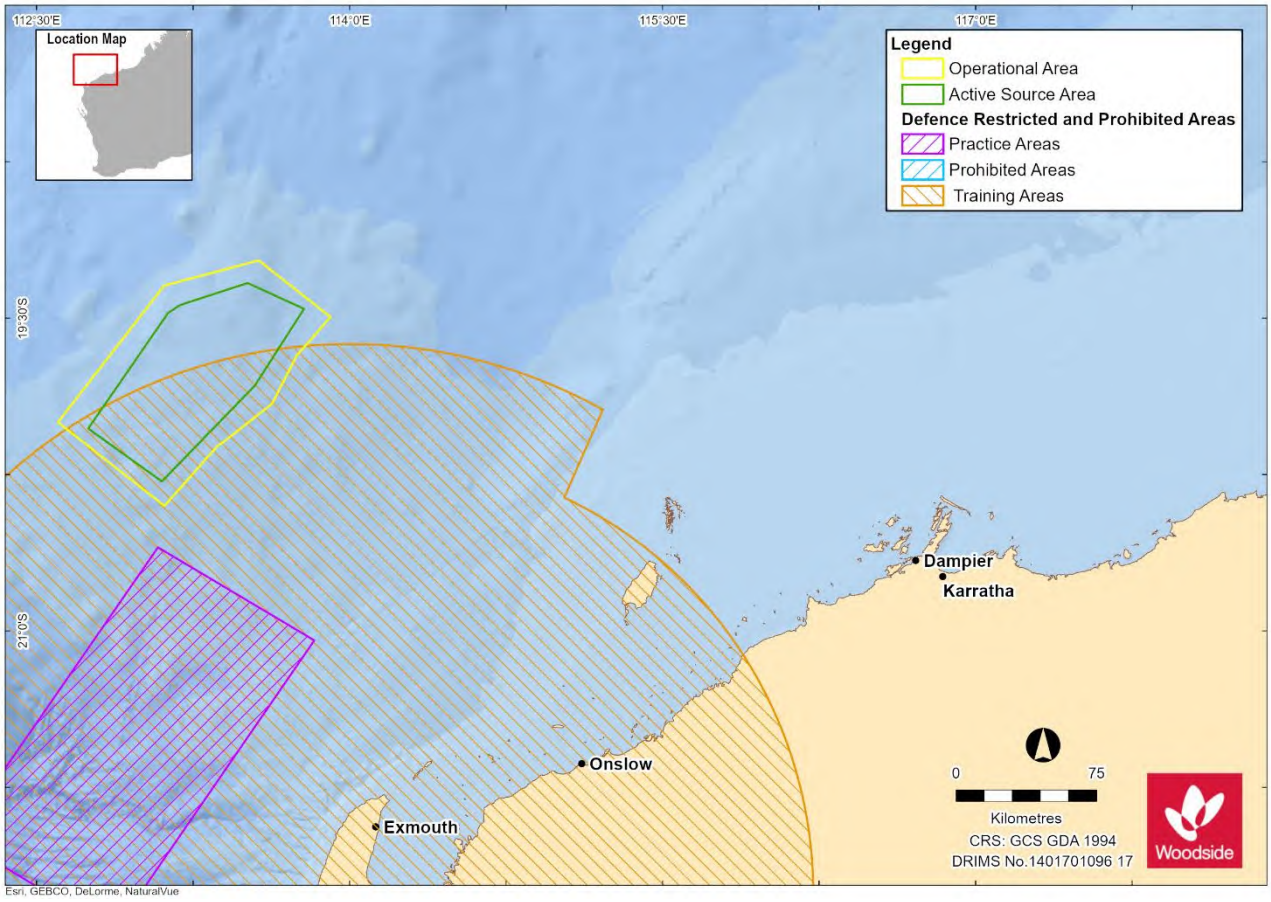


Figure 4-17: Defence areas overlapping and adjacent to the Operational Area

5 Consultation

5.1 Summary

Woodside consults relevant persons in the course of preparing an Environment Plan in accordance with regulation 11A of the Environment Regulations. Woodside acknowledges that consultation is designed to ensure that relevant persons are identified and given sufficient information and a reasonable period to allow them to make an informed assessment of the possible consequences of the proposed activity on them and, to ensure that titleholders can consider and adopt appropriate measures in response to the matters raised by relevant persons. Consistent with regulation 3 of the Environment Regulations, consultation also supports Woodside's objective to ensure that the environmental impacts and risks of the activity are reduced to ALARP and an acceptable level.

Woodside acknowledges that a titleholder's approach to consultation must be informed by both the Environment Regulations and the findings of the Full Federal Court in the *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (Tipakalippa Appeal) (see **Section 5.2** and **5.5.1**) delivered on 2 December 2022.

For this PAP, Woodside has considered both the Operational Area and the broader EMBA in undertaking consultation (see further discussion in **Section 5.2**). The broadest extent of the EMBA has been determined by reference to the highly unlikely event of a hydrocarbon release resulting from the PAP (see **Section 4**).

Woodside's consultation methodology is divided into three parts:

- The first section (Section 5.2 to 5.7) provides an overview of Woodside's consultation methodology for its Environment Plans, including how we apply regulation 11A(1) of the Environment Regulations to identify relevant persons.
- The second section (Section 5.8) explains Woodside's application of the consultation methodology and Woodside's assessment of relevant persons for this Environment Plan.
- The third section (Section 5.9) details the:
    - Opportunities provided to persons or organisations to be aware of Woodside's proposed Environment Plan and participate in consultation, including individual Traditional Custodians.
    - Consultation information provided to relevant persons, feedback received and Woodside's assessment of the merits of objections or claims.
    - Engagement with persons or organisations that Woodside chose to contact who are not relevant persons for the purposes of regulation 11A(1) of the Environment Regulations (see Section 5.3.4).

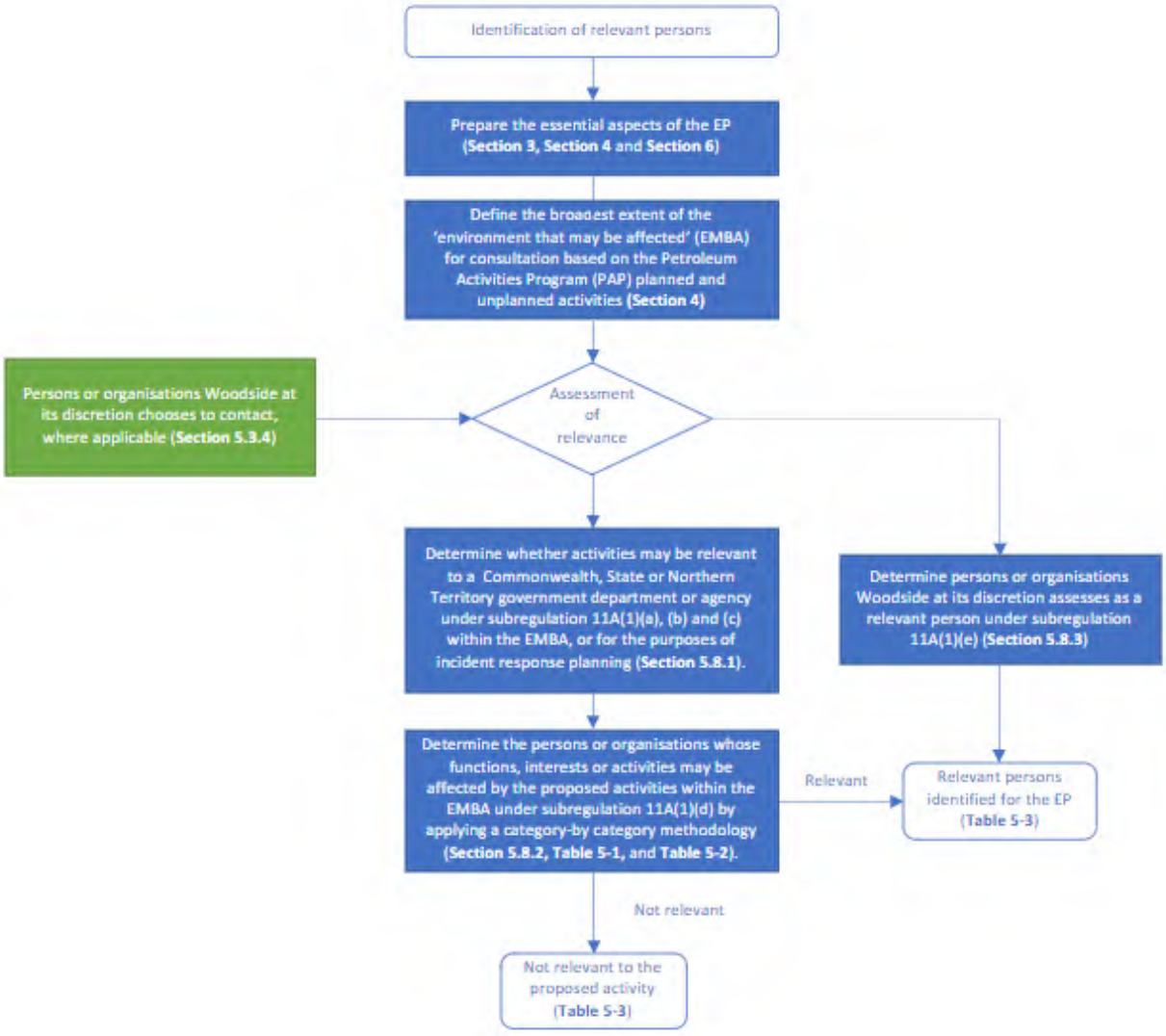


Figure 5-1: Overview of Woodside's methodology to identify relevant persons

5.2 Consultation – General Context

Woodside has a portfolio of quality oil and gas assets and more than 30 years of operating experience. We have a strong history of working with local communities, the relevant regulators and a broad range of persons and organisations to understand the potential risks and impacts from our proposed activities and to develop appropriate measures to manage them.

The length of time that we have operated in Commonwealth and State waters, and the history of continued engagement with a wide range of persons and organisations enables Woodside to develop an extensive consultation list to inform its consultation process. This consultation list is not used as a definitive list of persons to consult, but rather, assists Woodside as an input to its understanding of relevant persons with whom to consult on a proposed petroleum activity. The information in the consultation list has been captured from years of experience, it contains insights relating to the type of information particular persons or organisations want to receive during consultation, the appropriate method of consultation for relevant persons and includes appropriate contact details, which are reviewed and updated periodically.

Woodside acknowledges NOPSEMA's Guideline on *Consultation in the course of preparing an environment plan* (12 May 2023) as well as recent judicial guidance in the Tipakalippa Appeal on the intent of consultation as follows:

- At paragraph 54 of the appeal decision: … provide a basis for NOPSEMA's considerations of the measures, if any, that a titleholder proposes to take or has taken to lessen or avoid the deleterious effect of its proposed activity on the environment, as expansively defined.
- At paragraph 89 of the appeal decision: …its purpose is to ensure that the titleholder has ascertained, understood and addressed all the environmental impacts and risks that might arise from its proposed activity. Consultation facilitates this outcome because it gives the titleholder an opportunity to receive information that it might not otherwise have received from others affected by its proposed activity. Consultation enables the titleholder to better understand how others with an objective stake in the environment in which it proposes to pursue the activity perceive those environmental impacts and risks. As the Regulations expressly contemplate, it enables the titleholder to refine or change the measures it proposes to address those impacts and risks by taking into account the information acquired through the consultations. Objectively, the scheme intends that this is likely to improve the minimisation of environmental impacts and risks from the activity.

The Tipakalippa Appeal has also been further considered in the context of specific methods for consultation with First Nations relevant persons (**Section 5.5.1**).

In order to undertake consultation, Woodside has developed a methodology for identifying relevant persons, in accordance with regulation 11A(1) of the Environment Regulations (**Section 5.3**) This methodology reflects NOPSEMA's recent guideline and demonstrates that, in order to meet the requirements of regulation 10A (criteria for Environment Plan acceptance) when preparing the Environment Plan, Woodside understands:

- our planned activities in the Operational Area, being the area in which our planned activities are proposed to occur (see Section 3.3.2); and
- the geographical extent to which the environment may be affected (EMBA) by risks and impacts from our activities (unplanned) (identified in Section 4.1 and assessed in Section 6.7).

Woodside has undertaken consultation in the course of preparing this Environment Plan in compliance with regulation 11A of the Environment Regulations, which requires a titleholder to:

- consult with each of the following (a relevant person) in the course of preparing an Environment Plan:
  - each Department or agency of the Commonwealth to which the activities to be carried out under the Environment Plan, or the revision of the Environment Plan, may be relevant;
  - each Department or agency of a State or the Northern Territory to which the activities to be carried out under the Environment Plan, or the revision of the Environment Plan, may be relevant;
  - the Department of the responsible State Minister, or the responsible Northern Territory Minister;
  - a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan, or the revision of the Environment Plan; and
  - any other person or organisation that the titleholder considers relevant (regulation 11A(1).
- give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the their functions, interests or activities (regulation 11A(1)(2));

- allow a relevant person a reasonable period for the consultation (regulation 11A(1)(3)); and
- tell each relevant person that the titleholder consults with that the relevant person may request that particular information it provides in the consultation not be published and any information subject to such a request is not to be published (regulation 11A(1)(4)).

Further, Woodside seeks to carry out consultation in a manner that:

- is consistent with the principles of ecologically sustainable development (ESD) set out in section 3A of the EPBC Act – see Section 2;
- is intended to reduce the environmental impacts and risks from the activity to ALARP and an acceptable level;
- seeks to ensure that the environmental impacts and risks of the activity will be of an acceptable level;
- is intended to minimise harm to the relevant person and the environment from the proposed petroleum activities and to enable Woodside to consider measures that may be taken to mitigate the potential adverse environmental impacts that the petroleum activity may otherwise cause;
- is collaborative; Woodside respects that for a relevant person, consultation is voluntary. Where the relevant person seeks to engage, Woodside collaborates with the relevant person with the aim of seeking genuine and meaningful two-way dialogue; and
- provides opportunities for relevant persons to provide feedback throughout the life of the EP through its ongoing consultation process (refer to Section 5.7 and Section 7.10.2.1).

An overview of Woodside's consultation approach is outlined at **Figure 5-2.**

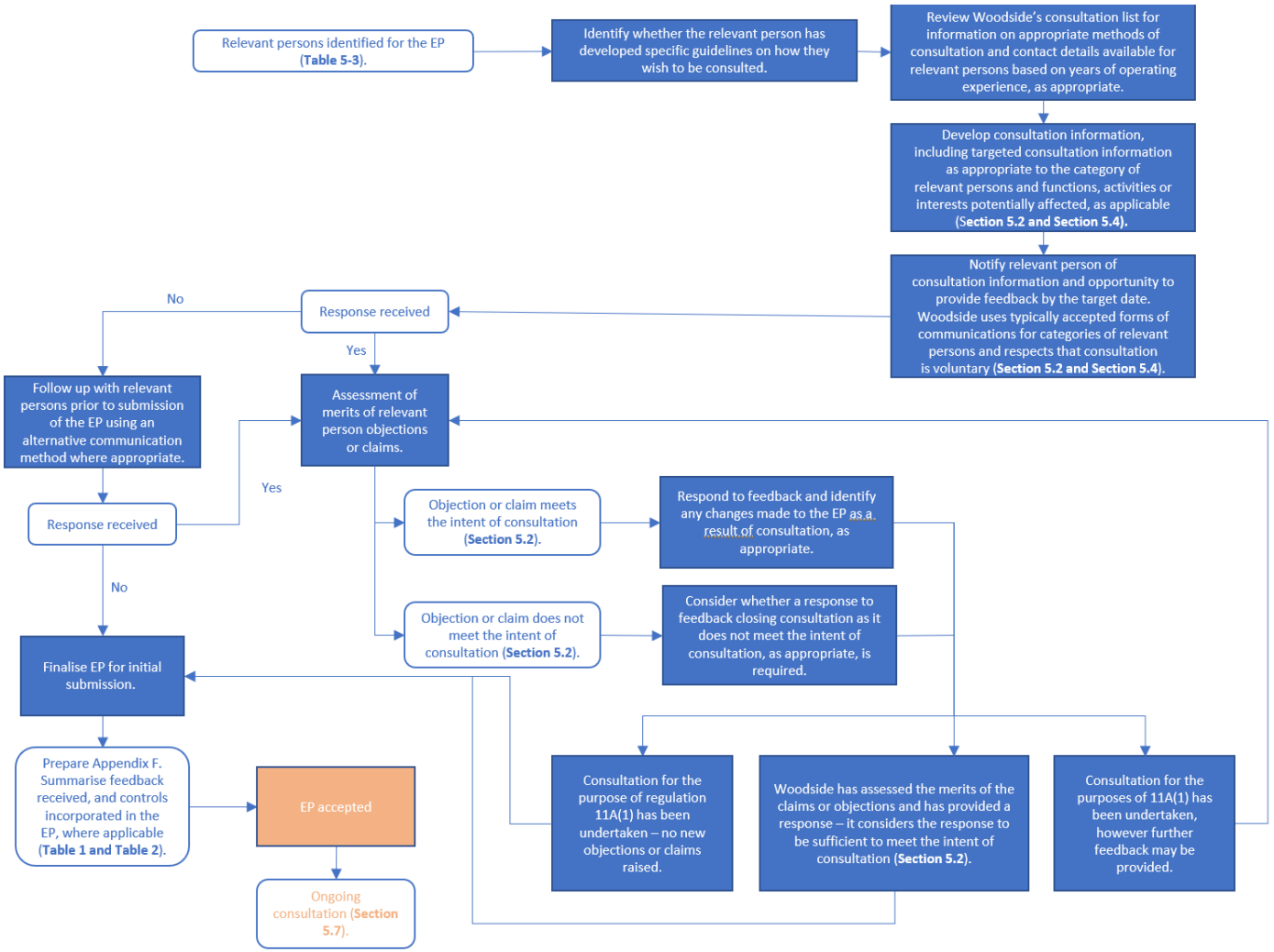


Figure 5-2: Overview of Woodside's consultation approach

The methodology for consultation for this activity has been informed by various guidelines and relevant information for consultation on planned activities, including:

Federal Court:

- Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193

NOPSEMA:

- GL2086 – Consultation in the course of preparing an environment plan – May 2023
- GN1847 - Responding to public comment on environment plans - July 2022
- GN1344 - Environment plan content requirements - September 2020
- GL1721 - Environment plan Decision Making Guideline - December 2022
- GN1488 - Oil pollution risk management - July 2021
- GN1785 – Petroleum activities and Australian Marine Parks – June 2020
- GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023
- PL2098 – Draft Policy for managing gender-restricted information
- Consultation on offshore petroleum environment plans – Information for the community

Department of Climate Change, Energy, the Environment and Water:

- Sea Countries of the North-West; Literature review on Indigenous connection to and uses of the North West Marine Region

Australian Fisheries Management Authority:

- Petroleum industry consultation with the commercial fishing industry

Commonwealth Department of Agriculture and Water Resources:

- Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006
- Offshore Installations Biosecurity Guide

WA Department of Primary Industries and Regional Development:

- Guidance statement for oil and gas industry consultation with the Department of Fisheries

WA Department of Transport:

- Offshore Petroleum Industry Guidance Note

Good practice consultation:

- IAP2 Public Participation Spectrum
- Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Act 1999

5.3 Identification of Relevant Persons for Consultation

5.3.1 Regulations 11A(1)(a), (b) and (c)

The relevant inquiry for determining relevant persons within the description of regulations 11A(1)(a) and (b) is whether the activities to be carried out under the Environment Plan may be relevant to one of the government departments or agencies in those regulations. These government departments

and agencies are listed in **Table 5-3** below. In accordance with regulation 11A(1)(c), Woodside consults with the department of the relevant State Minister, which for this Environment Plan is the Department of Mines, Industry Regulation and Safety (DMIRS).

5.3.2 Regulation 11A(1)(d)

In order to identify a relevant person for the purposes of regulation 11A(1)(d), the meaning of "functions, interests or activities" needs to be understood. In regulation 11A(1)(d), the phrase "functions, interests or activities" should be construed broadly and consistently with the objects of the Environment Regulations (regulation 3) and the objects of the EPBC Act (section 3A).

In developing its methodology for consultation, Woodside acknowledges that the guidance on the definition of functions, interests and activities is as follows in accordance with NOPSEMA's *GL2086 – Consultation in the course of preparing an environment plan* guideline (May 2023):

Functions	Refers to a power or duty to do something.
Interests	Conforms to the accepted concept of 'interest' in other areas of public administrative law and includes any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation.
Activities	Broader than the definition of 'activity' in Regulation 4 of the Environment Regulations and is likely to be directed to what the relevant person is already doing.

As discussed in **Section 5** and **Section 5.2**, Woodside's methodology for determining 'relevant persons' for the purpose of regulation 11A(1)(d) of the Environment Regulations includes consideration of:

whether a person or organisation has functions interests or activities that overlap with the Operational Area and EMBA; and

whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities.

5.3.3 Regulation 11A(1)(e)

In addition to assessing relevance under regulation11 A(1)(d), Woodside has discretion to categorise any other person or organisation as a relevant person under regulation11A(1)(e).

5.3.4 Persons or Organisations Woodside Chooses to Contact

In addition to undertaking consultation with relevant persons under regulation11A(1) there are persons or organisations that Woodside chooses to contact, from time to time, in relation to a proposed activity. For example, these are persons or organisations:

- that are 'not relevant' pursuant to regulation 11A(1) but that Woodside has chosen to seek additional guidance from, for example, to inform the correct contact person that Woodside should consult, or engage with;
- that are 'not relevant' pursuant to regulation 11A(1) but have been contacted as a result of consultation requirements changing or updated guidance from the Regulator; and
- where it is unclear what their functions, interests or activities are, or whether their functions, interests or activities may be affected. In this circumstance, engagement is required to inform relevance under Woodside's methodology. Woodside follows the same methodology for

assessing a person or organisation's relevance as it does during its initial assessment (as described in Figure 5-1 and Section 5.8. The result of Woodside's assessment of relevance during the development of the Environment Plan is outlined at Table 5-3.

Engagement undertaken with persons or organisations Woodside assessed as not relevant but chose to contact are summarised at **Appendix F, Table 2**.

5.4 Consultation Material and Timing

Regulation 11A(2) provides that a titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person. Regulation 11A(3) provides that the titleholder must allow a relevant person a reasonable period for the consultation.

As set out in **Section 5.2**, Woodside notifies relevant persons, of the proposed activities, respecting that consultation is voluntary (for the relevant person) and collaborates on a consultation approach where further engagement is sought by the relevant person. Woodside understands that the consultation process should be appropriate for the category of relevant persons and that not all persons or organisations will require the same level of engagement. Woodside recognises that the level of engagement is dependent on the nature and scale of the PAP. Woodside recognises published guidance for good practice consultation relevant to different sectors and disciplines (see **Section 5.2**). Woodside's methodology for providing relevant persons with sufficient information as well as a reasonable period of time to provide feedback is set out in this section.

5.4.1 Sufficient Information

Woodside produces a Consultation Information Sheet for each Environment Plan (**Appendix F, reference 1.1**). This is provided to relevant persons and organisations and is also available on Woodside's website for interested parties to access and to provide feedback on. The Consultation Information Sheet typically includes a description of the proposed petroleum activity, the Operational Area where the activity will take place, the timing and duration of the activity, a location map of the Operational Area and EMBA, a description of the EMBA, relevant exclusion zones as well as a summary of relevant risks and mitigation and/or management control measures relevant to the proposed petroleum activity. It also sets out contact details to provide feedback to Woodside.

Woodside recognises that the level of information necessary to assist a person or organisation to understand the impacts of the proposed activity on their functions, interests or activities may vary and, also may depend on the degree to which a relevant person is affected. For example, Woodside considers that relevant persons who may be impacted by planned activities in the Operational Area, for example as a result of temporary displacement due to exclusion zones, may require more targeted information relevant to their functions, interests or activities. Woodside also acknowledges NOPSEMA's brochure entitled *Consultation on offshore petroleum environment plans information for the community*, which advises consultees that they may inform titleholders that they only want to be consulted in the very unlikely event of an oil spill.

Woodside places advertisements in a selected local, state and national newspaper. This typically includes the name of the Environment Plan Woodside is seeking feedback on, an overview of the activity, the consultation feedback date and the ways in which a person or organisation can provide feedback. Advertising in the local paper in the area of the activity is also consistent with the public notification process under section 66 of the *Native Title Act* for native title applications. Woodside typically aligns advertisement feedback timeframes with the timing described below. Feedback received is assessed in accordance with **Section 5.8** to determine relevance and evidenced in **Appendix F, Table 1** as appropriate.

Woodside utilises a range of tools to provide sufficient information to relevant persons, which may include one or more of the following:

- Consultation Information Sheet available on Woodside's website;

- Summary Consultation Information Sheet, presentations or summaries specific to a particular relevant person group;
- subscription (available on Woodside's website) to receive notification of new Consultation Information Sheets for Woodside Environment Plans;
- emails;
- letters;
- phone calls;
- face-to-face meetings (virtual or in person) with presentation slides or handouts as appropriate;
- maps outlining a persons or organisations defined area of responsibility in relation to the proposed activity, for example a fisheries management area or defence training area; and
- community meetings, as appropriate.

Woodside recognises that information may need to be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that in line with the intent of consultation (see **Section 5.2**), the threshold for genuine two-way engagement is met via information on incorporation of controls, where applicable, being provided to the relevant person to ensure the relevant persons understands how their input has been considered in the development of the Environment Plan.

Woodside communicates with relevant persons in different ways. Woodside recognises that as part of genuine two-way dialogue, these forms of communication may evolve, including for example due to changes to organisation representation, as relationships are further established, or an alternative form of communication is expressed by a person or organisation. Woodside acknowledges that there might be limitations in how it can consult with relevant persons.

Typical forms of communications for categories of relevant persons are set out below.

Category of relevant person	Typically accepted form of communication
Government departments / agencies – marine **Government departments / agencies – environment** **Government departments / agencies – industry**	Woodside applies NOPSEMA's guideline for engagement with Commonwealth government departments or agencies in line with *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023* by using email for its consultation unless another form of communication is requested. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Commercial fisheries and peak representative bodies **Recreational marine users and peak representative bodies**	**Commonwealth commercial fisheries:** Email is used as the primary form of communication with Commonwealth commercial fisheries in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. **State commercial fisheries and recreational marine users:** The Western Australian Department of Primary Industries and Regional Development (DPIRD) has responsibility for managing the *Fish Resources Management Act 1994* and *Aquatic Resources Management Act 2016*, which limits the provision of contact details from the register to the name and business address of licence holders. Alternative forms of communication are at the licence holder's discretion. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested. **Peak representative bodies:** Email is used as the primary form of communication with commercial fishery and recreational marine user peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Titleholders and Operators	Email is used as the primary form of communication between titleholders and operators in the ordinary course of business. Other forms of communication, such

	as phone calls, and meetings and/or presentation briefings are used where requested.
Peak industry representative bodies	Email is used as the primary form of communication with peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Traditional Custodians and nominated representative corporations	The forms of communication that Woodside engages in are often bespoke and applied on a case-by-case basis and as appropriate to, or as requested by the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used where requested.
Native Title Representative Bodies	The forms of communication that Woodside engages in are often bespoke and applied on a case-by-case basis and as appropriate to the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used where requested.
Historical heritage groups or organisations	NOPSEMA's guideline (*GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023*) for engagement with government departments or agencies is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Local government and recognised local community reference/liaison groups or organisations	**Local government:** NOPSEMA's guideline (*GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023*) for engagement with local government is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations. **Community reference/liaison groups and chambers of commerce:** Email is used as the primary form of communication with local community reference/liaison groups or organisations in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Other non-government groups or organisations	Email is used as the primary form of communication with Other non-government groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.
Research Institutes and Local conservation groups or organisations	Email is used as the primary form of communication with research institutes and local conservation groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used where requested.

Information which is provided to relevant persons for the purposes of consultation on this Environment Plan is summarised at **Appendix F, Table 1.**

Appendix F, Table 2 sets out the information which is provided to persons or organisations that are not relevant for the purposes of regulation 11A but which Woodside has chosen to contact (see **Section 5.3.4**).

When engaging in consultation, Woodside notifies relevant persons that, in accordance with regulation 11A(4), the relevant person may request that particular information the person or organisation provides in the consultation not be published and that information subject to that request will not be published.

5.4.2 Reasonable Period for Consultation

Woodside seeks to consult in order to support preparation of its Environment Plan. Woodside recognises that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale and complexity of the activity.

Woodside recognises that information may need to be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that in line with the intent of

consultation (see **Section 5.2**), the threshold for genuine two-way engagement is met via engagement on incorporation of controls, where applicable, being provided to the relevant person so that the relevant person understands how their input has been considered in the development of the Environment Plan.

Woodside has allowed a reasonable period for relevant persons, including Traditional Custodian relevant persons, to participate in consultation for this Environment Plan. The consultation period for this Environment Plan spans almost 2.5 years, from initial commencement of Woodside's consultation period in May 2021, after which NOPSEMA conducted a public comment period in October 2021, to submission of this Environment Plan, in October 2023.

The consultation period under this Environment Plan greatly exceeds benchmark periods under other relevant legislative processes:

- Consultation under Regulation 11B of the Regulations sets out a public consultation period of 30 days.
- The Department of Mines and Petroleum "Guidelines for Consultation with Indigenous People by Mineral Explorers" directs a period of 21- 30 days of consultation with traditional owners.
- Guidance taken from the Aboriginal Cultural Heritage Act 2021—Consultation Guidelines (Government of Western Australia, 2023) suggests that up to 12 weeks may be a reasonable period of time to allow identification, contact, and response, from First Nations peoples (subject to any alternative timeframe being agreed through co-design of consultation).

This extended period of consultation demonstrates that Woodside has provided a "reasonable period" for consultation in accordance with regulation 11A(3). Commentary in the *Tipakalippa Appeal* judgment limits consultation to a process that must be capable of being discharged within a reasonable time:

"it must be taken to be the regulatory intention that the consultation requirement cannot be one that is incapable of being complied with within a reasonable time..."[11]

Woodside seeks feedback in order to support preparation of its Environment Plan. What constitutes a reasonable period for consultation is considered on a case-by-case basis, with reference to the person being consulted and the nature, scale and complexity of the activity.

Woodside's typical approach is as follows:

- advertising in selected local, state and national newspapers (see Appendix F, reference 2.1) to give persons or organisations the opportunity to understand the activity and identify whether their functions, interests or activities may be affected;
- providing consultation materials directly to identified relevant persons as well as persons who are not relevant but Woodside chose to contact (see Section 5.3.4), and providing a target date for feedback. Woodside acknowledges that feedback may be received from relevant persons following the target date;
- acknowledging that the way in which Woodside provides consultation information may vary depending on the relevant person or organisation and, may depend on the degree to which a relevant person or organisation is affected. Different consultation processes may be required for relevant persons and organisations depending on the information requirements;
- following up with relevant persons prior to Environment Plan submission. Where possible, Woodside will endeavour to use an alternative method of communication to contact the relevant person; and

[11] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [136].

- engaging in two-way dialogue with relevant persons or organisations where feedback is received.

Appendix F, Table 1 and Table 2 sets out a history of consultation and demonstrates that a reasonable period of consultation has been afforded for each relevant person.

Woodside considers that the "reasonable period" of consultation for this Environment Plan has been provided and the consultation under regulation 11A is complete.

As detailed in **Section 5.7** and **Section 7.7**, if comments and feedback are received after the Environment Plan has been submitted, Woodside will consider those comments and update controls as appropriate, at all stages during the life of the Environment Plan, as per Woodside's ongoing consultation approach.

5.4.3 Discharge of Regulation 11A

The Full Federal Court made clear in the Tipakalippa Appeal that consultation should be approached in a "*reasonable", "pragmatic" and "not so literal"* way, so that consultation obligations were capable of being met by titleholders (**Section 5.5.1**).[12] Consultation is a "real world activity" and must be capable of reasonable discharge.[13] The Full Federal Court referred to Native Title cases as an illustration that reasonable limits should be applied to consultation efforts to ensure the process is workable.[14]

When the titleholder demonstrates that it has provided sufficient information and a reasonable period for consultation, the regulation 11A consultation requirements are met.[15] Meeting these requirements is the evaluative judgment to determine reasonable satisfaction of the consultation obligation, and as such, the regulator uses its discretion to determine if these criteria are met. The nature of the person being consulted, and their function, interest and activity that may be affected, will inform the manner of consultation and the reasonable period to be afforded.[16]

The titleholder is not required to obtain consent from a consultee to engage in the activity or confirmation from a consultee that consultation is complete. A titleholder is required to provide an opportunity to consult.

The Federal Court has commented that a "reasonable opportunity" for consultation must be afforded to relevant persons.[17] A reasonable opportunity may not be every opportunity requested and is limited to reasonable opportunities to consult.

Woodside has completed all practicable and reasonable steps to discharge its consultation obligations. Woodside has provided sufficient information and a reasonable period of time to enable relevant persons to make an informed assessment of the possible impacts and risks of the activity on their functions, interests or activities, and sufficient time to provide relevant feedback for Woodside to assess relevant persons' claims and action the assessment and response. Woodside has also provided a reasonable opportunity for relevant persons to engage in genuine two-way dialogue on environmental impacts and concerns.

[12] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 [89], [98], [103]-[104] and [109].

[13] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [89].

[14] *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [96] and [103].

[15] Explanatory Statement, Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023, page 29.

[16] Explanatory Statement, Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023, page 30 and *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [153].

[17] *Cooper v National Offshore Petroleum Safety and Environmental Management Authority (No 2)* [2023] FCA 1158 at paragraph [11]; *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 at [153].

Woodside has discharged its duty under regulation 11A. Woodside considers that consultation under regulation 11A is complete.

Appendix F, Table 1 and Table 2 of this Environment Plan sets out the history of consultation under regulation 11A. To the extent a relevant person says that it has further information to share or claims that consultation under regulation 11A has not completed **Appendix F, Table 1 and Table 2** provide reasons specifically why Woodside considers consultation under regulation 11A has been met in relation to that relevant person.

5.5 Context of Consultation Approach with First Nations

To comply with regulation 11A, Woodside identifies and consults Traditional Custodians whose functions, interests or activities may be affected by the activities under an Environment Plan.

5.5.1 Approach to Methodology − Woodside's Interpretation of Tipakalippa

Woodside has implemented a consultation methodology consistent with regulation 11A and guidance provided in the Tipakalippa Appeal (**Section 5.2**). Woodside's consultation methodology allows for a sufficiently broad capture of Traditional Custodian relevant persons, provides for informed consultation, follows cultural protocols and allows a reasonable opportunity for consultation with Traditional Custodians whose functions, interests and activities may be affected by the activity described in this Environment Plan (**Section 5.5.2.1** to **5.5.2.3.)**

Woodside notes the Full Federal Court discussed several *Native Title Act 1993* (Cth) (**NTA**) cases in response to a submission made in that case that a requirement under regulation 11A to consult "each and every" relevant person would be "unworkable". The reference to native title cases dealt with how decision-making processes under the NTA requiring "all" members of a group to be contacted for communal approval are interpreted by courts in a "reasonable", "pragmatic" and "not so literal" way,[18] and how obligations to consult "each and every" person under regulation 11A should be interpreted in a similarly pragmatic way so that consultation is workable. The reference to NTA authorities was made by analogy:

> "*It can be seen that the terms of [the native title legislation] are somewhat absolute – "all". However, [the native title legislation] has consistently been construed in a way that is not so literal … The cases concerning [the native title legislation] … have reiterated … that [the native title legislation] does not require that "all" of the members of the relevant claim group be involved in the decision. The key question will be whether a reasonable opportunity to participate in the decision-making process has been afforded by the notice for a relevant meeting.*" [19]
>
> "*We consider the authorities in relation to processes under the NTA to be* ***illustrative*** *of how a seemingly rigid statutory obligation to consult persons holding a communal interest may operate in a workable manner*"[20] (emphasis added).
>
> "*there is no definition of what constitutes "consultation for the purpose of ref 11A... A titleholder will need to "demonstrate" to NOPSEMA that what it did constituted consultation appropriate and adapted to the nature of the interests of the relevant persons*"[21] (emphasis added).

[18] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [95], [98], [103]-[104] and [109].
[19] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [98].
[20] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [96].
[21] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [104].

It is clear from the Court's statement in relation to consultation with organisations that a Titleholder will have some decisional choice in identifying which natural person(s) are to be approached, how the information will be given to allow the "relevant person" to assess the possible consequence of the proposed activities on their functions, interests or activities, and how the requisite consultation is undertaken.22 Woodside takes this to mean that consultation is not fixed to a rigid process, and indeed, will need to be adapted so that it is informed by the relevant person or group. Woodside has met its regulation 11A requirements through its consultation methodology (**Section 5.5.2**).

Consistent with the Tipakalippa Appeal, Woodside considers NTA-style “full group” meetings are not the only way for there to be compliance with regulation 11A in relation to Traditional Custodian relevant persons. Nominated representative corporations (such as the Prescribed Bodies Corporates (PBCs) established under the NTA) have a designated role of representing the views of their own member Traditional Custodians. They have established methods for engaging with their own members. Woodside will not undermine the purpose and authority of nominated representative corporations by requiring full group meetings where the nominated representative corporations have not requested engagement of members via full group meetings. We do not consider it appropriate for titleholders to direct or challenge the nominated representative corporations on how to engage with their members.

Woodside’s approach described below demonstrates that sufficient information and a reasonable opportunity is provided to individual Traditional Custodians to provide feedback on Woodside activities beyond the opportunity provided to nominated representative corporations.

5.5.2 Consultation Method

Woodside’s First Nations team has extensive expertise in engaging and working with First Nations organisations and individuals, including having worked within the Commonwealth native title and cultural heritage systems and state and territory cultural heritage and land rights systems, for several decades. The team understands the complexities of making information accessible to groups and individuals and engaging in accordance with First Nations groups’ established channels of communication and methods of consultation. The First Nations team exercises its professional judgement and is deeply respectful of long-standing relationships (where in place) when considering consultation with First Nations groups. The First Nations team’s approach is also informed by the established systems of recognition for First Nations groups and their nominated representative corporations within particular jurisdictions.

For example, the methodology for engaging with First Nations groups in the Northern Territory (not relevant for this EP) tends to centre around engagement through Aboriginal land councils (under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth)) as well as community meetings that target clan groups where they do not have PBCs or other nominated representative corporations to represent them. By contrast, recognition for First Nations groups and their nominated representative corporations in Western Australia falls under the *Native Title Act 1993* (Cth) because the vast majority of the Western Australian coastline is settled under the native title regime. This means that the methodology and process for consultation in Western Australia places greater emphasis on, but is not limited to Native Title Representative Bodies and PBCs.

Native title determinations provide certainty about the appropriate Traditional Custodian groups that have the cultural authority to speak for country adjacent to the EMBA, and also help Woodside to identify Traditional Custodian persons and groups asserting Traditional Custodianship. The Full Court in the Tipakalippa Appeal explicitly endorsed methods of consultation with groups of relevant persons that are appropriate and adapted to the characteristics of groups.[23] Woodside’s consultation

[22] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [47] and [48].

[23] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [95].[104].[153].

methodology is adapted and appropriate to the recognised systems of communal interests in Western Australia.

In Western Australia (relevant for this EP), Woodside has sought to follow the established, effective and respectful means of communication used by Native Title Representative Bodies and nominated representative corporations (including PBCs) with their respective First Nations communities. Woodside follows these processes for the appropriate broad capture of individuals' awareness of our activities, to self-identify (**Section 5.5.2.2),** and to provide feedback to inform the management of environmental impacts and risks.

Using these tools, Woodside communicates information about Environment Plans by:

- advertising in relevant newspapers. This encourages self-identification, by advertising proposed activities widely through newspapers that have national and intra-state circulation, i.e., Koori Mail, National Indigenous Times, The West Australian;
- creating carefully considered Consultation Summary Sheets with information developed by an Indigenous member of the First Nations Team to remove jargon and provide relevant information for people to have informed understandings about the activities;
- direct contact through nominated representative corporations;
- utilising social media (ie. Facebook/Instagram), texts and emails. These mediums are the preferred communication methods used by Traditional Custodians throughout Western Australia and on that basis used by Native Title Representative Bodies and other government agencies and industry, to engage with Traditional Custodians or call meetings. First Nations woman, Professor Bronwyn Castle through 10 years of research found "Social media is an intrinsic part of daily life. The use of Facebook is around 20 per cent higher [among First Nations people] than the national average across all geographical locations" (Social media mob: being Indigenous online, Professor Bronwyn Carlson (2018));
- For ongoing consultation post regulation 11A consultation, Woodside introduced a Program of Ongoing Engagement with Traditional Custodians which sets out the commitment to ongoing engagement and support to care for and manage country, including Sea Country. The program was developed in response to Traditional Custodian feedback;
- Woodside has members of its First Nations team who are based in Karratha and Roebourne and who serve as on-Country points of contact for First Nations organisations and individuals. These team members have broad local knowledge and established, on-the-ground relationships within communities. This helps contribute to positive outcomes including encouraging First Nations attendance and involvement at Woodside's information sessions and Community roadshows. Team members on the ground engage in a great deal of preparatory work including by distributing information and providing notice to the community to support First Nations attendance at information sessions and Community roadshows;
- From the commencement of engagement with Traditional Custodians, Woodside seeks direction on how they prefer to be consulted and has consulted accordingly. Consultation processes that are informed by Traditional Custodians and co-designed on a case-by-case basis and includes their direction as to cultural protocols, structure of consultation and whom to appropriately consult with (such as elders).
- Holding meetings on country at a place and time agreed with the Traditional Custodians and offering and providing financial assistance for meeting expenses (as appropriate);
- Providing information specifically designed to be easily understood, to reach all relevant people, and give a reasonable period of time for those people to make an informed assessment of the possible consequences of the proposed activity on them.

5.5.2.1 Identification of Relevant Persons

In order to undertake consultation, Woodside has developed a methodology for identifying all relevant persons, in accordance with regulation 11A(1) of the Regulations (**Section 5.2** and **5.3**).

Specific to Woodside's approach for identifying relevant Traditional Custodians, Woodside's First Nations Communities Policy and consultation approach is guided by Traditional Custodians by directing consultations through their nominated representative corporation. This has been implemented by Woodside through consultation with a nominated representative corporation where that corporation has advised Woodside that it acts as the representative body for a Traditional Custodian group and has requested that Woodside engage with it as the representative body for that Traditional Custodian group.

Woodside asks nominated representative corporations (such as PBCs) and Native Title Representative Bodies to identify individuals that should be consulted, and enables individuals to self-identify in response to national and local advertising, social media and community engagement opportunities (**Section 5.5.2.3 and 5.9.1).** Where there is a nominated representative corporation for an area, unless directed by the nominated representative corporation, Woodside does not directly approach individuals for consultation, because this has the potential to undermine the role of the nominated representative corporations. Approaching individuals directly is a practice that is no longer considered acceptable because of divisions it has been shown to cause in communities. In addition to asking for the identification of individuals, Woodside also asks nominated representative corporations to distribute consultation information to whomever the nominated representative corporations deem appropriate including members of the nominated representative corporations who are communal rights holders.

Having said this, as set out in further detail in **Section 5.5.2.3** below, individuals are also given the opportunity to self-identify, consult and provide their own feedback on the proposed activity. When approached in this way, Woodside will engage individuals as relevant persons and will also (subject to any confidentiality or cultural restrictions) advise the nominated representative body of the consultation where it relates to cultural values. These methods of consultation are consistent with requirements for notification under the *Native Title Act 1993* (Cth), such as under the future act provisions (section 29), which requires notification of the Native Title Representative Body, the PBC (or nominated representative) and notification through newspapers. The notification process has been selected as a respectful, practical and pragmatic analogue for consultation with First Nations peoples, rather than requiring members to be notified via a formal authorisation process which aims to seek, from members, authorisation of agreements and native title/compensation claims under the Native Title Act 1993 (Cth)[24].

In this consultation, Woodside requested nominated representative corporations to identify any potential individual relevant persons for consultation, and to distribute consultation materials to their members. However, Woodside recognises that the process is voluntary and that it cannot compel nominated representative corporations (such as PBCs) to do so. Woodside also recognises that it would not be appropriate to seek to audit the nominated representative corporations for compliance with any member consultation request.

5.5.2.2 Opportunity to Self-identify and Identifying Other Individuals

Woodside requests nominated representative corporations and the Native Title Representative Bodies to identify other individuals to consult with or individuals who may seek to self-identify for a proposed activity. Woodside also advertises broadly through Indigenous, national and local advertising, social media and community engagement opportunities (as described in **Section 5.9.1**) to provide individuals with an opportunity to consult. Woodside does not directly approach individuals for consultation, as this undermines the role of the nominated representative corporations (**Section**

[24] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193, at [104]

5.5.2.1). Woodside's approach to providing individual Traditional Custodians the opportunity to self-identify and consult for an Environment Plan is as follows:

- Woodside applies the principles of self-determination when consulting with Traditional Custodians by consulting through the Traditional Owners' authorised representative entities.
- Recognising the function of a PBC to represent communal interests and manage cultural values, Woodside suggests that the information provided to representative entities is provided to their members but Woodside recognises the process is voluntary and Woodside cannot compel them to do so nor seek to audit the representative entities for compliance with any request.
- Representative entities cannot provide membership details to Woodside due to individual confidentiality requirements.
- Woodside requests advice as to who else Woodside should be consulting but recognises the process is voluntary and cannot compel nominated representative corporations to provide this information.
- Modern Indigenous engagement practises rely on the building and maintaining of respectful relationships. Most nominated representative corporations to date have requested the building of that relationship, where one is not already in place.
- While Woodside has, in some cases, approached individual directors and elders outside of this process due to requirements imposed in Environment Plan consultation, this approach is considered inappropriate by modern Indigenous engagement standards, fundamentally undermining the authority of the authorised representative entity and can be detrimental to the relationship.

For this proposed activity, Woodside requested nominated representative corporations (including PBCs) and Native Title Representative Bodies to identify any potential individual relevant persons for consultation, and to distribute consultation materials to their member base. However, Woodside recognises the process is voluntary and it cannot compel them to do so nor seek to audit the representative entities for compliance with any request. Woodside has not been directed to engage individual Traditional Custodians by nominated representative corporations for this proposed activity. Woodside has nevertheless provided reasonable opportunity for individual Traditional Custodians to engage in consultation through appropriate and adapted consultation methods.

5.5.2.2.1 Sufficient Information

Woodside recognises that the information sufficient to allow a person or organisation to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities may vary and also may depend on the degree to which a relevant person is potentially affected.

Woodside produces a Consultation Information Sheet for each Environment Plan which is provided to relevant persons and organisations to provide the opportunity for feedback on the activity (**Section 5.4.1**. In response to Traditional Custodians' feedback, Woodside has tailored effective consultation methods for its activities, specifically designed for Traditional Custodians, so that information is provided in a form that is readily accessible and appropriate. The targeted Consultation Summary Sheet (as described in **Section 5.9.1**) developed and reviewed by Indigenous representatives so that content is appropriate to the intended recipients, is then provided to relevant Traditional Custodian groups. Phone calls are made to provide context to the consultation.

Where face to face consultation meetings are requested, Woodside coordinates engagement at the Traditional Custodians' location of choice (where practicable) and with their nominated attendees. Key project personnel, environmental and First Nations relations experts are typically present to enable effective communication and prompt response to questions. Materials for these sessions

incorporate visual aids such as photos, maps and videos, and plain language suitable for people with a non-technical background.

Woodside has sought to provide sufficient information to individual members of nominated representative corporations (such as PBCs) by providing information to representative bodies and suggesting dissemination with members. However, Woodside recognises consultation is voluntary and it cannot compel them to do so nor would it be appropriate to seek to audit the representative entities for compliance with any request.

5.5.2.3 Reasonable Period for Consultation

Woodside seeks to consult in order to support preparation of its Environment Plan. Woodside recognises that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale and complexity of the activity (**Section 5.4.2**.)

5.5.2.4 Discharge of Regulation 11A

In relation to Traditional Custodian relevant persons (and all relevant persons), Woodside has discharged its duty under regulation 11A. Woodside considers that consultation under regulation 11A is complete (**Section 5.4.3).**

5.6 Providing Feedback and Assessment of Merit of Objections or Claims

There are a number of ways in which feedback can be provided. Feedback can be provided through the Woodside feedback email or via the Woodside feedback toll free phone line as outlined in the Consultation Information Sheet and the Woodside website. Where appropriate, consultation may also be supported by phone calls or meetings. An Environment Plan feedback form is also available on Woodside's website enabling stakeholders to provide feedback on proposed activities, or to request additional information.

Woodside consults widely on its Environment Plans and notes that feedback is received in various forms. Feedback that is considered inappropriate or that puts the environment, health, safety or wellbeing of Woodside employees or operations at risk will not be tolerated. Woodside respects people's rights to protest peacefully and lawfully but actions that put the environment, health, safety or wellbeing of Woodside employees or operations at risk go beyond those boundaries.

Woodside accepts feedback and engages in consultation in order to achieve the aims set out in **Section 5.2**. Woodside recognises that there are persons and organisations that take a view that Woodside's operations and/or growth projects should be stopped or at least delayed as far as possible. Whilst Woodside assesses the merits of objections or claims received, it acknowledges NOPSEMA's guidance in its brochure entitled *Consultation on offshore petroleum environment plans information for the community*, which states that relevant persons are free to respond on any matter and raise any concern, however this may not be able to be considered if it is outside the scope or purpose of the Environment Plan and approval process, for example, statements of fundamental objection to offshore petroleum activities or information containing personal threats or profanities.

Feedback from relevant persons is reviewed and an assessment of the merits is made of information provided as well as objections or claims about the adverse impact of each activity to which the Environment Plan relates. This might, for instance, be done through a review of data and literature and for relevance to the nature and scale of the activity outlined in the Environment Plan. Consistent with the aim of consultation in **Section 5.2**, Woodside will consider information received when reviewing and designing measures to put in place to minimise harm to relevant persons and where reasonable or practical to further manage impacts and risks to ALARP and acceptable levels.

Woodside considers feedback during consultation from relevant persons and other persons Woodside chose to contact (see **Section 5.3.4**). This information is summarised in **Appendix F,**

Table 1 and Table 2 of the Environment Plan and includes a statement of Woodside's response, or proposed response, if any, to each objection and claim.

In accordance with regulation 9(8) of the Environment Regulations, sensitive information (if any) in an Environment Plan, and the full text of any response by a relevant person to consultation under regulation 11A, must be contained in the sensitive information part of the plan and not anywhere else in the plan.

5.7 Ongoing Consultation

Consultation can continue to occur during the life of an EP, including after an EP has been accepted by NOPSEMA.

As per Woodside's ongoing consultation approach (refer to **Section 7.10.2.1**), feedback and comments received from relevant persons continue to be assessed and responded to, as required, throughout the life of an EP, including during its assessment and once accepted, in accordance with the intended outcome of consultation (as set out in **Section 5.2**).

Should consultation feedback be received following the acceptance of an EP that identifies a measure or control that requires implementation or updates to meet the intended outcome of consultation (see **Section 5.2**), Woodside will apply its Management of Change and Review process as appropriate (see **Section 7.7**).

5.8 Woodside's Methodology to Identify Relevant Persons

5.8.1 Identification of Relevant Persons Under Regulation11A(1)(a), (b) and (c)

Woodside's methodology for identifying relevant persons under regulations 11A(1)(a), (b) and (c) is as follows:

- Woodside considers the defined responsibilities of each of the departments and agencies to which the activities in the EMBA to be carried out under the Environment Plan may be relevant. This list of relevant department and agencies is formulated by reference to the responsibilities of the government departments as set out on their websites, in NOPSEMA's GL1887 - Consultation with Commonwealth agencies with responsibilities in the marine area guideline (January 2023), which describes where the Department is a relevant agency under the Environment Regulations, as well as experience and knowledge that Woodside has gained from years of operating in relation to the departments and agencies which Woodside has historically consulted over the years. This list is revised from time to time, for example, for the purposes of accommodating government restructures, renaming of departments, shifting portfolios and/or to account for new agencies that might arise.
- Woodside has categorised government department or agency groups as follows:

Government departments / agencies – marine	Agencies with legislated responsibilities for use of the marine environment.
Government departments / agencies – environment	Agencies with legislated responsibilities for the protection of the marine environment.
Government departments / agencies – industry	The legislated Department of the responsible Commonwealth, State or Northern Territory Minister for Industry.

- Woodside considers each of the responsibilities of the departments and agencies and determines whether those responsibilities overlap with potential risks and impacts specific to the proposed petroleum activity in the EMBA. The assessment is both activity and location based.
- Woodside acknowledges the roles and responsibilities of government departments and agencies acting on behalf of various industry participants. For example, AMSA - Marine Safety

is responsible for the safety of vessels and the seafarers who are operating in the domestic commercial shipping industry and AHO is responsible for maritime safety and Notices to Mariners. To undertake the PAP in a manner that prevents a substantially adverse effect on the potential displacement of marine users, Woodside therefore consults AMSA - Marine Safety and AHO on its proposed activities. Woodside considers each of the responsibilities of the departments and agencies and determines those that would either be involved in the incident response itself or in relation to the regulatory or decision-making capacity with respect to planning for the unlikely event of a worst-case hydrocarbon release incident response specific to the PAP. Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in Section 5.2).

- The list of those government departments and agencies assessed as relevant is set out in Table 5-3.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in Section 5.2) and summarised at Appendix F, Table 1 and Table 2 as appropriate to the relevance assessment.

Woodside does not consult with departments or agencies with interests that do not overlap with risks and impacts specific to the proposed petroleum activity in the EMBA or would not be involved in incident response planning. For instance, in this Environment Plan, Woodside has not consulted with the department for the Minister of the Northern Territory because there is no overlap given that the proposed activities are in Commonwealth waters offshore of Western Australia.

5.8.2 Identification of relevant persons under regulation11A(1)(d))

Relevant persons under regulation11A (1)(d) are defined as a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan, or a revision of the Environment Plan. In identifying relevant persons, Woodside considers:

- the planned activities to be carried out under this Environment Plan (described in Section 3); and
- the EMBA by unplanned activities (identified in Section 4 and assessed in Section 6.

To identify relevant persons who fall within regulation 11A(1)(d), Woodside adopts the following methodology, and then undertakes consultation with relevant persons which is set out further in **Section 5.8.**

- As a general proposition, Woodside assesses whether a person or organisation is a relevant person having regard to:
  - whether a person or organisation has functions interests or activities or that overlap with the Operational Area and EMBA; and
  - whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities.
- This assessment will include applying professional judgement, knowledge and current literature.
- Further, to assist in identifying the full range of relevant persons, Woodside considers the impacts and risks associated with its proposed activities and considers the broad categories of relevant persons who may be affected by the activities. For this Environment Plan, the broad categories are identified in Table 5-1 below and identification methodology applied as set out in Table 5-2: Methodology for identifying relevant persons within the EMBA undertaken under subcategory 11 A (1) (d) – by category

- The list of those persons or organisations assessed as relevant and persons or organisations Woodside chose to contact is set out in Table 5-3.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation (as set out in Section 5.2) and applying the categories of relevant persons methodology outlined in Table 5-2, as appropriate.
- Feedback from relevant persons is summarised at Appendix F, Table 1. Feedback from persons assessed as not relevant but whom Woodside choses to contact is summarised at Appendix F, Table 2.

Table 5-1: Categories of relevant persons

Category	Explanation
Commercial fisheries and peak representative bodies	Commonwealth or State Commercial Fishery with a fishery management plan recognised under the Commonwealth Fisheries Management Act 1991 (Cth) and Western Australian Fish Resources Management Act 1994 (WA), which may be amended from time to time. Commonwealth peak fishery representative bodies are identified by AFMA. WAFIC is the peak representative body for state fishers in Western Australia.
Recreational marine users and peak representative bodies	Charter boat, tourism and dive operators identified by DPIRD specific to the location of the proposed activity. Representative bodies are the recognised peak organisation(s) for recreational marine users.
Titleholders and operators	Registered holder of an offshore petroleum title or GHG title governed by the OPGGS Act and associated regulations.
Peak industry representative bodies	Recognised peak organisation(s) for the oil and gas sector.
Traditional Custodians (individuals and/or groups/entity)	Traditional Custodians are First Nations Australians who hold cultural rights and interests, or have cultural functions or perform cultural activities over particular lands and waters. Where a First Nations person, group or entity self-identifies and/or asserts cultural rights, interests, functions or activities they will be included in the definition of Traditional Custodian for the purpose of this Environment Plan.
Nominated Representative Corporations	Nominated representative corporations are Traditional Custodians' nominated representative institutions such as Prescribed Body Corporates (PBC). PBCs are established under the Native Title Act 1993 by Traditional Custodians to represent their entire Traditional Custodian group (defined broadly by reference to descents from an ancestor set who were known to be the Traditional Custodians at the time of European colonisation) and their interests including, among other things, management and protection of cultural values.
Native Title Representative Bodies	A Representative Aboriginal/Torres Strait Islander Bodies (RATSIB) is a regional organisation appointed under the Native Title Act 1993 (NTA) with prescribed functions, set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies.
Historical heritage groups or organisations	Legislated or government enlisted groups or organisations responsible for the management of marine heritage.
Local government and recognised local community reference/liaison groups or organisations	Local government governed by the Local Government Act 1995 (WA) which is responsible for representing the local community. Recognised local community reference/liaison group or organisation in relation to oil and gas matters.

Category	Explanation
Other non-government groups or organisations	Non-government organisation with public website material targeting the proposed activity.
Research Institutes and local conservation groups or organisations	Research institutes are government or private institutions that conduct marine or terrestrial research. Local conservation groups are local non-government organisation that regularly conduct conservation activities focused on the local environment or wildlife.

Table 5-2: Methodology for identifying relevant persons within the EMBA undertaken under subcategory 11 A (1) (d) – by category

Category	Relevant person identification methodology
Commercial fisheries (Commonwealth and State) and peak representative bodies	Woodside assesses relevance for commercial fisheries (Commonwealth and State) and their representative bodies using the following next steps in its methodology: • Defining the parameters having regard to timing, location and duration of the proposed petroleum activity. • Confirming whether the EMBA overlaps with the fisheries management area (i.e. the spatial area the fishery is legally permitted to fish in) (see **Section 4.10.2).** • Woodside acknowledges WAFIC's consultation guidance25 (accessed on 2 February 2023), that titleholders develop separate consultation strategies for significant unplanned events (for example oil spill) where titleholders can demonstrate the likelihood of such events occurring is extremely low. WAFIC's guidance is that consultation on unplanned events resulting in an emergency scenario should only be undertaken if an incident occurs (see **Appendix I**). • For Commonwealth and State commercial fisheries, Woodside assesses the potential spatial and temporal extent for interaction with the fishery by reviewing AFMA ABARES and DPIRD Fishcube data within the Operational Area and EMBA (see **Section 4.10.2**). Assessment of relevance: • State commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see **Section 4.10.2**) are assessed as relevant to the proposed activity. Woodside acknowledges WAFIC's consultation guidance1 (see above) and applies this by: - directly consulting fishery licence holders that are assessed as having a potential for interaction in the Operational Area; and - consulting fisheries that are assessed as having a potential for interaction in the EMBA via WAFIC. • Commonwealth commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see Section 4.10.2) are assessed as relevant to the proposed activity. • If Woodside has identified that a Commonwealth or State fishery is a relevant person, then Woodside also consults the fisheries relevant representative body. For example, WAFIC represents the interests of State fisheries in Western Australia. If a state fishery is identified as relevant, Woodside would also identify WAFIC as relevant. Recognised Commonwealth fishery representative bodies are identified by AFMA via its website. WAFIC is the only recognised state fishery representative body.
Recreational marine users and peak representative bodies	Woodside assesses relevance for recreational marine users and peak representative bodies using the following next steps in its methodology: • From Woodside knowledge and operating experience, knowledge of recreational marine users in the area. This assessment is both activity and location based. • Defining the parameters having regard to timing, location and duration of the proposed petroleum activity.

[25] Consultation Approach for Unplanned Events - WAFIC

Category	Relevant person identification methodology
	• Assessing the potential spatial and temporal extent for interaction with recreational marine users by reviewing DPIRD Fishcube data to assess whether there has been activity within the EMBA in the past 5 years. Assessment of relevance: • Recreational marine users that have been active in the past 5 years within the EMBA are assessed as relevant to the proposed activity. Woodside is provided with the contact details of charter, boat tourism and dive operators specific to the region of the EMBA by DPIRD to consult with the relevant persons. • If Woodside has identified recreational marine users as relevant persons, then Woodside also consults identified peak recreational marine user representative bodies. For example, Recfishwest represents the interests of recreational fishers. These representative bodies are identified via Woodside's existing consultation list, which is updated as appropriate via advice from known groups and DPIRD.
Titleholders and Operators	Woodside assesses relevance for other titleholders and operators using the following next steps in its methodology: • Using WA Petroleum Titles (DMIRS-011) to determine overlap with other Titleholders or Operators permit areas within the EMBA. • From Woodside knowledge and operating experience, knowledge of other operators in the area. • Woodside produces a map showing the outcome of this assessment. Assessment of relevance: • Titleholders and Operators whose permit areas are identified as having an overlap within the EMBA are assessed as relevant.
Peak industry representative bodies	Woodside assesses relevance for peak industry representative bodies using the following next steps in its methodology: ● Review of peak industry representative bodies responsibilities that Woodside actively participates in, with consideration of overlap between industry focus area and Woodside's proposed activities within the EMBA. ● Review of Woodside's existing consultation list. ● Website search to identify whether any additional peak industry representative bodies have been created whose responsibilities may overlap with Woodside's proposed activities within the EMBA. Assessment of relevance: ● Peak industry representative bodies whose responsibilities are identified as having an overlap with Woodside's proposed activities within the EMBA are assessed as relevant.
Traditional Custodians (individuals and/or groups/entity) and Nominated Representative Corporations	Consistent with its understanding of the matters discussed in **Section 4.10.1** and **5.5**, to identify Traditional Custodian groups or individuals, Woodside: ● Uses existing systems of recognition to identify First Nations groups who overlap or are coastally adjacent to the EMBA (for example, recognition provided under native title or cultural heritage legislation, or marine park management plans, or identification by other First Nations groups or entities) (**Section 4.10.1**) ● Notifies and invites consultation with First Nations people through their nominated representative corporation (for example PBCs); or, in the case of native title, and where appropriate, the Native Title Representative Body (**Section 5.5.2.1**) ● Requests the nominated representative body to forward the notifications and invitations to consult to their members (members are individual communal rights holders) (**Section 5.5.2.1**) ● Requests advice as to other First Nations groups or individuals that should be consulted (**Section 5.5.2.1**) ● Requests the nominated representative body to provide consultation materials to its members (**Section 5.5.2.2.1)** ● Advertises widely so as to invite self-identification and consultation by First Nations groups and/or individuals (**Section 5.5.2.2.1**). Further detail to Woodside's methodology is as follows.

Category	Relevant person identification methodology
	Woodside uses the databases of the National Native Title Tribunal (**Section 4.10.1**: ● to understand whether there are any Native Title Claims (historical or current) or determinations overlapping or coastally adjacent to the EMBA; ● to understand whether there are any relevant Indigenous Land Use Agreements (ILUA), registered with the National Native Title Tribunal that overlap or are adjacent to the EMBA that may identify Traditional Custodians or representative bodies to contact regarding potential cultural values. Where there is a positive determination of native title, contacting the PBC or, where their representative is a Native Title Representative Body contacting the Native Title Representative Body. Where appropriate, contacting the relevant Native Title Representative Body to request a list of any First Nations groups asserting Traditional Custodianship over an area of coastline adjacent to the EMBA. Review of Commonwealth and State Marine Park Management Plans that overlap the EMBA which may identify Traditional Custodians or representative bodies to contact regarding potential cultural values. In the WA context, any Aboriginal Corporation appointed as a Local Aboriginal Cultural Heritage Service (LACHS) under the Aboriginal Cultural Heritage Act 2021 for an area that overlaps the EMBA. First Nations groups or individuals identified by a Traditional Custodian, nominated representative corporation, Native Title Representative Body. Request to the PBC to distribute Woodside consultation materials through its membership. Woodside is unable to contact this membership through any other means. Woodside has a number of public notification and information sharing processes by which individual Traditional Custodians can become aware of the proposed activity, its risks and impacts, and self identify. Individuals that consider their functions, interests or activities may be affected by a proposed activity must self-identify for each Environment Plan. Woodside does not presume that self-identification for an activity, covered by another Environment Plan, automatically means that an individual/s functions, interest and activities may be affected by other activities where EMBAs overlap. This decision is for the individual to make. The public notification, information sharing, and consultation processes Woodside puts in place enables Traditional Custodians to become aware of proposed activities, assess any risks and impacts to their values, and enable individuals to self-identify. Assessment of relevance: • Traditional Custodian groups, entities or individuals and Nominated Representative Corporations who are identified through the above methodology and overlap or are coastally adjacent to the EMBA are assessed as relevant.
Native Title Representative Bodies	Woodside assesses relevance for Native Title Representative Bodies using the following steps in its methodology (**Section 4.10.1**): • A Representative Aboriginal/Torres Strait Islander Bodies (RATSIB) is a regional organisation appointed under the Native Title Act 1993 (NTA) with prescribed functions set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies. • Review of National Native Title Tribunal RATSIB areas that overlap or are coastally adjacent to the EMBA. Assessment of relevance: • Where the area for which a Native Title Representative Body is recognised under the Native Title Act 1993, overlaps with the EMBA or is coastally adjacent to the EMBA, Woodside will assess the Native Title Representative Body as relevant.
Historical heritage groups or organisations	Woodside assesses relevance for groups or organisations whose responsibilities are focused on historical heritage using the following next steps in its methodology: • Using the Australasian Underwater Cultural Heritage Database to assess any known records Maritime Cultural Heritage sites (shipwrecks, aircraft and relics) within the EMBA (see **Section 4.10.1**).

Category	Relevant person identification methodology
	Assessment of relevance: • Where there is a known underwater heritage site (shipwrecks, aircraft and relics) within the EMBA, the relevant group or organisation that manages the site will be assessed as relevant.
Local government and recognised local community reference/liaison groups or organisations	Woodside assesses relevance for local government and recognised local community reference/liaison groups or organisations using the following next steps in its methodology: • Review of Woodside maps (developed based on data from the WA Local Government, Sport and Cultural Industries My Council database and WA Local Government Association (WALGA) Local Government Directory maps) to assess any overlap between the local government's defined area of responsibility and the EMBA. • Woodside hosts regular community reference/liaison group meetings. Members represent a cross-section of the community and local towns interests. Representatives are from community and industry and generally include, Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, Industry representative bodies, Community and industry organisations. Woodside considers these reference/liaison groups to be the appropriate recognised representatives of the local community for the oil and gas sector. • Woodside reviews the community reference/liaison group's terms of reference to determine its area of responsibility and any overlap with the EMBA. For example, the Exmouth Community Liaison Group's area of responsibility in relation to Woodside's operational, development and planning activities, is defined in the terms of reference as the Exmouth sub-basin. Comparatively, the Karratha Community Liaison Group's area of responsibility is the Pilbara region (i.e. onshore). Assessment of relevance: • The local government whose defined area of responsibility overlaps the EMBA is assessed as relevant. • The community reference/liaison group whose defined area of responsibility overlaps the EMBA is assessed as relevant and consulted collectively via the relevant reference/liaison group.
Other non-government groups or organisations	Woodside assesses relevance for other non-government groups or organisations using the following next steps in its methodology: • Review of Woodside's existing consultation list. • Website search of registered non-government groups or organisations (i.e. registered with an Australian Business Number (ABN) and publicly available contact information) that may have public website material specific to the proposed activity at the time of development of the EP. • Organisation has a publicly available mission statement (or purpose) that clearly describes their collective functions, interests or activities. • Review of current website material to identify targeted information which demonstrates functions, interests or activities relevant to the potential risks and impacts associated with planned activities. Assessment of relevance: • Registered non-government groups or organisations with current targeted public website material specific to the proposed activity at the time of developing the EP and who have demonstrated functions, interests or activities relevant to the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in **Section 5.2**) will be assessed as relevant.
Research institutes and local conservation groups or organisations	Woodside assesses relevance for research institutes and local conservation groups or organisations using the following next steps in its methodology: • Review of Woodside's existing consultation list. • Website search for research institutes that may operate within the EMBA. This assessment is both activity and location based.

Category	Relevant person identification methodology
	• Website search for local conservation groups or organisations that regularly conduct conservation activities within the EMBA. Assessment of relevance: • Where there is known research being undertaken by a research institute within the EMBA, the research institute that is conducting the research will be assessed as relevant. • Local environmental conservation groups who regularly conduct conservation activities or have demonstrated conservation functions, interests or activities within the EMBA are assessed as relevant. This assessment is both activity and location based.

5.8.3 Identification of Relevant Persons Under Regulation11A(1)(e)

Woodside adopts a case-by-case approach for each Environment Plan to assess relevance under regulation 11A(1)(e).

5.8.4 Assessment of Relevant Persons for the Proposed Activity

The result of Woodside's assessment of relevant persons in accordance with regulation 11A(1) is outlined at **Table 5-3** and **Appendix F, Table 1**.

Persons or organisations that Woodside assessed as not relevant but nonetheless chose to contact at its discretion in accordance with **Section 5.3.4** or self-identified and Woodside assessed as not relevant are summarised at Table 5-3 and **Appendix F, Table 2**.

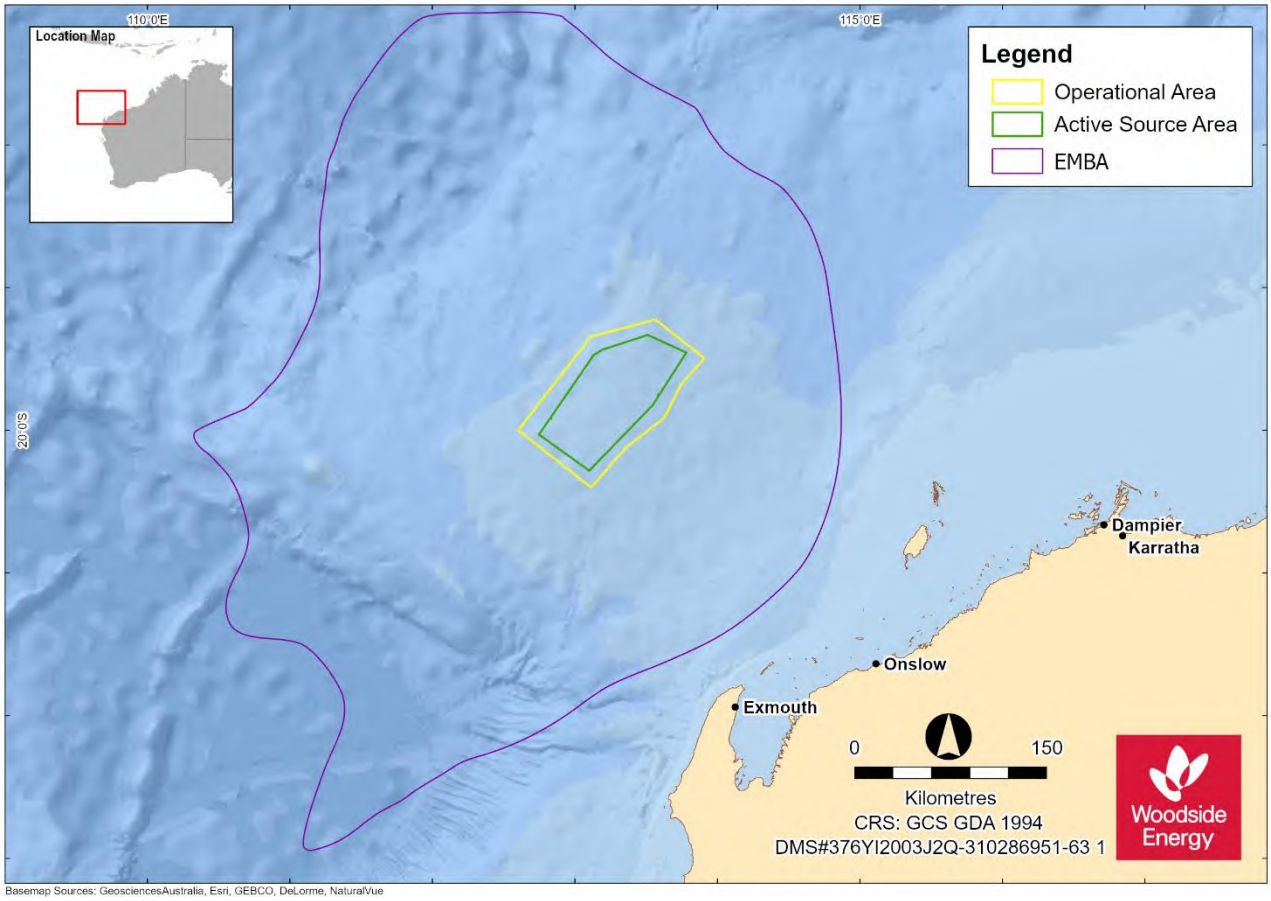


Figure 5-3: Operational Area and EMBA for this Environment Plan

Table 5-3: Assessment of relevance

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Commonwealth and WA State Government Departments or Agencies – Marine			
Australian Border Force (ABF)	Responsible for coordinating maritime security	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). ABF's functions may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Fisheries Management Authority (AFMA)	Responsible for managing Commonwealth fisheries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. AFMA's functions may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.	Yes
Australian Hydrographic Office (AHO)	Responsible for maritime safety and Notices to Mariners	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). AHO's functions may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Maritime Safety Authority (AMSA) – Marine Safety	Statutory agency for vessel safety and navigation	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). AMSA – Marine Safety's functions may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Maritime Safety Authority (AMSA) – Marine Pollution	Legislated responsibility for oil pollution response in Commonwealth waters	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). AMSA – Marine Pollution's functions may be relevant to the activity as the proposed activity has a hydrocarbon spill risk which may require AMSA response in Commonwealth waters.	Yes
Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries (formerly DAWE)	Responsible for implementing Commonwealth policies and programs to support agriculture, fishery, food and forestry industries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. DAFF – Fisheries' (formerly DAWE) functions may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Department of Defence (DoD)	Responsible for defending Australia and its national interests.	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(a). DoD's functions may be relevant to the activity as defence training areas lie within the EMBA.	Yes
Department of Primary Industries and Regional Development (DPIRD)	Responsible for managing State fisheries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b). No State fisheries are active in the Operational Area. The Marine Aquarium Managed Fishery, Mackerel Managed Fishery (Area 2 and 3), West Coast Deep Sea Crustacean Managed Fishery and Pilbara Line Fishery are active in the EMBA. DPIRD's functions may be relevant to the activity as the government department responsible for State fisheries.	Yes
Department of Transport (DoT)	Legislated responsibility for oil pollution response in State waters	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b). The proposed activity has a hydrocarbon spill risk, which may require DoT response in State waters.	Yes
Department of Planning, Lands and Heritage (DPLH)	Responsible for state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters.	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b). There is no known Maritime Cultural Heritage overlapping the EMBA.	No
Pilbara Ports Authority	Responsible for the operation of the Port of Dampier.	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 11A(1)(b). The proposed activity does not have the potential to impact Pilbara Ports Authority's functions, interests or activities as the EMBA does not overlap the Pilbara Ports Authority's area of responsibility.	No
Commonwealth and WA State Government Departments or Agencies – Environment			
Department of Agriculture, Fisheries and Forestry (DAFF) – Biosecurity (marine pests, vessels, aircraft and personnel)	DCCEEW administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a). DAFF – Biosecurity's (formerly DAWE) functions may be relevant to the proposed activities in the EMBA in the prevention of introduced marine species.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
(formerly DAWE)	has the potential to transfer marine pests. DCCEEW also has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any biosecurity risk is managed. The Department requests to be consulted where an activity involves the movement of aircraft or vessels between Australia and offshore petroleum activities either inside or outside Australian territory.		
Department of Climate Change, Energy, the Environment and Water Agriculture (DCCEEW) (formerly DAWE)	Responsible for implementing Commonwealth policies and programs to support climate change, sustainable energy use, water resources, the environment and our heritage. Administers the Underwater Cultural Heritage Act 2018 in collaboration with the States, Northern Territory and Norfolk Island, which is responsible for the protection of shipwrecks, sunken aircraft and other	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a). DCCEEW's (formerly DAWE) functions may be relevant to the proposed activities in the EMBA as there are potential environmental impacts from the proposed activity. There are known Maritime Cultural Heritage overlapping the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
	types of underwater heritage and their associated artefacts in Commonwealth waters.		
Director of National Parks (DNP)	Responsible for the management of Commonwealth parks and conservation zones.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a). DNP's functions may be relevant to the activity as DNP requires an awareness of activities that occur within AMPs, and an understanding of potential impacts and risks to the values of parks (NOPSEMA guidance note: N-04750-GN1785 A620236, June 2020). Titleholders are required to consult DNP on offshore petroleum and greenhouse gas exploration activities if they occur in, or may impact on the values of marine parks, including where potential spill response activities may occur in the event of a spill (i.e. scientific monitoring).	Yes
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	Supports the DBCA to manage the Ningaloo Coast World Heritage Area.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(a). The proposed activity does not have the potential to impact NCWHAC's functions, interests or activities as the EMBA does not overlap the Ningaloo Marine Park.	No
Department of Biodiversity, Conservation and Attractions (DBCA)	Responsible for managing WA's parks, forests and reserves to achieve wildlife conservation and provide sustainable recreation and tourism opportunities.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 11A(1)(b). The proposed activity EMBA does not overlap WA parks, forests or reserves. Activities have the potential to impact marine tourism in the EMBA.	Yes
Commonwealth and State Government Departments or Agencies – Industry			
Department of Industry, Science and Resources (DISR) (formerly DISER)	Department of relevant Commonwealth Minister.	Required to be consulted under regulation 11A(1)(a).	Yes
Department of Mines, Industry Regulation and Safety (DMIRS)	Department of relevant State Minister	Required to be consulted under regulation 11A(1)(c).	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Commonwealth Commercial fisheries and representative bodies			
North West Slope and Trawl Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years.	Yes
Southern Bluefin Tuna Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the EMBA it has not been active in the EMBA within the last 5 years. Woodside does not consider that the proposed activity will present a risk to licence holders, given since 1992, the majority of Australian catch has concentrated in south-eastern Australia. (Patterson et al., 2022). In addition, given fishing methods by licence holders for species fished in this fishery (Australia has a 35% share of total global allowable catch of Southern Bluefin Tuna, which is value-added through tuna ranching near Port Lincoln (South Australia), or fishing effort in New South Wales (Australian Southern Bluefin Tuna Industry Association).	No
Western Deepwater Trawl Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years.	Yes
Western Skipjack Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps Operational Area and EMBA, it has not been active in the EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given the fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is not currently active and no fishing has occurred since 2009 (Patterson et al., 2022). In addition, interactions are not expected given the species' pelagic distribution fishing methods for species fished by licence holders.	No
Western Tuna and Billfish Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Woodside does not consider that the activity will present a risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution.	
Commonwealth Fisheries Association (CFA)	Represents the interests of commercial fishers with licences in Commonwealth waters	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. CFA's functions may be relevant to the activity as the North West Slope and Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.	Yes
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	Represents the interests of the Southern Bluefin Tuna Fishery and Western Skipjack Fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The Southern Bluefin Tuna Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Southern Bluefin Tuna Fishery, the ASBTIA has also been assessed as not relevant. Woodside has provided information to the ASBTIA at its discretion in line with Section 5.3.4 on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.	No
Tuna Australia	Represents the interests of the Western Tuna and Billfish Fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The Western Tuna and Billfish Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Western Tuna and Billfish Fishery, Tuna Australia has also been assessed as not relevant. Woodside has provided information to Tuna Australia at its discretion in line with Section 5.3.4 on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.	No
Pearl Producers Association (PPA)	Peak representative organisation of The Australian South Sea Pearling Industry, with members in Western	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The Pearl Oyster Managed Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Pearl Oyster Managed Fishery, the PPA has also been assessed as not relevant.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
	Australia and the Northern Territory		
State Commercial fisheries and representative bodies			
Marine Aquarium Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area it has not been active in the Operational Area within the last 5 years. The fishery has been active in the EMBA in the last 5 years.	Yes
South West Coast Salmon Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given fishers are active south of Perth and from the beach (previous WAFIC advice).	No
Mackerel Managed Fishery (Area 2 and 3)	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years - no fishing occurs due to the water depths and distance from shore. The fishery has been active in the EMBA in the last 5 years.	Yes
Pilbara Crab Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years. The Operational Area overlaps with a closed area of the fishery (as per Schedule 2 of the draft Management Plan [DPIRD, 2018]) and therefore, fishing activity within the Operational Area is currently not permitted.	No
West Coast Deep Sea Crustacean Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area, the fishery has not been active in the Operational Area within the last 5 years. Fishing effort is primarily concentrated between Fremantle and Carnarvon. A single 10 nm CAES block (202125) was reportedly fished on the Exmouth Plateau at the southern	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		boundary of the Operational Area sometime between 2003 and 2010 (How et al., 2015, 2017). However, fishing effort has not been reported here since and more recent catch and effort data (2010–2019) confirms no catch or effort within the Operational Area; the closest blocks fished during this period were located about 300 km south (10 nm CAES block 230130) of the Operational Area (DPIRD, 2021). The fishery has been active in the EMBA in the last 5 years.	
Pearl Oyster Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery does not overlap the Operational Area. The fishery overlaps the EMBA but has not been active in the EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders given fishing methods and location for species fished by licence holders (fishing effort is mostly focussed in shallow coastal waters of 10-15 m depth, with a maximum depth of 35 m) (Lulofs rt al. 2002).	No
Western Australian Sea Cucumber Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area, the fishery has not been active in the Operational Area within the last 5 years. Due to water depth, distance offshore, and distance from popular fishing spots, fishers do not collect sea cucumber within the Operational Area. The fishery has not been active in the EMBA within the last 5 years.	No
West Coast Rock Lobster Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery does not overlap the Operational Area. The fishery overlaps the EMBA but has not been active in the EMBA in the last 5 years.	No
Demersal Scalefish Fishery: Pilbara Trawl Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery does not overlap the Operational Area or EMBA.	No
Pilbara Trap Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). The fishery does not overlap the Operational Area or EMBA.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Pilbara Line Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years. The fishery has been active in the EMBA in the last 5 years.	Yes
Western Australian Fishing Industry Council (WAFIC)	Represents the interests of commercial fishers with licences in State waters.	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 11A(1)(d). No State fisheries are active in the Operational Area. The Marine Aquarium Managed Fishery, Mackerel Managed Fishery (Area 2 and 3), West Coast Deep Sea Crustacean Managed Fishery and Pilbara Line Fishery are active in the EMBA. WAFIC's functions may be relevant to the activity as the peak representative body for State fisheries.	Yes
Recreational marine users and representative bodies			
Exmouth recreational marine users	Exmouth-based dive, tourism and charter operators	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d). Activities have the potential to impact Exmouth-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Gascoyne Recreational Marine Users	Gascoyne-based dive, tourism and charter operators	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d). Activities have the potential to impact Gascoyne-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Recfishwest	Represents the interests of recreational fishers in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d). Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Marine Tourism WA	Represents the interests of marine tourism in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d).	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	
WA Game Fishing Association	Represents the interests of game fishers in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 11A(1)(d). Activities have the potential to impact game fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Titleholders and Operators			
Chevron Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Western Gas	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Exxon Mobil Australia Resources Company	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Shell Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
INPEX Alpha Ltd	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Carnarvon Energy Ltd	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
BP Developments Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Osaka Gas Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Tokyo Gas Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
JERA Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
PE Wheatstone	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Kyushu Electric Wheatstone	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Eni Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Fugro Exploration	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Finder No 9 /10 / 17	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
KUFPEC	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Santos NA Energy Holdings / Santos Ltd / Santos WA Northwest / Santos Offshore / / Santos (BOL) / Santos WA PVG	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
OMV Australia / Sapura OMV Upstream	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
JX Nippon O&G Exploration (Australia)	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 11A(1)(d). Titleholder or Operator's permit areas overlaps the EMBA.	Yes
National Energy Resource Australia (NERA) Collaborative Seismic Environment Plan Project (CSEP) acting for a consortium of operators	Titleholder or Operator	Woodside has applied its methodology for 'Additional Persons' and 'Titleholders and Operators' under regulation 11A(1)(d). During the course of preparing the EP, NERA CSEP self-identified and requested to be consulted. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Peak Industry Representative bodies			
APPEA	Represents the interests of oil and gas explorers and producers in Australia.	Woodside has applied its methodology for 'Peak Industry Representative bodies' under regulation 11A(1)(d). APPEA's responsibilities are identified as having an intersect with Woodside's planned activities in the EMBA.	Yes
Traditional Custodians and nominated representative corporations			
Murujuga Aboriginal Corporation (MAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). MAC is the Nominated Representative Corporation under the Burrup and Maitland Industrial Estates Agreement (BMIEA), which is coastally adjacent to the EMBA and underpins land access for the onshore component of the Scarborough Project. The EMBA does not overlap the Murujuga National Park. MAC was established to represent the members of competing Native Title claims over Murujuga, collectively known as the Ngarda Ngarli and comprising Mardudhunera, Ngarluma,	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Yaburara, Yindjibarndi and Wong-Goo-Tt-Oo people. The determination of the competing Native Title claims resulted in no native title being found over the lands subject to the BMIEA or below the low water mark. MAC also owns and co-manages the Murujuga National Park, is responsible for the Dampier Archipelago National Heritage Place and is progressing the World Heritage nomination of the Murujuga Cultural Landscape. Woodside has consulted with MAC in regard to the Scarborough Project area generally since 2018 and MAC has been involved in ethnographic surveys that included the planned activities of this EP. As discussed further below, Woodside engaged YMAC as the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia to confirm the best approach to confirm additional cultural values (if any) for the broader Scarborough Project, the scope of which included the proposed activity for this EP. YMAC advised that the most appropriate stakeholders for the Scarborough project generally are MAC and NAC, who are not represented by YMAC (refer to Table 5-4).	
Ngarluma Aboriginal Corporation (NAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Ngarluma/Yindjibarndi native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which NAC and the Yindjibarndi Aboriginal Corporation are the Registered Native Title Body Corporates for. NAC is party to the RTIO Ngarluma Indigenous Land Use Agreement (Body Corporate Agreement), which is coastally adjacent to the EMBA. As noted above (and discussed further below), Woodside sought guidance from YMAC as the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia to confirm the best approach to confirm additional cultural values (if any) for the broader Scarborough Project, the scope of which included the proposed activity for this EP. YMAC advised that the most appropriate stakeholders for the Scarborough project generally are MAC and NAC, who are not represented by YMAC (refer to Table 5-4).	Yes
Wirrawandi Aboriginal Corporation (WAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Yaburara & Mardudhunera People claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which WAC is the Registered Native Title Body Corporate for.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		WAC is party to the Cape Preston Project Deed (YM Mardie ILUA), Cape Preston West Export Facility ILUA, Kuruma Marthudunera and Yaburara and Coastal Mardudhunera ILUA and KM & YM ILUA, which are coastally adjacent to the EMBA.	
Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which the Baiyungu, Thalanyji and Yinggarda people are party to. The NTGAC and YAC are the Registered Native Title Body Corporates holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people. The NTGAC is also party, with the WA State Government, to the Ningaloo Conservation Estate Indigenous Land Use Agreement (the ILUA) which is coastally adjacent to the EMBA. The NTGAC is responsible for the joint management of the inner Ningaloo Marine Park (State Waters), the Cape Range National Park and new conservation areas extending along the Ningaloo Coast, which runs in parallel to the outer Ningaloo Marine Park in Commonwealth waters. The NTGAC's nominated representative is the YMAC and the NTGAC executive officer and contact officer pursuant to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 is employed by YMAC. Woodside has therefore consulted the NTGAC, via YMAC.	Yes
Yinggarda Aboriginal Corporation (YAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which the Baiyungu, Thalanyji and Yinggarda people are party to. The NTGAC and YAC are the Registered Native Title Body Corporates holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people. The YAC nominated representative was the YMAC and the YAC executive officer and contact officer pursuant to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 is employed by YMAC. Woodside therefore consulted YAC, via YMAC. Woodside was advised that as of late April 2023, the nominated representative for YAC was now Gumala Aboriginal Corporation.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Robe River Kuruma Aboriginal Corporation (RRKAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). There are no native title claims that the RRKAC is party to overlapping the EMBA or coastally adjacent to the EMBA. The RRKAC is party to the RTIO Kuruma Marthudunera People ILUA, Kuruma Marthudunera and Yaburara and Coastal Mardudhunera ILUA and KM & YM ILUA, which are coastally adjacent to the EMBA.	Yes
Yindjibarndi Aboriginal Corporation	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Ngarluma/Yindjibarndi native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which NAC and the Yindjibarndi Aboriginal Corporation are the Registered Native Title Body Corporates for.	Yes
Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 11A(1)(d). The Thalanyji native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, which BTAC is the Registered Native Title Body Corporate for. BTAC is also party to the Macedon ILUA which is coastally adjacent to the EMBA.	Yes
Native Title Representative Bodies			
Yamatji Marlpa Aboriginal Corporation (YMAC)	Native Title Representative Body	Woodside has applied its methodology for 'Native Title Representative Bodies' under regulation 11A(1)(d). YMAC is the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia. As such, they are not a Prescribed or Registered Native Title Body Corporate but exist to assist native title claimants and holders. The NTGAC's nominated representative is YMAC. Woodside has therefore consulted the NTGAC via YMAC. YMAC was also the nominated representative for YAC. Woodside was advised that as of late April 2023, the nominated representative for YAC is now Gumala Aboriginal Corporation. Woodside contacted YMAC to seek guidance with respect to the appropriate Traditional Custodian group(s) to engage with respect to the proposed activity where this was not clear.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		YMAC's functions may be relevant to the proposed activity in relation to its facilitation and coordination function as a Native Title Representative Body under applicable federal legislation.	
Self-identified First Nations Groups			
Ngarluma Yindjibarndi Foundation Ltd (NYFL)	Traditional Custodian - entity	Woodside has applied its methodology for 'Traditional Custodians' under regulation11 A 1 (d). Prior to the resolution of the Ngarluma and Yindjibarndi native title claim, the Ngarluma and Yindjibarndi registered native title claimants, the NWS JVs and Woodside entered into the Northwest Shelf Agreement 1998. In 1999 the Ngarluma and Yindjibarndi native title claim was settled with the Federal Court appointing, at the request of the common law native title holders, the Ngarluma Aboriginal Corporation (NAC) as PBC to represent the communal interests of the Ngarluma people and the Yindjibarndi Aboriginal Corporation (YAC) as PBC to represent the communal interests of the Yindjibarndi people. Both NAC and YAC are relevant people. NYFL was subsequently created to act as Trustee for the Trust under the Agreement and to carry on the business of enterprise development, investment and social welfare. NYFL self-identified and has advised it is relevant for this EP.	Yes
Historical cultural heritage groups or organisations			
Western Australian Museum	Manages 200 shipwreck sites of the 1,500 known to be located off the Western Australian coast.	Woodside has applied its methodology for 'Historical cultural heritage groups or organisations' under regulation 11A(1)(d). There are no known shipwrecks overlapping the EMBA which the Western Australian Museum may be responsible for.	No
Local government and community representative groups or organisations			
Shire of Exmouth	Local government governed by the Local Government Act 1995 representing the suburbs and localities of Exmouth, Learmonth and North West Cape.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d). The Shire of Exmouth's area of responsibility does not overlap the EMBA. The Shire of Exmouth was consulted as a member of the Exmouth Community Reference Group. Under regulation 11A(1)(e), Woodside, at its discretion, chose to assess the Shire of Exmouth as a relevant person.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
City of Karratha	Local government governed by the Local Government Act 1995 representing the suburbs and localities of Baynton, Baynton West, Bulgarra, Cossack, Dampier, Gap Ridge, Karratha, Karratha Industrial Estate, Jingarri, Madigan, Millars Well, Nickol, Pegs Creek, Point Samson, Roebourne, Whim Creek and Wickham.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d). The City of Karratha's area of responsibility does not overlap the EMBA. The City of Karratha was consulted as a member of the Karratha Community Liaison Group. Under regulation 11A(1)(e), Woodside, at its discretion, chose to assess the City of Karratha as a relevant person.	Yes
Exmouth Community Reference Group (CRG) Base Marine Bgahwan Marine Cape Conservation Group Inc. DBCA Department of Defence Department of Transport Exmouth Bus Charter Exmouth Chamber of Commerce and Industry Exmouth District High School Exmouth Freight and Logistics Exmouth Game Fishing Club Exmouth Tackle and Camping Supplies Exmouth Visitors Centre	The Exmouth CRG represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Exmouth region.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d). The Exmouth CRG's area of responsibility under its terms of reference overlaps the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Exmouth Volunteer Marine Rescue Fat Marine Gascoyne Development Commission Gun Marine Services Ningaloo Lodge Offshore Unlimited Shire of Exmouth BHP Petroleum Santos Community Member			
Karratha Community Liaison Group (KLG) WA Police Karratha Health Care Development WA Ngarluma Yindjibarndi Foundation Ltd (NYFL) Department of Education Pilbara Ports Authority Regional Development Australia Pilbara Development Commission Dampier Community Association City of Karratha Karratha & Districts Chamber of Commerce and Industry	The KLG is the recognised community group that represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Pilbara region.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 11A(1)(d). The KLG's area of responsibility under its terms of reference does not overlap the EMBA. Under regulation 11A(1)(e), Woodside, at its discretion, chose to assess the KLG as a relevant person.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Horizon Power Murujuga Aboriginal Corporation (MAC)* Department of Local Government, Sport and Cultural Industries *MAC was consulted directly as described above.			
Other non-government groups or organisations			
350 Australia (350A)	Non-government organisation	During the course of preparing the EP, 350A self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that 350A's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	No
Australasian Centre for Corporate Responsibility (ACCR)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine ACCR's relevance for the proposed activity. Woodside has assessed that ACCR's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Woodside chose to contact ACCR at its discretion in line with Section 5.3.4.	No
Australian Conservation Foundation (ACF)	Non-government organisation	During the course of preparing the EP, ACF self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that ACF's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	Yes
Australian Marine Conservation Society (AMCS)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine AMCS's relevance for the proposed activity.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Woodside has assessed that AMCS's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Under regulation 11A(1)(e), Woodside, at its discretion, chose to assess AMCS as a relevant person.	
Climate Council	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Climate Council's relevance for the proposed activity. Woodside has assessed that Climate Council's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Woodside chose to contact Climate Council at its discretion in line with Section 5.3.4.	No
Conservation Council of Western Australia (CCWA)	Non-government organisation	During the course of preparing the EP, CCWA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that CCWA's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	Yes
Doctors for the Environment (DEA)	Non-government organisation	During the course of preparing the EP, DEA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that DEA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	No
Extinction Rebellion WA (XRWA)	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine XRWA's relevance for the proposed activity. Woodside has assessed that XRWA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Woodside chose to contact XRWA at its discretion in line with Section 5.3.4.	
Friends of Australian Rock Art. Inc (FARA)	Non-government organisation	During the course of preparing the EP, FARA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that FARA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	No
Greenpeace Australia Pacific (GAP)	Non-government organisation	During the course of preparing the EP, GAP self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that GAP's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	Yes
International Fund for Animal Welfare (IFAW)	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine IFAW's relevance for the proposed activity. Woodside has assessed that IFWA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Woodside chose to contact IFAW at its discretion in line with Section 5.3.4.	No
Lock The Gate Alliance (LTGA)	Non-government organisation	During the course of preparing the EP, LTGA self-identified, provided comment on the broader Scarborough Project and requested to be consulted on Scarborough EPs. Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d). Woodside has assessed that LTGA's public website material and feedback does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	No
Market Forces	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Market Force's relevance for the proposed activity.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Woodside has assessed that Market Force's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Woodside chose to contact Market Force at its discretion in line with Section 5.3.4.	
Say No to Scarborough Gas (SNTSG)	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine SNTSG's relevance for the proposed activity. Woodside has assessed that SNTSG's public website material and feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	Yes
Sea Shepherd Australia (SSA)	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine SSA's relevance for the proposed activity. Woodside has assessed that SSA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Under subregulation 11 A 1 (e), Woodside, at its discretion, chose to assess SSA as a relevant person.	Yes
The Wilderness Society (TWS)	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine TWS's relevance for the proposed activity. Woodside has assessed TWS's public website material and feedback, with the latter demonstrating an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2).	Yes
World Wildlife Fund (WWF) Australia	Non-government organisation	Woodside has applied its methodology for 'Additional persons' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine WWF's relevance for the proposed activity. Woodside has assessed that WWF's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2). Woodside chose to contact WWF at its discretion in line with Section 5.3.4.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Research institutes and local conservation groups or organisations			
University of Western Australia (UWA)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine UWA's relevance for the proposed activity. There is no known research being undertaken by the UWA that intersects within the EMBA. Woodside chose to contact UWA at its discretion in line with Section 5.3.4.	No
Western Australian Marine Science Institution (WAMSI)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine WAMSI's relevance for the proposed activity. There is no known research being undertaken by WAMSI that intersects within the EMBA Woodside chose to contact WAMSI at its discretion in line with Section 5.3.4.	No
Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine CSIRO's relevance for the proposed activity. There is no known research being undertaken by CSIRO that intersects within the EMBA. Woodside chose to contact CSIRO at its discretion in line with Section 5.3.4.	No
Australian Institute of Marine Science (AIMS)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 11A(1)(d) to determine AIMS's relevance for the proposed activity. There is no known research being undertaken by AIMS that intersects within the EMBA. Woodside chose to contact AIMS at its discretion in line with Section 5.3.4.	No
Other			
Save Our Songlines (SOS) and/ or [redacted] and/ or [redacted]	Representatives of Non-Government Organisation Save Our Songlines and/ or individuals [redacted] and/ or [redacted]	Woodside has applied its methodology for 'Traditional Custodians and nominated representative corporations' and 'Other non-government groups or organisations' under regulation 11A(1)(d) to determine Save Our Songlines (SOS) and/or [redacted] and/ or [redacted] relevance for the proposed activity. During the course of preparing the EP, Save Our Songlines and/ or [redacted] and/ or [redacted] self-identified and requested to be consulted on Scarborough EPs. Woodside has assessed that SOS and/ or [redacted] and/ or [redacted] feedback demonstrates an interest with the proposed activity.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Woodside Come Clean	Campaign website	Woodside Come Clean is not a registered organisation (i.e. no Australian Business Number (ABN)) and has no contact details publicly available. As this is not a group or organisation, but rather a campaign website, it would not be reasonable for Woodside to consider relevance for the proposed activity, nor attempt to consult. Irrespective, Woodside has reviewed the Woodside Come Clean public website material and determined that the material does not demonstrate any intersect with potential direct impacts specific to the proposed petroleum activity, while remaining in accordance with the intended outcome of consultation (as set out Section 5.2). Woodside notes that the Woodside Come Clean campaign website links to Say No to Scarborough Gas, which Woodside has consulted for the proposed activity.	No

5.9 Consultation Activities and Additional Engagement for the Scarborough 4D B1 Marine Seismic Survey Environment Plan Methodology to Identify Relevant Persons

Woodside has been conducting extensive consultation with relevant persons and other parties for this EP since 2021.

- From May 2021, a Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see **Section 5.3.4**), which included details such as an activity overview, maps, a summary of key risks and/or impacts and management measures (**Appendix F, reference 1.1**).
- In October 2021, NOPSEMA conducted a public consultation period for this EP. This public consultation process occurred in accordance with subregulation 11 B. In this process, the Regulator invited comments from the public on this EP for 30 days between 17 October and 17 November 2021 and no comments were received.
- On 21 October 2021, Woodside advertised seeking public comment on the planned activities proposed for this EP in the national, state and relevant local newspapers including in The Australian, The West Australian and the Pilbara News (see **Appendix F, reference 1.36).**
- In January 2023, Woodside advertised the planned activities for this EP in The Australian, The West Australian, Pilbara News Midwest Times, North West Times (18 January 2023) and Geraldton Times (20 January 2023) (see **Appendix F, reference 2.1**). Regional newspapers do not require subscription and are available and in some cases delivered directly to households. All communities within or adjacent to the EMBA had access to this information via this media. No direct comments or feedback were received from the advertisements.
- In January 2023, an activity update Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see **Section 5.3.4**), which included an update regarding planned activities, information regarding the EMBAs for this EP and additional information relating to mitigation and managements measures for this EP (**Appendix F, reference 1.39).**
- Since the commencement of the initial consultation period (May 2021), the Stakeholder Consultation Information Sheet has also been available on Woodside's website. The activity update Consultation Information Sheet has been available on the Woodside website since January 2023. The Information Sheets include a toll-free 1800 phone number and Woodside's feedback email address (feedback@woodside.com.au).
- Additional targeted information was provided to relevant marine users including Commonwealth and State fisheries, fishery representative bodies, AHO and AMSA – Marine Safety (**Appendix F, reference 1.3, 1.4, 1.5, 1.6).** The targeted information included maps and additional information relevant to the specific category of persons. The relevant persons had a 30-day period in which to provide feedback.
- Where appropriate, Woodside conducted phone calls and meetings with relevant persons.
- Where appropriate, targeted follow-up emails were sent to relevant persons who had not provided a response prior to the close of the target feedback period.
- While ensuring that the particulars of each activity (including description, planned and unplanned impacts and controls) are adequately covered, Woodside conducts consultation with relevant persons on all Scarborough Project activities for which they are relevant in a combined manner. This achieves efficiency for Woodside and the relevant person, and ensures that all activities are understood in their broader context.

- Woodside considered relevant person responses and assessed the merits and relevance of objections and claims about the potential adverse impact of the proposed activity set out in the Environment Plan, in accordance with the intended outcome of consultation (see Section 5.2)
- Consultation activities undertaken with relevant persons are summarised at Appendix F, Table 1.
- Engagement undertaken with persons or organisations Woodside assessed as not relevant but chose to contact (see Section 5.3.4) or self-identified and Woodside assessed as not relevant are summarised at Appendix F, Table 2.
- From 3 May 2023, Woodside commenced a geotargeted sponsored social media campaign (Appendix F, reference 2.2) to various local government authorities that are within or coastally adjacent to the EMBA for the proposed activities. The campaign provided the opportunity for individuals (including self-identified traditional custodians) who may be interested in Woodside's activities to participate in consultation. The campaign also advised persons or organisations on how they can find out about Woodside's proposed activities by visiting Woodside's website.

Community information sessions

- Community Information Sessions were held in Roebourne on 5, 10, 19 and 24 May, 22 June, and 19 July 2023; in Exmouth on 17 June 2023; and Broome, Derby and Kununurra on 12, 13 and 15 June 2023 respectively. Ahead of the events, Woodside advertised the sessions via the means below which provided the opportunity for local individuals to become aware of the event and have access to experts and information about the activity. The methods used to promote these consultation opportunities were developed with input from Indigenous representatives and were adapted to incorporate culturally appropriate and accessible language to encourage engagement and understanding of Woodside's proposed activities:
  - Advertising in the Broome Advertiser and Kimberley Echo on 1 and 8 June 2023 (**Appendix F,** reference 2.3.1) and for the Karratha Community Session in the Pilbara News on 28 June 2023 (**Appendix F,** reference 2.4.3).
  - From 8 June 2023, Woodside commenced a geotargeted social media campaign along the coastline from Geraldton to Derby (**Appendix F,** reference 2.2) advertising the community information sessions. A Facebook information campaign was targeted in Exmouth to ensure it reached communities where the Exmouth Consultation Information Session was planned to be held. (**Appendix F,** reference 2.5.1) A Karratha Community Information Session was advertised via a Facebook post on 28 June 2023 (**Appendix F,** reference 2.4.3) and a geotargeted social media campaign from 16 June to 29 June 2023 (**Appendix F,** reference 2.4.3).
  - Directly contacting local Traditional Custodian groups to invite representatives to attend the Community Information Sessions and providing the event information (see **Appendix F,** Table 1).
  - Advertising in Roebourne with posters on four community boards and dropped posters to community locations; and put information and posters on the Roebourne Community Calendar (**Appendix F,** reference 2.4.1 and 2.4.2).
  - Representatives from Woodside, including project and environment personnel equipped to answer technical questions, attended the event. Copies of the Consultation Information Sheets and bespoke targeted Summary Consultation Information Sheets were available to attendees. Community members were able to engage with Woodside representatives to understand the proposed activity and how it may affect them, ask questions and provide their feedback.

- Community Information Sessions were held in Karratha on 28 and 29 June 2023. Woodside advertised the sessions (see below) providing the opportunity for individuals to become aware of the event and have access to information as well as people who can answer questions and provide information about the activity. The methods used to promote these consultation opportunities were developed with input from Indigenous representatives and were adapted to incorporate culturally appropriate and accessible language to encourage engagement and understanding of Woodside's proposed activities:
  - Ahead of the 28 June 2023 event, a story was posted on Woodside's Facebook page (**Appendix F,** reference 2.4.3) sharing details of its shopping centre stand where Consultation Information Sheets regarding planned and proposed activities were available, including the activities proposed under this Environment Plan.
  - Ahead of the 29 June 2023 event, the Community Information Session was advertised in the Pilbara News), via a geotargeted social media campaign in Karratha and surrounding areas and by posting the event details on Woodside's Facebook page (**Appendix F,** reference 2.4.3).
  - Representatives from Woodside, including project and environment personnel equipped to answer technical questions, attended the event. Copies of the Consultation Information Sheets and bespoke targeted Summary Consultation Information Sheets were available to attendees. Community members were able to engage with Woodside representatives to understand the proposed activity and how it may affect them, ask questions and provide their feedback.
- Woodside had a stand at the annual FeNaCING Festival in Karratha on 5 and 6 August 2023. Members of Woodside's Corporate Affairs and Operations teams actively engaged with the community to discuss proposed Environment Plan activities. Consultation Information Sheets for a number of Woodside Environment Plans including this Environment Plan were available. Approximately 2,000 people visited the Woodside stand (based on the number of completed consultation forms and questionnaires). This consultation opportunity was promoted in the Pilbara News on 2 August 2023, and a story appeared on the Woodside North West Facebook page on 2 August 2023. (**Appendix F,** reference 2.4.4).
- Woodside had a stand at the Passion of the Pilbara festival in Onslow on 18 August 2023. Members of Woodside's Corporate Affairs team actively engaged with the community to discuss proposed Environment Plan activities. Consultation Information Sheets for a number of Environment Plans including this Environment Plan were available. Approximately 100 people visited the Woodside stand.
  - This consultation opportunity was promoted in a story on the Woodside North West Facebook page on 17 August 2023. (**Appendix F**, reference 2.4.5).
  - Woodside consulted the Karratha, Port Hedland and Roebourne communities on Environment Plan activities during 18–20 September 2023. Members of Woodside's Corporate Affairs, First Nations, Environment and Scarborough Project teams actively engaged the community to discuss proposed Environment Plans, including the Scarborough and Browse projects.
  - 18 Sept 2023: Karratha Shopping Centre 8am–12pm; Red Earth Arts Precinct 3–6pm. Estimated number of people consulted: 20;
  - 19 Sept 2023: Port Hedland, South Hedland Square 10am–5pm. Estimated number of people consulted: 20;
  - 20 Sept 2023: Roebourne, Woodside Office 10am–4pm. Estimated number of people consulted: no attendance at the session due to Sorry Business and multiple Aboriginal

corporation meetings which were unknown at the time of scheduling/planning engagements;

- These consultation opportunities were promoted in the Pilbara News on 13 September 2023, and via Facebook and Instagram social media campaigns from 6 to 16 September 2023. **(Appendix F, reference 2.4.6).**

5.9.1 Traditional Custodian Specific Consultation

In addition to the approaches above including community information sessions, additional activities were undertaken with relevant Traditional Custodians, which were specifically designed to provide for effective engagement with Traditional Custodians and so that information was provided in a form that was readily accessible and appropriate (**Section 5.5**). Consultation undertaken specifically with Traditional Custodians for this Environment Plan includes:

- Direct engagement with nominated representative corporations via the contact listed on the ORIC website, requesting advice on how they would like to be engaged and asking whether other members and/or individuals should be consulted. This has resulted in:
  - Meetings with directors, elders and any nominated representatives, on country or in Perth;
  - Requests and offers of resourcing to enable and support consultation;
  - Exchange of written feedback and correspondence;
  - A Summary Consultation Information Sheet, developed and reviewed by Indigenous representatives in collaboration with technical experts to ensure content is appropriate to the intended recipients, was provided to relevant Traditional Custodian groups (**Appendix F, reference 1.40**). and phone calls to provide context to the consultation made.
- Ongoing efforts were made to engage and develop relationships with these bodies via a variety of means such as email, phone calls, alternative contacts, texts, social media and in some cases physical visits.
- Consultation meetings with attendees decided by Traditional Custodian groups, supported by senior Woodside representatives, subject matter experts, First Nations Relations advisers with skills and experience in community engagement. Meetings are developed through a two-way consultation process to ensure effective information sharing via:
  - Mutually agreed agenda avoiding time pressure;
  - Encouraging Traditional Custodian attendees to control the pace of the meeting and pause at any time to ask questions, seek clarification or provide feedback;
  - Visual aids such as posters, presentations, simplified technical videos and real-world pictures and footage;
  - Emphasis on potential planned and unplanned risks and impacts of the activity;
  - Ample opportunity for questions and feedback;
  - Discussion about ongoing relationship development and opportunities;
  - Distribution of hard-copy Consultation Information Sheets (**Appendix F, reference 1.39**) and Summary Consultation Information Sheets (**Appendix F, reference 1.40**)
  - Meeting all costs such as sitting fees, travel, legal support and executive support and other support required.
- Woodside has a geotargeted sponsored social media campaign (**Appendix F, reference 2.2**) to various communities that are coastally adjacent to the EMBA for the proposed activities.

- The wide-reaching campaign brought the proposed activity to the attention of persons who may be interested and advised persons or organisations how they can find out about Woodside's proposed activities by visiting Woodside's website, which details the intent of consultation with relevant persons under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth). The reach of this campaign is shown in **Appendix F, reference 2.2** providing the opportunity to consult via over 139,000 views to date across various regions.
- These social media posts were developed with input from Indigenous representatives. Social media is a highly effective means to engage Indigenous audiences as outlined in Indigenous Digital Life (Professor Carlson, 2021). Advertisements used language and information appropriate to Indigenous audiences. Feedback from community engagements indicates a high level of penetration for this technique.

Woodside has employed a diverse range of techniques to allow relevant persons to become aware of the proposed activity and how it may affect their functions activities or interests, and understand their ability to provide feedback. The combination of engagement meetings, traditional print media, social media and face-to face community interaction was designed with input from Indigenous representatives and adapted to the audience, so that it provides a wide-ranging opportunity to consult.

6 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT, PERFORMANCE OUTCOMES, STANDARDS AND MEASUREMENT CRITERIA

6.1 Overview

This section presents the impact and risk analysis and evaluation, EPOs, EPSs and MC for the Petroleum Activities Program, using the methodology described in **Section 2.**

6.2 Analysis and Evaluation

The analysis and evaluation demonstrate that the identified risks and impacts associated with the Petroleum Activities Program are reduced to ALARP, are of an acceptable level and consider all operations of the activity, including potential emergency conditions.

The risks identified during the ENVID (including decision type, current risk level, acceptability of risk and tools used to demonstrate acceptability and ALARP) have been divided into two broad categories:

- planned (routine and non-routine) activities
- unplanned events (accidents, incidents or emergency situations).

Within these categories, impact assessment groupings are based on stressor type, e.g. emissions, physical presence, etc. In all cases, the worst credible consequence was assumed.

The ENVID conducted on 12 April 2021 identified seven impacts and seven risks associated with the Petroleum Activities Program. Planned activities and unplanned events are summarised in **Table 6-1**.

The analysis and evaluation for the Petroleum Activities Program indicate that all the current environmental risks and impacts associated with the activity are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 6.6** and **6.7**. As described in **Section 4** marine ecosystems and species hold both cultural and environmental value to traditional custodians.

Woodside recognises the potential for marine ecosystems to include cultural features as well as environmental values, as described in **Section 4.10.1**. As a result, potential impacts and risks to environmental receptors must be managed to ALARP and an acceptable level in offshore areas. Therefore potential impacts and risks to cultural features associated with coastal Indigenous connection with, or traditional uses of marine species and associated ecosystems in nearshore coastal waters are also reduced to ALARP and an acceptable level.

Consultation with Indigenous Groups has not resulted in any advice which contradicts this approach in regards to cultural, spiritual or environmental values. Where ongoing consultation identifies a need for additional mitigations beyond those established to manage environmental values, this will be managed through the processes described in **Section 7.7**.

6.3 Cumulative Impacts

Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other petroleum activities which could realistically result in overlapping temporal and spatial extents. Scarborough drilling and completion activities may be undertaken within WA-61-L however there will be no temporal overlap (activities will not occur concurrently) and therefore no cumulative impacts are predicted with this activity. The potential cumulative impact of concurrent activities is assessed in **Section 6.6.1** (Physical Presence) and **Section 6.6.2** (Routine Acoustic Emissions: Seismic Survey Equipment).

6.4 Environment Risks/Impacts not Deemed Credible or Outside the Scope of this EP

The ENVID identified one source of environmental risk/impact, the generation of noise from helicopters, that was assessed as not being applicable (not credible) within or outside the Operational Area and therefore was determined to not form part of this EP (refer **Section 2.6**).

Impacts of noise from helicopter transfers to marine fauna is not considered credible as the Operational Area is more than 185 km from mainland Australia and there are no identified BIAs or other biologically sensitive areas within the Operational Area.

6.5 Indirect Impacts from Activities Outside of the Operational Area

For the proposed Scarborough 4D Baseline (B1) MSS, the potential 'indirect' environmental impacts and risks evaluated are those associated with mobilisation/demobilisation of the seismic vessel and project vessels to the Operational Area, which have been considered in the environmental impact assessment in **Sections 6.6 and 6.7**. Due to the nature and scale of the PAP and these potential indirect environmental impacts and risks, and the regulatory frameworks and applicable maritime regulations in place to manage them, Woodside considers the potential impacts and risks from mobilisation and demobilisation of the seismic and project vessels to be inherently ALARP in its current state. Therefore, Woodside considers that standard vessel operations are appropriate to manage the potential impacts and risks from mobilisation and demobilisation of the seismic and project vessels to a level that is acceptable.

As described in **Section 3.2**, the purpose of the Petroleum Activities program is for the appraisal of gas fields for the management of hydrocarbon reserves. The extraction of Scarborough gas for onshore processing is not included in this Petroleum Activities Program. Future petroleum activities must first be authorised under the OPGGS(E)R and implemented before Scarborough gas is able to be extracted for onshore processing. Therefore, any indirect impacts and risks arising from the onshore processing of Scarborough gas are not considered indirect impacts/risks of this Petroleum Activities Program, and will be evaluated in Scarborough EPs as appropriate.

Table 6-1: Environmental risk and impact analysis summary of planned and unplanned activities

Aspect	EP section	Risk rating				Acceptability of impact/risk
		Consequence	Potential impact/consequence level	Likelihood	Current risk rating	
Planned activities (routine and non-routine)						
Physical presence: Interference with marine users	**6.6.1**	E	Social and Cultural – Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	-	-	Broadly acceptable
Routine acoustic emissions: Seismic survey equipment	**6.6.2**	E	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	-	-	Acceptable
Routine acoustic emissions: Vessels and mechanical equipment operation	**6.6.3**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine atmospheric emissions: Fuel combustion	**6.6.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. air quality).	-	-	Broadly acceptable
Routine discharges: Bilge water, grey water, sewage, putrescible wastes and deck drainage water	**6.6.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine light emissions: External lighting on project vessels	**6.6.6**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Unplanned activities (accidents, incidents, emergency situations)						
Accidental hydrocarbon release: Vessel collision	**6.7.2**	D	Environment – Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes	1	M	Acceptable
Accidental hydrocarbon release: Bunkering	**6.7.3**	E	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	1	L	Broadly acceptable
Unplanned discharge: Deck spills	**6.7.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
Unplanned discharge: Loss of solid hazardous and non-hazardous wastes (including dropped objects)	**6.7.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	1	L	Broadly acceptable
Physical presence: Vessel collision/entanglement with marine fauna	**6.7.6**	E	Environment – Slight, short term local impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	1	L	Broadly acceptable
Physical presence: Loss of equipment	**6.7.7**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	2	L	Broadly acceptable
Physical presence: Introduction and establishment of invasive marine species	**6.7.8**	D	Environment – Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	0	L	Broadly acceptable

6.6 Planned Activities (Routine and Non-routine)

6.6.1 Physical Presence: Interactions with Other Marine Users

Context		
Activity Components – **Section 3.5**	Socio-Economic Environment – **Section 4.10**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-Economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Displacement of other marine users – proximity of project vessels (and submersible equipment) interfering with or displacing third party vessels (commercial fishing, recreational fishing/tourism, research/monitoring programs and commercial shipping)							X	A	E	-	-	GP	Broadly Acceptable	EPO 1, 2
Potential interactions with proposed oil and gas activities							X							

Description of Source of Impact

Project Vessels (including the towed seismic equipment)

The Petroleum Activities Program will be conducted using a single seismic vessel. A temporary 3 nm SNA will be maintained around the seismic vessel and towed array (comprising the airgun array and streamer array, which includes header buoys, starboard and port deflectors or baravanes, streamers and tail buoys) during seismic operations. Marine users are requested to avoid this area during the survey to ensure the safety of the seismic vessel and third-party vessels.

The support vessel will accompany the seismic vessel to re-supply it with fuel and other logistical and operational supplies (including taking the seismic vessel under tow, if required). An additional chase vessel may be used to manage interactions with shipping and fishing activities, if required. It is intended that a dedicated spotter vessel with two MFOs aboard will be deployed ahead of the seismic vessel during all activities with seismic source discharge.

Impact Assessment

Potential Impacts to Environmental Values

Commercial Fishing

Potential for interaction with commercial fisheries is a common consideration for marine seismic surveys. Should any commercial fishing activities occur within the Operational Area, commercial fishers may be asked to deviate from fishing grounds periodically to accommodate seismic survey operations, any potential interactions with commercial fisheries would be short term due to the transient nature of the seismic vessel and the small area occupied by the

seismic vessel (and SNA) at any one time, and limited to operational inconvenience (navigational hazard) and temporary displacement from fishing grounds within the Operational Area.

There are a number of Commonwealth and State managed fisheries with management areas that overlap with the Operational Area, however, none of these fisheries have conducted any fishing activities within the Operational Area in at least the last 10 years. There is only one Commonwealth managed fishery (Western Deepwater Trawl Fishery) and one State managed fishery (West Coast Deep Sea Crustacean Managed Fishery) that have historically had catch/effort within the Operational Area prior to 2010. There has been no recent fishing catch/effort within the Operational Area from 2008-2019 (Woodhams and Bath 2017; Patterson et al., 2020) and 2018- 2022 (DPIRD, 2022), respectively (refer to **Section 4.10.2**). The Operational Area is located in water depths ranging from about 800-1150 m, located outside of the depth range where significant fisheries effort normally occurs.

Given the lack of fishing catch/effort in the Operational Area in recent years, it is expected that there will be no impact to commercial fisheries as a result of the presence of the proposed Scarborough 4D B1 MSS.

Recreational Fishing and Tourism Operations

The presence of project vessels and submersible equipment has the potential to impact third party vessels within or adjacent to the Operational Area. Interactions could result in short-term displacement of vessels as they make course alterations to avoid the project vessels (and associated towed seismic equipment in the SNA)

However, the Operational Area is considered too far offshore for recreational fishing or tourism activities to occur. Therefore, it is expected that there will be no impact to recreational fishing or tourism activities as a result of the presence of the proposed Scarborough 4D B1 MSS.

Commercial Shipping

The presence of project vessels and submersible equipment may cause temporary disruptions to commercial shipping. Moderate density shipping traffic may be encountered in the northeast corner of the Operational Area.

The potential impacts to commercial shipping vessels are expected to include short-term displacement of vessels as they make slight course alterations to avoid the project vessels (and associated towed seismic equipment in the SNA).

Oil and Gas Activities

No oil and gas production wells or facilities are located within the Operational Area (refer to **Figure 4-15**). Therefore, no impacts to oil and gas activities are expected.

Defence

The DoD did not identify any activities within the NWXA however the potential for UXOs was raised. Based on the locations of the proposed activity and potential UXOs it was determined that there is no credible risk from UXOs for the proposed activity.

Commercial Fishing

As above, there has been no recent fishing catch/effort within the Operational Area for the Commonwealth Western Deepwater Trawl Fishery (2008-2019) and WA West Coast Deep Sea Crustacean Managed Fishery (2010-2019), and therefore no impacts to commercial fisheries are expected. There are no other known seismic surveys planned to occur in these fisheries and, therefore, no cumulative impacts are expected.

Commercial Shipping

The Operational Area overlaps with a shipping fairway and north-south international shipping traffic. There are no other known seismic surveys planned to occur on the west coast of WA that may interact with the same international vessels within the fairway and, therefore, no cumulative impacts to shipping are expected.

Summary of Potential Impacts to Environmental Values(s)

Given the adopted controls, it is considered that physical presence of project vessels (including towed seismic equipment) will not result in a potential impact greater than slight, short-term temporary displacement of commercial shipping. Commercial vessels may be required to make small alterations to their course to avoid the project vessels (and associated towed seismic equipment in the SNA) but these interactions can be managed in accordance with standard maritime practices.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[26]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified				

[1] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[26]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Good Practice				
Notify AHO of activities and movements no less than four weeks before the scheduled activity commencement date.	F: Yes CS: Minimal cost. Standard practice.	Notification to AHO will enable them to generate navigation warnings (Maritime Safety Information Notifications (MSIN)) and NTM and NTA [including AUSCOAST warnings where relevant)]).	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.1**
Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements 24–48 hours before the scheduled activity commencement date.	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.2**
Notify relevant government departments, fishing industry representative bodies, fishery licence holders, and other oil and gas operators (if agreed during consultation) of activities prior to commencement and upon completion of activities	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.3**
Engage with proponents identified as having potential concurrent activities within the Operational Area prior to commencing the Petroleum Activities Program and develop an operations plan including the following aspects: • communications • work programming • hazard management • emergency response.	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.4**
Notify Defence of activities and movements no less than five weeks before the scheduled activity commencement date	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.5**
Establish and maintain a publicly available website to include both:	F: Yes. CS: Minimal cost	A publicly available website will allow transparency of the activity for other marine	Benefits outweigh cost/sacrifice.	Yes **C 1.6**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[26]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
• an interactive map which provides persons with updated information on activities being conducted as part of the Petroleum Activities Program, including location of seismic vessel and • cetaceans and marine turtle observations		users including First Nations. The interactive map provides additional/alternate method for marine users to obtain information on the timing of activities, thereby reducing the likelihood of interference with other marine users. The data logs of marine fauna observations will provide demonstrations of potential interactions with marine fauna, including whales and turtles.		
Establish and maintain a 3 nm radius SNA around the seismic vessel and towed array.	F: Yes CS: Minimal cost. Standard practice.	Presence of the SNA will reduce the likelihood of interfering with other marine users.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 2.1**
At least one dedicated support/chase vessel will be employed to assist the seismic vessel.	F: Yes CS: Minimal cost. Standard practice.	Use of a support/chase vessels to assist the seismic vessel will reduce the likelihood of an interaction with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 2.2**
Project vessels to operate AIS, and tail buoys will be fitted with lights, Global Navigation Satellite System (GNSS) and virtual AIS.	F: Yes CS: Minimal cost. Standard practice.	Use of AIS on project vessels, and lights, virtual AIS and GNSS on tail buoys will reduce the likelihood of an interaction with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 2.3**
Woodside will consider evidence based claims from commercial fishing licence holders where: • There is genuine displacement from undertaking normal fishing activities that results in demonstratable economic loss. • Deployed fishing equipment has been accidentally lost or damaged by any activities under Woodside's control. • There is a loss of catch due to the	F: Yes However, due to the absence of commercial fishing in the Operational Area, displacement of fishers are not expected. CS: Time, stakeholder fatigue and potential confusion associated with communicating [Document Title] and engaging with fishers unnecessarily.	Given limited fishing activity has ever taken place in or near the Operational Area and no fishing effort has been reported in over 10 years, the Operational Area does not represent an area that is significant to fisheries and displacement is not expected. Therefore, providing a process for compensation claims provides no benefit.	Cost is grossly disproportionate to the limited benefit gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[26]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
seismic activity that can be demonstrated				
Professional Judgement – Eliminate				
Limit activities to avoid peak shipping and commercial fishing activities.	F: No. Shipping occurs year-round and cannot be avoided. Concurrent operations (CONOPS) with fishing seasons cannot be eliminated as fishing activities occur consistency throughout the year, and exact timings and locations of fishing activities are not known. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Eliminate use of vessels.	F: No. The use of vessels is required to conduct the Petroleum Activities Program. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of the physical presence of the project vessels on other marine users, which is expected to be limited to commercial shipping movements. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, physical presence of the project vessels (and associated towed seismic equipment in the SNA) is unlikely to result in potential impact greater than slight, short-term impact to other marine users, such as commercial shipping. In addition, these activities will not interfere with other marine users rights to a greater extent than is necessary. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet expectations of AMSA and AHO provided during consultation with stakeholders. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of the physical presence of the project vessels (and associated towed seismic equipment in the SNA) to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Marine users are aware of the Petroleum Activities Program.	**C 1.1** Notify AHO of activities and movements no less than four weeks before the scheduled activity commencement date.	**PS 1.1** Notification to AHO four weeks prior to scheduled commencement to allow for the generation of navigation warnings (MSIN, NTA and NTM [including AUSCOAST warnings where relevant]).	**MC 1.1** Consultation records demonstrate that AHO has been notified prior to commencement of the Petroleum Activities Program within the required timeframes.
	C 1.2 Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements 24–48 hours before the scheduled activity commencement date.	**PS 1.2** Notification to AMSA JRCC 24–48 hours prior to the scheduled commencement date.	**MC 1.2.1** Consultation records demonstrate that AMSA JRCC has been notified prior to commencement of the Petroleum Activities Program within the required timeframes.
	C 1.3 Notify relevant government departments, fishing industry representative bodies, fishery licence holders, and other oil and gas operators (if agreed during consultation) of activities prior to commencement and upon completion of activities	**PS 1.3** Notification to AFMA, CFA, DAFF (fisheries), WAFIC, DPIRD, Recfishwest, individual fishery licence holders and other oil and gas operators (if agreed during consultation) ten days before activity commences, and following completion of activities, as per **Table 7-2**	**MC 1.3.1** Consultation records demonstrate that relevant stakeholders have been notified prior to commencement of the Petroleum Activities Program within the required timeframes and on completion of activities.
	C 1.4 Engage with proponents identified as having potential concurrent activities within the Operational Area prior to commencing the Petroleum Activities Program and develop an operations plan including the following aspects: • communications • work programming • hazard management • emergency response	**PS 1.4** A concurrent operations plan developed for any concurrent MSS activities identified within the Operational Area.	**MC 1.4.1** Records demonstrate Woodside re-engage with identified proponent before commencing the Petroleum Activities program and developed a concurrent operations plan (if required).
	C 1.5 Notify Defence of activities and movements no less than five weeks before the scheduled activity commencement date.	**PS 1.5** Notification to Defence five weeks prior to the scheduled commencement date.	**MC 1.5.1** Records demonstrate that Defence has been notified prior to commencement of the Petroleum Activities Program within the required timeframes.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	C 1.6 Establish and maintain a publicly available website to include both: • An interactive map which provides persons with updated information on activities being conducted as part of the Petroleum Activities Program, including location of seismic vessel and • cetacean and marine turtle observations	**PS 1.6a** Activity interactive map established and maintained throughout activities.	**MC 1.6.1** Records demonstrate interactive map was provided and available to stakeholders throughout activities.
		PS 1.6b Cetacean and marine turtles observations available on a public website	**MC 1.6.2** Records of marine turtles and cetaceans sightings available on a public website.
EPO 2 Prevent adverse interactions between vessels and other marine users during the Petroleum Activities Program	**C 2.1** Establish and maintain a 3 nm radius SNA around the seismic vessel and towed array.	**PS 2.1** SNA established, communicated and maintained around the seismic vessel and towed array during the Petroleum Activities Program.	**MC 2.1.1** Records demonstrate that the SNA has been established and details have been communicated to approaching third-party vessels.
	C 2.2 Employ at least one support/chase vessel will be employed to assist the seismic vessel.	**PS 2.2** At least, one vessel employed to assist the seismic vessel mitigate interactions with third-party vessels.	**MC 2.2.1** Records demonstrate that a second vessel is employed for the Petroleum Activities Program.
	C 2.3 Project vessels to operate AIS, and tail buoys will be fitted with lights, GNSS and virtual AIS.	**PS 2.3** Project vessels operating AIS and tail boys fitted with lights, GNSS and virtual AIS.	**MC 2.3.1** Records demonstrate that project vessels operating AIS, and tail boys are fitted with lights, GNSS and virtual AIS.

6.6.2 Routine Acoustic Emissions: Seismic Survey Equipment

Context		
Activity Components – **Section 3.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5** Socio-Economic Environment – **Section 4.10**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Generation of underwater noise from seismic survey equipment					X	X	X	B	E	-	-	LGS GP	Acceptable	EPO 3, 4, 5, 6

Description of Source of Impact

The Petroleum Activities Program will use a seismic source, consisting of an airgun array with a maximum capacity of up to 3150 in³, towed at a water depth of 6–8 m (±1 m). The source will be used to generate acoustic pulses by periodically discharging compressed air into the water column, at intervals of about five to six seconds as the vessel transits along planned survey lines within the Active Source Area.

The 3150 in³ seismic source is expected to produces far-field source levels up to a maximum of 254.4 dB re 1 µPa m (PK) and per-pulse SEL of 227.4–230.2 dB re 1 μPa^2m^2s (at 10-2000 Hz) in the vertical plane directly beneath the array. In the horizontal (broadside) plane, the seismic source is expected to produce far-field source levels up to a maximum of 248.1 dB re 1 µPa m (PK) and per-pulse SEL of 224.1 dB re 1 μPa^2m^2s (at 10-2000 Hz).

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Elevated underwater noise can affect marine fauna, including marine mammals (cetaceans), turtles and fishes in three main ways (Richardson et al.,1995; Simmonds et al., 2004):

- By causing direct physical effects, including injury or hearing impairment. Hearing impairment may be temporary (temporary threshold shift – TTS), or permanent (PTS), with PTS generally considered to represent a form of injury.
- Through disturbance leading to behavioural changes or displacement from important areas. The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation.
- By masking or interfering with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey).

The area over which seismic sound may adversely impact marine species depends upon multiple factors including the extent of sound propagation relative to the location of receptors, and the sensitivity and range of spectral hearing of different species (Slabbekoorn et al., 2010; Popper and Hawkins, 2012).

Without adequate control measures in place, noise emitted from the seismic source used during the Petroleum Activities Program has the potential to impact a range of receptor groups, being:

- plankton
- benthic invertebrates
- fish, sharks and rays
- cetaceans

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- marine turtles
- seabirds and migratory shorebirds
- commercial fisheries
- marine protected areas.

Sound metric terminology

Sound levels and the decibel scale

The decibel (dB) scale is used to measure the amplitude or 'loudness' of a sound wave. For underwater sounds, the dB scale is denoted relative to the reference pressure of 1 micropascal (µPa) e.g. dB re 1 µPa, whereas the reference pressure level used in air is 20 µPa, which was selected to match human hearing sensitivity. Because of these differences in reference standards, dB sound levels in air are not comparable to underwater sound levels i.e. dB sound levels underwater are much quieter than the same dB sound levels in air (Carroll et al., 2017).

Sound metrics

Marine seismic surveys emit pulses of underwater sound. These sounds are termed 'impulsive' sounds as they are brief and intermittent with rapid rise times and decay back to ambient levels (within a few seconds).

There are four main metrics used to measure and describe underwater sound pressure and energy that are applied to the assessment of these types of sound, all of which use the decibel scale (adapted from ISO/DIS 18405.2:2017):

- **Zero-to-peak sound pressure (PK)**, the greatest magnitude of the sound pressure during a specified time interval (**Figure 6-1**); unit: dB re 1 µPa; PK levels are relevant to the assessment of potential physical injury and impairment impacts to marine fauna and biota resulting from a single seismic pulse.
- **Peak-to-peak sound pressure (PK-PK),** sum of the peak compressional pressure and the peak rarefactional pressure during a specified time interval (approximately double the zero-to-peak pressure) (**Figure 6-1**); unit: dB re 1 µPa; PK-PK levels, like PK levels, are relevant to the assessment of potential physical injury and impairment impacts to marine fauna and biota resulting from a single seismic pulse.
- **Root-mean-square sound pressure level (SPL),** the time-mean-square sound pressure, in a stated frequency band, to the square of the reference sound pressure over the duration of an acoustic event (i.e. the duration of a single seismic pulse) (**Figure 6-1**); unit: dB re 1 µPa; because the SPL represents the effective sound pressure over the full duration of the acoustic event rather than the maximum instantaneous peak pressure, it is regularly used to represent the effective loudness of a sound and to assess the potential for a behavioural response from marine fauna.
- **Sound exposure level (SEL),** a measure related to the sound energy (instead of the sound pressure) in one or more pulses, or the ratio of the time-integrated squared sound pressure to the specified reference value; unit: dB re 1 $\mu Pa^2 \cdot s$; SEL is specified in terms of either a per-pulse SEL or an accumulated SEL (SEL_{cum}) from multiple pulses over a given period. SEL recognises that the effects of sound can be a function of exposure duration as well as maximum instantaneous peak pressure. SEL can therefore be considered a dose-type measurement with SEL_{cum} being used to assess dose-type impacts such as the potential for the gradual onset of temporary threshold shift (TTS) in marine fauna hearing because of prolonged exposure to high sound levels. It is standard practice for SEL_{cum} to be assessed over a summation period of 24-hours (SEL_{24h}).

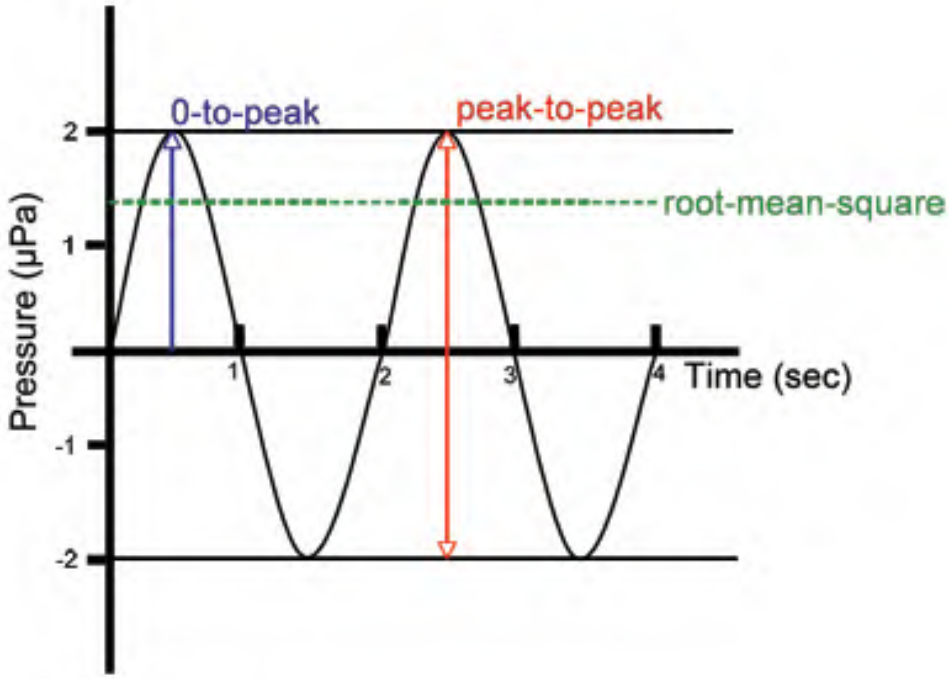

Figure 6-1: Simplified sound wave and sound pressure metrics (University of Rhode Island and Inner Space Center, 2017)

Particle motion

The particle motion component of sound is also relevant to the assessment of potential impacts to marine fauna. Acoustic particle motion refers to the physical motion caused by a sound wave within the water, seabed or other medium. Unlike pressure, particle motion is directional in nature, although the actual to-and-fro particle displacements that constitute sound are extremely small, in the order of nanometres (Popper and Hawkins, 2018). Particle motion can be described in terms of particle displacement (m), velocity (m/s), or acceleration (m/s^2) (Popper et al., 2014; Carroll et al., 2017). Alternatively, it is sometimes expressed in dB with respect to a reference value of displacement (dB re 1 pm), velocity (dB re 1 nm/s) or acceleration (dB re 1 µm/s^2) (Nedelec et al., 2016).

Particle motion is important because marine invertebrates and most fishes are primarily sensitive to particle motion rather than sound pressure and, therefore, particle motion is the most relevant metric for perceiving underwater sound by invertebrates and most fish species (Popper and Hawkins, 2019). However, there is currently limited information available to quantify the particle motion sensitivity of fishes and invertebrates. It is complex and challenging to directly measure particle motion compared to sound pressure, hence most research is presented in the context of sound pressure or exposure levels instead of particle motion (Carroll et al., 2017; Popper and Hawkins, 2018). Therefore, while the assessment of underwater noise impacts in this EP considers the role of particle motion and its effect on fishes and invertebrates, the acoustic modelling and impact threshold criteria are based upon sound pressure and sound exposure metrics.

It should be noted that particle motion is most relevant close to the source where it is the dominant component of a sound wave, while pressure will dominate a sound wave propagating over distance (Radford et al., 2012; Morley et al., 2014; Nedelec et al,. 2016; Popper and Hawkins, 2018). Sound pressure levels received at increasing distance from a source do not, therefore, provide a reliable representation of particle motion. Organisms that are sensitive only to particle motion have typically been found to be sensitive only at close range where these particle motions are greatest (Popper et al., 2014; Edmonds et al., 2016; Popper and Hawkins, 2018).

Sound frequency and hearing sensitivity

Different animals are sensitive to different sound frequencies, which are measured in Hertz (Hz) and kilohertz (kHz). Therefore, if an animal is sensitive to a particular frequency range, a sound in that frequency range will seem louder to that animal than to a different animal which is less sensitive to those frequencies. For example, some large baleen whales are sensitive to very low frequency sounds (7 Hz to 35 kHz), while other toothed whales and dolphin species are considered more sensitive to mid-high frequency sounds (150 Hz to 160 kHz) with their peak hearing frequency somewhere between these frequency ranges (National Marine Fisheries Service, 2018). Therefore, how loud a sound will be perceived will differ between species.

In some cases, a sound level is specified relative to a given frequency range or is weighted according to the auditory sensitivity of an animal (e.g. low-frequency, medium-frequency and high-frequency groups of cetaceans). This has the

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advantage of placing the sound into a more biologically relevant context for that animal. If a frequency range or weighting is not specified, the frequency of the sound is generally referred to as “broadband” sound i.e. the sound level accounts for sound across all frequencies, noting again that a particular animal may not be able to detect all of the sound frequencies and associated energy that are emitted.

Therefore, the frequency of a sound and how sensitive different animals are to sound can make a considerable difference to how loud the sound is perceived to be and any resultant impact.

Acoustic modelling

To assess the potential magnitude and extent of impacts from underwater noise produced during the Petroleum Activities Program, Woodside commissioned JASCO Applied Sciences (JASCO) to model sound propagation at several locations that were representative of the different water depths, bathymetry and seabed properties within the Active Source Area (Koessler et al., 2021; **Appendix G**).

The objective of this acoustic modelling study was to evaluate the potential effects of sound (potential injury and behavioural disruption) to marine fauna including cetaceans, marine reptiles, fishes, elasmobranchs, and zooplankton. The modelling also provides information to support the evaluation of potential effects of sound on socio-economic receptors such as commercial fisheries and marine protected areas.

Two standalone single-impulse sites were modelled and used to model one scenario for survey operations over 24 hours to assess accumulated SEL. The modelled sites and acquisition lines are shown in **Figure 6-2** along with the survey boundaries and other areas of interest. The accumulated SEL scenario assumed that a survey vessel sailed along survey lines at ~4.5 knots, with an impulse interval of 12.5 m. The locations of the single impulse sites were selected to cover a range of water depths along the survey lines that will be acquired during the Scarborough 4D B1 MSS, and the potential sound propagation characteristics that may arise during acquisition.

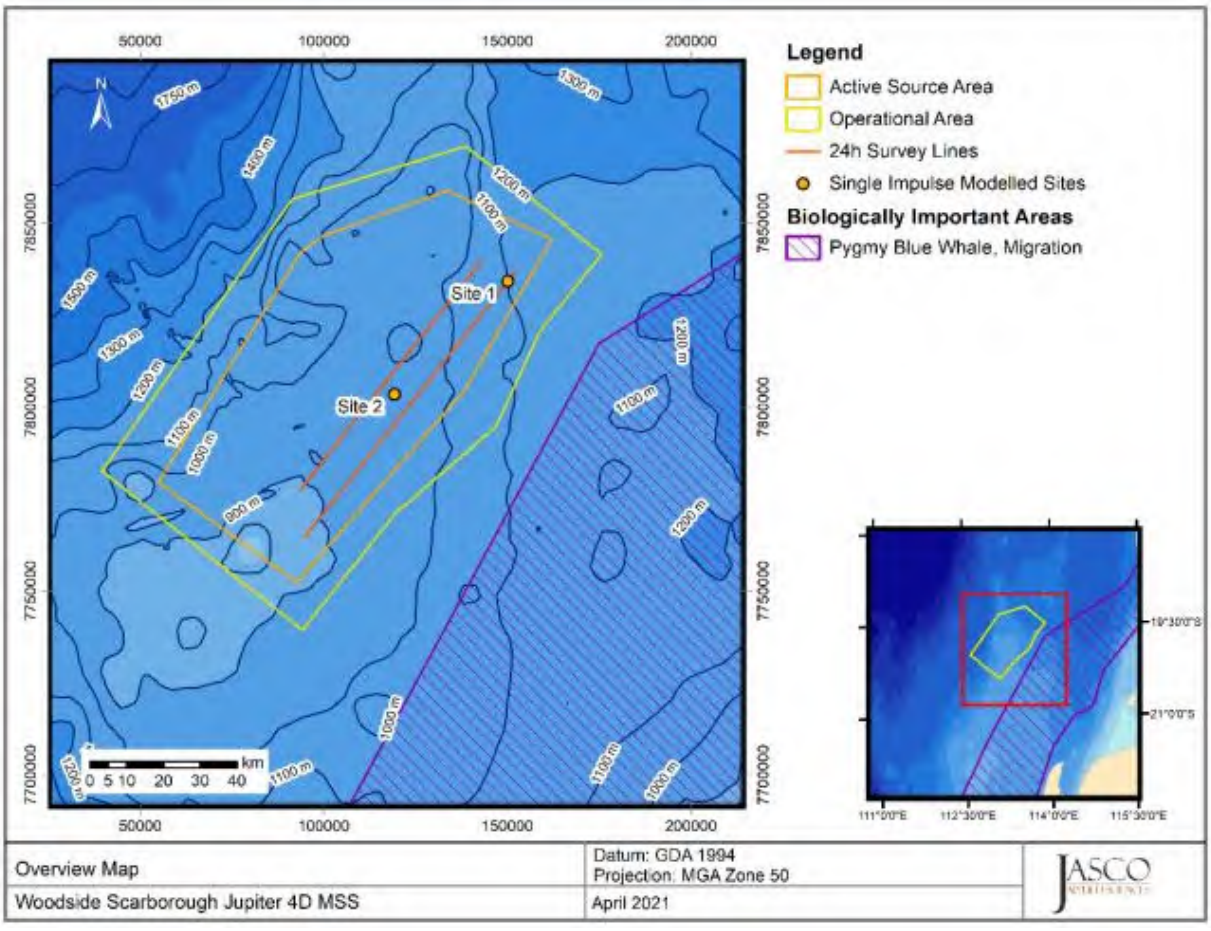

Figure 6-2: Overview of the modelled sites, acquisition lines, and features for the Scarborough 4D B1 MSS (Koessler et al., 2021)

Contours of the modelled underwater sound fields were computed, sampled either as the maximum value over all modelled depths (maximum-over-depth: MOD) or at the seafloor for the two single pulse locations, and one cumulative SEL_{24h} scenario. The modelled distances to each of the sound exposure thresholds for marine fauna were computed from these contours.

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Two distances relative to the source are reported for each sound level:

- R_{max} - the maximum range to the given sound level over all azimuths; and
- $R_{95\%}$ - the range to the given sound level after the 5% farthest points were excluded.

The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment. In some environments a sound level contour might have small anomalous isolated fringes in which case the use of R_{max} can misrepresent the area of the region exposed to such effects. In these instances $R_{95\%}$ is considered more representative. In environments that have bathymetric features that affect sound propagation then the $R_{95\%}$ may neglect to account for these and therefore R_{max} might better represent the region of effect in specific directions. For this impact assessment the R_{max} values have been considered. In many of the impact assessments, the maximum R_{max} values resulting from the various modelling sites have been referenced (unless specified) which provides a further level of conservatism to the assessment.

The results of the acoustic modelling are presented in relation to the sound exposure thresholds relevant to each receptor group assessed below. The detailed results are provided in the acoustic modelling report (Koessler et al., 2021; **Appendix G**).

Animal movement and exposure modelling (ANIMAT modelling)

In addition to the propagation modelling outlined above, Woodside commissioned JASCO to perform an acoustic exposure analysis study for pygmy blue whales (*Balaenoptera musculus brevicauda*) within the migration BIA to investigate any potential effects on pygmy blue whale migration from the Scarborough 4D B1 MSS (Koessler et al., 2021; **Appendix G**). Detailed information on pygmy blue whales was derived from a range of sources that used multi-sensor tags to record fine-scale dive and movement behaviour (Owen et al., 2016; Möller et al., 2020). Where information was unavailable for pygmy blue whales, parameters were derived from blue whale (*B. musculus*) tagging data (Goldbogen et al., 2011).

Sound exposure distribution estimates were determined by moving large numbers of simulated animals (animats) through a modelled time-evolving sound field, computed using the existing sound source and sound propagation model (Koessler et al., 2021). This approach provides the most realistic prediction of the maximum expected root-mean-square sound pressure level (SPL) and peak pressure level (PK), and the temporal accumulation of sound exposure level (SEL) that are now considered the most relevant sound metrics for impact assessment.

The acoustic exposure analysis and animal movement (animat) scenario was modelled for a seven day period, with the spatial distribution of animats restricted to the migration BIA, and the same vessel speed and impulse interval as the accumulated SEL scenario discussed above. On each day, a 24-hour segment of the planned seismic track lines was run. **Figure 6-3** shows the geographic features associated with the modelled animat scenario. The results of the ANIMAT modelling are discussed below, and detailed results are provided in the acoustic modelling report (Koessler et al., 2021; **Appendix G**).

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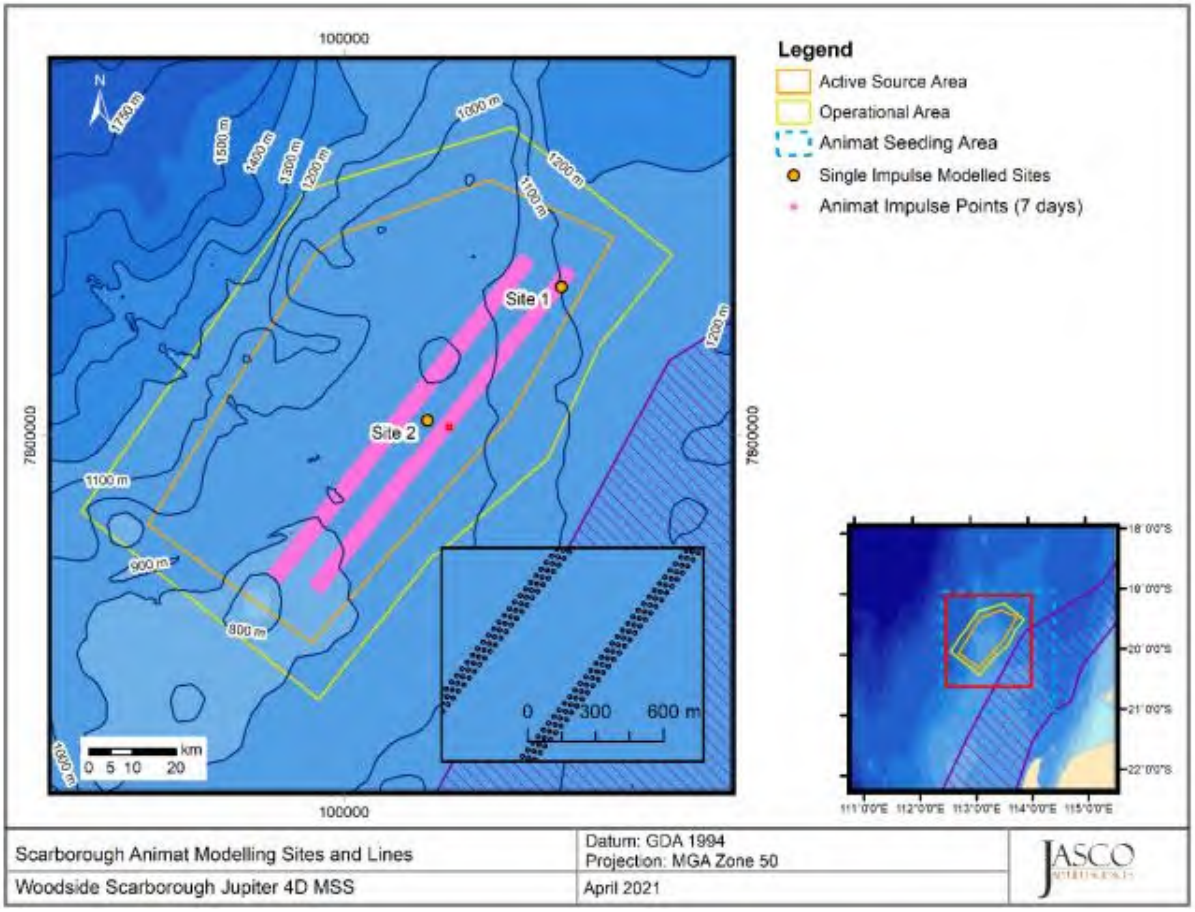

Figure 6-3: Overview of the features for the pygmy blue whale exposure modelling for the Scarborough 4D B1 MSS (Koessler et al., 2021)

Zooplankton

Species sensitivity and sound exposure thresholds

Plankton is a collective term for all marine organisms that are unable to swim against a current. This group is diverse and includes phytoplankton (plants) and zooplankton (animals), as well as fish and invertebrate eggs and larvae. There is no scientific information on the potential for noise-induced effect in phytoplankton and no functional cause-effect relationship has been established. Noise-induced effects on zooplankton, such as copepods, cladocerans, chaetognaths and euphausiids, have been investigated in a number of sound exposure experiments.

Zooplankton includes fish eggs and larvae that are transported by currents and winds and hence cannot take evasive behaviour to avoid seismic sources. Larval fish species studied appear to have hearing frequency ranges similar to those of adults and similar acoustic startle thresholds (Popper et al., 2014). Swim bladders may develop during the larval stage and may render larvae susceptible to pressure-related injuries such as barotrauma. Effects of sound upon eggs, and larvae containing gas bubbles, is focused on barotrauma rather than hearing (Popper et al., 2014). Larval stages are often considered more sensitive to stressors than adult stages, but exposure to seismic sound reveals no differences in larval mortality or abundance for fish, crabs or scallops (Carroll et al., 2017).

Parry et al. (2002) studied the abundance of plankton after exposure to airgun sounds but found no evidence of mortality or changes in catch-rate at a population-level. Other studies have also noted limited negative impacts on zooplankton, fish eggs, larvae or fry, and most have reported that impacts occur within a few metres or tens of metres from the source (Kostyuchenko, 1973; Dalen and Knutsen, 1987; Holliday et al., 1987; Kosheleva, 1992; Pearson et al., 1994; Turnpenny and Nedwell, 1994; Booman et al., 1996; Payne, 2004; Payne et al., 2009). These studies included exposures to sound pressures up to approximately 242 dB re 1 µPa, comparable to those predicted in close range to the Scarborough 4D B1 MSS seismic source.

McCauley et al. (2017) found that after exposure to airgun sounds generated with a single airgun (150 cui) zooplankton abundance decreased and mortality in adult and larval zooplankton increased two-to three fold when compared with controls. In this large-scale field experiment on the impact of seismic activity on zooplankton, a sonar and net tows were used to measure the effects on plankton, and a maximum effect-range of horizontal 1.2 km was determined. The findings contradicted the conventional idea of limited and very localised impact of intense sound in

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general, and seismic airgun signals in particular, on zooplankton, with the results indicating that there may be noise-induced effects on these taxa and that these effects may even be negatively affecting ocean ecosystem function and productivity.

The study measured zooplankton abundance and the proportion of the population that was dead at three distances from a single 150 cui airgun; 0 m, 200 m and 800 m. The experiment estimated the proportion of the zooplankton that was found to be dead, both before and after exposure to airgun noise, using net samples to measure zooplankton abundance, and bioacoustics to identify the distribution of zooplankton. In this study, copepods dominated the mesozooplankton (0.2–20 mm), and impacts were not assessed on microzooplankton (0.02–0.2 mm) or macrozooplankton (>20 mm).

McCauley et al. (2017) provide three findings from the experiment to show that zooplankton were affected by the seismic source:

- the proportion of the mesozooplankton community that was dead increased two- to three-fold;
- the abundance of zooplankton estimated by net samples declined by 64%; and
- the opening of a “hole” in the zooplankton backscatter observed via acoustics.

They found that exposure to airgun noise significantly decreased zooplankton abundance, and increased the mortality rate from a natural level of 19% per day to 45% per day (on the day of exposure, and that these impacts were observed out to the maximum range assessed (1.2 km) (McCauley et al., 2017).

Scientists from CSIRO’s Oceans and Atmosphere Business Units were contracted by APPEA to undertake a desktop study that: a) critically reviewed the methodologies and findings of the McCauley et al. (2017) experiment; and b) simulated the large scale impact of a seismic survey on zooplankton in the North West Shelf region, based on the mortality rate associated with airgun noise exposure reported by McCauley et al. (2017).

The CSIRO review of the McCauley et al. (2017) study found that there were three primary questions raised by the results of the experiment, all of which warrant further investigation (Richardson et al., 2017):

- Why was there no attenuation of the impact with distance? There is no consistent decline in the proportion of zooplankton that are dead with increasing distance away from the airgun. The energy of the sound waves at a distance of 1.2 km is substantially lower than at the source.
- Why was there an immediate decline in abundance? It is unclear why there would be a near immediate drop in zooplankton abundance as measured by net samples and acoustic data. If zooplankton were killed, they would not immediately sink from the surface layers, or be rapidly eaten. A drop in abundance would be more likely once the dead zooplankton either sunk to the bottom or were removed by predation.
- Was there sufficient replication to be confident in the study findings?

The conclusions made by McCauley et al. (2017) were based on a relatively small number of zooplankton samples. A total of 24 samples were collected – 2 tows each sampling time x 3 distances from the gun (0 m, 200 m, 800 m) x 2 levels (Control, Exposed) x 2 replicate experiments (Day 1, Day 2). Therefore, there were only 12 samples collected under conditions exposed to the airgun, six on each day of the two experiments. The major confounding explanation for this study is that a different water mass entered the area on each day of the experiment and had lower abundance and higher quantities of dead zooplankton. Richardson et al. (2017) concluded that: “although this is relatively unlikely it cannot be discounted because of the relatively few samples collected and only two replicate experiments conducted.”

Independently of the APPEA/CSIRO study, the International Association of Geophysical Contractors (IAGC) conducted its own review of the McCauley et al. (2017) paper. This review came to the following conclusion: “While we found the study interesting, we are also troubled by the small sample sizes, the large day-to-day variability in both the baseline and experimental data, and the large number of speculative conclusions that appear inconsistent with the data collected over a two-day period. Both statistically and methodologically, this project falls short of what would be needed to provide a convincing case for adverse effects from geophysical survey operations.” (IAGC, 2017).

The second component of the CSIRO study (Richardson et al., 2017) was to estimate the spatial and temporal impact of seismic activity on zooplankton on the North West Shelf from a large-scale seismic survey, considering mortality estimates of McCauley et al. (2017), and accounting for typical growth rates, natural mortality rates, and the ocean circulation in the region. The approach modelled a hypothetical 3D survey (2,900 km^2 in size, over a 35-day period, in water depths of 300-800 m) on the edge of the North West Shelf during summer. To simulate the movement of zooplankton by currents, the researchers used a hydrodynamic model that seeded 0.5 million particles into CSIRO’s Ocean Forecast Australia Model. Zooplankton particles could be hit multiple times by airgun pulses if they were carried by currents into the future survey path. The greatest limitation in this approach was accurate knowledge of the natural growth and mortality rates of zooplankton, and to address this the CSIRO researchers tested the sensitivity of the model to different recovery (growth-mortality) rates, and also the sensitivity of the results to ocean circulation by undertaking simulations with and without water motion (Richardson et al., 2017).

The results of the simulations, that included ocean circulation, showed that the impact of the seismic survey on zooplankton biomass was greatest in the Survey Region (defined as the survey Acquisition Area with a 2.5 km impact zone around it) (22% of the zooplankton biomass was removed) and declines as one moves beyond it to the Survey

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Region + 15 km (14% of biomass removed), and the Survey Region + 150 km (2% of biomass removed). The time to recovery (to 95% of the original level) for the Survey Region and Survey Region + 15 km recovery was 39 days (38–42 days) after the start of the survey and 3 days (2–6 days) after the end of the survey (Richardson et al., 2017).

The major findings of the CSIRO study were that there was substantial impact of seismic activity on zooplankton populations on a local scale within or close to the survey area, however, on a regional scale the impacts were minimal and were not discernible over the entire North West Shelf bioregion. Additionally, the study found that the time for the zooplankton biomass to recover to pre-seismic levels inside the survey area, and within 15 km of the area, was only three days following the completion of the survey. This relatively quick recovery was due to the fast growth rates of zooplankton, and the dispersal and mixing of zooplankton from both inside and outside of the impacted region (Richardson et al., 2017).

A more recent study by Fields et al. (2019) exposed zooplankton (copepods) to seismic pulses at various distances up to 25 m from a seismic source. The source levels produced were estimated to be 221 dB re µPa²·s. The study observed an increase in immediate mortality rates of up to 30% of copepods in samples compared to controls at distances of 5 m or less from the airguns. Mortality one week after exposure was significantly higher by 9% relative to controls in the copepods placed 10 m from the airguns. Fields et al. (2019) also reported no sub-lethal effects of seismic exposure to the copepods. These findings of the study are consistent with numerous other field studies referenced above, indicating that the potential effects of seismic pulses to zooplankton are limited to within approximately 10 m from the seismic source. Fields et al. (2019) note that the findings of the McCauley et al. (2017) study are difficult to reconcile with the body of other available research. The findings of the McCauley et al. (2017) study may, therefore, provide an overly conservative estimate of the potential effects of seismic pulses to zooplankton.

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For this impact assessment the sound exposure thresholds for mortality/potential mortal injury (PMI) to fish eggs and larvae from Popper et al. (2014) were applied and consider both PK and SEL_{24h} metrics (refer to **Table 6-2**). The thresholds were based on limited data, and were selected on the basis that Popper et al. (2014) note that they are likely to be conservative. While research generally suggests limited impacts to plankton beyond approximately 10 m distance from seismic sources, the precautionary Popper et al. (2014) thresholds for larval mortality / PMI have been selected to indicate the magnitude and extent of potential impacts from the survey.

Table 6-2: Maximum predicted distance (R_{max}) to mortality/PMI thresholds in the water column for fish eggs and larvae, and zooplankton

Sound Exposure Threshold	R_{max} distance (km)
207 dB re 1 µPa (PK)	0.11
210 dB re 1 µPa².s (SEL_{24h})	0.05

As shown in **Table 6-2**, the maximum distance (R_{max}) to mortality/PMI thresholds for fish eggs and larvae, and zooplankton, applying the single pulse (PK) 207 dB re 1 µPa threshold from Popper et al. (2014) is 110 m.

Any potential mortality/PMI impacts to zooplankton communities have to be assessed in the context of natural mortality in these populations. Any mortality or mortal injury effects to zooplankton (including fish eggs and larvae) resulting from seismic noise emissions are likely to be inconsequential compared to natural mortality rates, which are very high—exceeding 50% per day in some species and commonly exceeding 10% per day (Tang et al., 2014). For example, in a review of mortality estimates (Houde and Zastrow, 1993), the mean mortality rate for marine fish larvae was M = 0.24, a rate equivalent to a loss of 21.3% per day. In the experiment undertaken by McCauley et al. (2017) zooplankton mortality rate background levels were 19%. Sætre and Ona (1996) calculated that under the 'worst-case' scenario, the number of larvae killed during a typical seismic survey was 0.45% of the total population, and they concluded that mortality rates caused by exposure to airgun sounds are so low compared to natural mortality that the impact from seismic surveys must be regarded as insignificant.

The magnitude of such localised impacts (≤110 m from the seismic source) is negligible and is not expected to be discernible at the regional scale when considering the large natural spatial and temporal variability and scale of plankton and spawning biomass in the NWMR. In particular, phytoplankton and zooplankton biomass in the oceans can vary significantly at spatial scales ranging from hundreds of metres to hundreds of kilometres and temporal scales of hours, days, seasons and inter-annually, due to tidal and large scale currents, bathymetry, temperature, salinity, water chemistry parameters and other environmental factors (Gibbons and Hutchings, 1996; Holliday et al., 2011; McKinnon et al., 2008; Pearce et al., 2000; Sutton and Beckley, 2017). Therefore, changes in zooplankton abundance are likely to be replenished and indistinguishable from natural levels and distributions within hours of a seismic survey vessel passing. Furthermore, impacts to predator/ prey interactions, given the highly localised impact (<110 m from seismic source) and temporary nature of the impacts (hours), are unlikely.

Zooplankton – Impact Assessment Conclusion

The potential impacts of noise emissions from the seismic source on zooplankton during the seismic acquisition are considered to be slight and short-term, and the activity is not likely to result in any ecologically significant impacts at a

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population level for any zooplankton, fish eggs or larvae that may be present in the water column within or adjacent to the Operational Area. The Exmouth Plateau KEF is recognised as an area of upwelling of deeper, nutrient rich waters to the surface. These upwelling events experience high natural variability and therefore it is expected any impacts to zooplankton will be minimal at a regional scale and unlikely to result in impacts to high order trophic levels.

Benthic Invertebrates

Species Sensitivity and Sound Exposure Thresholds

Research is ongoing into the relationship between sound and its effects on benthic invertebrates, including the relevant metrics for both effect and impact. Marine invertebrates lack a gas-filled bladder and are unable to detect the pressure component of sound waves (Parry and Gason, 2006; Carroll et al., 2017) or "hear" sound in the way that mammals and fish are able to. Instead, invertebrates detect sound by sensing the particle motion component of sound in water and seabed sediments through physiological structures such as sensory hairs, statocysts and muscles, and therefore detect sound at close range (McCauley, 1994; Parry and Gason, 2006; André et al., 2016; Roberts et al., 2016; Edmonds et al, 2016; Carroll et al., 2017; Popper and Hawkins, 2018).

Statocysts, found in a wide range of invertebrates, are utilised by animals to maintain their orientation, direct their movements through the water and may play a key role in controlling the behaviour responses of invertebrates to a wide range of stimuli. Although directly sensitive to particle motion and not to sound pressure, most available research on seismic impacts to invertebrates characterises received sound levels in terms of the sound pressure. Therefore, available literature suggests particle motion, rather than sound pressure, is a more important factor for benthic invertebrates such as crustacean and molluscs. Water depth and seismic source size are related to the particle motion levels at the seafloor, with larger arrays and shallower water being related to higher particle motion levels, thus more relevant to effects on crustaceans and bivalves (Koessler et al., 2021; **Appendix G**).

A range of physiological responses have been identified in some studies; however, the received sound levels are typically at levels that would be received within tens or a few hundred metres from the sound source or have been from repeated exposure at the same sound levels, which is not typical of an actual seismic survey (Carroll et al., 2017; Edmonds et al., 2016; Salgado Kent et al., 2016; Webster et al., 2018).

Studies by Christian et al. (2003), DFO (2004) and Payne et al. (2007, 2008) have exposed crustaceans to seismic sound levels of approximately 197–237 dB re 1 µPa PK-PK. No acute or chronic lethal or sub-lethal effects were observed in the weeks to months following exposure, with the exception of Payne et al. (2007, 2008) who noted a decrease in serum enzymes and an increase in food consumption in the weeks to months post exposure, which may indicate stress effects or potential osmo-regulatory disturbance.

Research undertaken by Day et al. (2016a, 2016b) in Australian waters exposed captive southern rock lobster (*Jasus edwardsii*) to multiple passes of a seismic source element in 10-12 m water depths. Maximum received sound exposures were 209-212 dB re 1µPa PK-PK, 186 to 190 dB re 1 µPa²·s per-pulse SEL, and SEL_{cum} of 192 to 199 dB re µPa²·s. Exposed lobsters and control lobsters were sampled up to a year post-exposure. The findings of the study are as follows:

- Exposure to seismic sound did not result in any mortalities to adult lobsters.
- Some potential sub-lethal changes in adult lobsters were observed, including some long-term impairment to lobsters' statocysts, which was also linked to a short delay in the lobsters' ability to right themselves when upturned.
- Haemocyte count (indicative of immune response function) also showed some evidence of decline over time.
- The condition or development of eggs carried by female lobsters at the time of exposure, even at close proximity directly beneath the seismic source, were not affected.

The significance of the seismic exposures and whether the sub-lethal effects may have wider ecological implications (e.g. ability to feed, avoid predators and resist disease) warrants further consideration. Day et al. (2016a, 2016b) reported that some of the control lobsters used in the experiments were collected from a marine reserve and were found to have a high level of pre-existing impairment to statocysts similar to that induced by the seismic exposure experiments, which was considered to be the result of long-term exposure to shipping noise. Some experiments showed no significant differences in righting times between control and exposed lobsters, while in some instances the control lobsters demonstrated slower righting times than exposed lobsters. Lobsters with pre-existing statocyst impairment demonstrated the fastest righting times of all experiments, which Day et al. (2016a, 2016b) suggested may indicate that lobsters are able to adapt or compensate for long-term statocyst impairment. Therefore, the level of statocyst impairment resulting from seismic exposure is not clear. Monitoring of the lobster population at the same reserve where the lobsters with pre-existing statocyst impairment were taken from showed that the rock lobster population within the reserve was thriving and at carrying capacity (Green and Gardner, 2009; Kordjazi et al., 2015). Therefore, the levels of statocyst impairment reported in the Day et al. (2016a, 2016b) study does not appear to be impacting on the survival of the lobster population, and any population-level survivability effects from statocyst impairment are not significant and wider ecological implications are likely to be negligible.

More recently Day et al. (2019) concluded that airgun exposure did cause damage to the righting reflect and statocysts in rock lobsters (*Jasus edwardsii*). Following exposure equivalent to a full-scale commercial array (3100

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cui) passing within 100–500 m, lobsters showed impaired righting and significant damage to the sensory hairs of the statocyst. Reflex impairment and statocyst damage persisted up to 365 days post-exposure and did not improve following moulting. For this study, maximum measured received noise levels were 209-213 dB re 1 µPa (PK-PK).

Day et al. (2021) examined the potential impacts of seismic surveys on the larval stages of southern rock lobster (*Jasus edwardsii*) to determine whether early development and recruitment may be affected. Lobster puerulus (post-larval stage) and juveniles were held in baskets and exposed to multiple passes of a seismic source element in 10-12 m water depths. Maximum received sound exposures were 203-219 dB re 1µPa PK-PK, 181 to 190 dB re 1 µPa²·s per-pulse SEL, and SEL_{cum} of 201 to 205 dB re µPa²·s, comparable to Day et al. (2016a, 2016b) (Day et al., 2021). Lobster puerulus were randomly assigned to control (not exposed to airgun signals) or E0 (exposed to airgun signals at a nominal range of 0 m from the sail line), and juveniles were assigned to control, E0 and E500 (exposed to airgun signals at a nominal range of 500 m from the vessel sail line). The findings of the study are as follows:

- Exposure did not result in any elevated mortality for puerulus or juveniles.
- Righting was significantly impaired for all exposure treatments immediately after exposure, indicating that the range of impact extended to at least 500 m from the source (maximum range tested in the study).
- Puerelus and juvenile E0 treatment lobsters did not show the capacity for recovery, while juvenile E500 lobsters recovered from impairment after the first moult, providing evidence of a range threshold for recovery.
- Intermoult period was significantly increased in E0 juvenile lobsters, and appeared to be increased in puerulus, while juvenile E500 treatment lobsters show a moderate, non-significant increase in moult duration.
- Increased intermoult duration suggested impacted development and potentially slowed growth, and physiological stress.

Kosheleva (1992) identified no detectable effects to marine bivalves and gastropods (mussels and periwinkles) after exposure to a single seismic source element of source level 233 dB re 1µPa at a distance of 0.5 m or greater from the source. Conversely, Matishov (1992) reported a single scallop shell splitting in a sample of three scallops, but this was located 2 m beneath a seismic source element and therefore exposed to maximum sources levels (which is not representative of a typical commercial seismic survey).

Recent Australian studies (Przeslawski et al., 2016, 2018; Day et al., 2016b, 2017) have focused on commercial scallops (*Pecten fumatus*). Przeslawski et al. (2016, 2018) examined the short-term impacts on scallops and other marine invertebrates from a 2,530 in³ seismic array and found no evidence of mortality or change in condition following exposure to a seismic survey. Analysis of images and samples revealed some site-specific differences in scallop abundance, size, condition and assemblages, but these were not related to seismic operations. Day et al. (2016b, 2017) exposed scallops to maximum received sound exposures of up to 213 dB re 1µPa PK-PK, 181 to 188 dB re 1 µPa².s per-pulse SEL, and SEL_{cum} of 188 to 198 dB re 1µPa².s. The study also predicted ground acceleration of up to 37.57 m/s². Day et al. (2016b, 2017) concluded that exposures did not result in any immediate mass mortalities, however, repeated exposures resulted in a chronic increase in mortality over timeframes of approximately four months post-exposure, though not beyond naturally occurring rates of mortality. Separate experiments undertaken in 2013 and 2014 yielded mortalities of 3.6-3.8% in control scallops (no seismic exposure), 9.4-11.3% mortality in scallops exposed to a single pass of the seismic source, 11.3-16.1% mortality in scallops exposed to two passes of the seismic source, and 14.8-17.5% mortality in scallops exposed to four passes of the seismic source. The mortality rates were at the low end of the range of naturally occurring mortality rates documented in the wild, which range from 11-51% with a six year mean of 38% (Day et al., 2017). A third experiment in 2015 resulted in 100% mortality to both control scallops and exposed scallops, and accordingly was attributed to other causes and not to seismic exposure (Day et al., 2016b, 2017).

Sub-lethal effects to exposed scallops were also observed by Day et al. (2016b, 2017) indicating a compromised capacity for homeostasis and potential immunodeficiency over acute (hours to days) and chronic (months) timescales post exposure. Exposures did not elicit energetically expensive behaviours (i.e. extensive swimming or long periods of valve closure), but scallops showed significant changes in some behavioural patterns during exposure (e.g. “flinch” response) and an increase in recessing into sediment following exposure (Day et al., 2017).

Published sound exposure criteria do not currently exist for acoustic impacts to invertebrates but the available literature above provides an indication of the sound levels and distances within which some impacts may occur. A range of sound levels, from 202 dB re 1 µPa PK-PK to 212 dB re 1 µPa PK-PK, based on the findings of the Payne et al. (2008) and Day et al. (2016a, 2016b) studies, were applied in the assessment. The Payne et al. (2008) 202 dB re 1 µPa PK-PK is considered to be associated with no impacts to benthic crustaceans (such as prawns, scampi and lobsters), whereas the 209-212 re 1 µPa PK-PK thresholds could be associated with some level of sub-lethal effects in these animals (Koessler et al., 2021). A 213 dB re 1 µPa PK-PK level is considered as representative of levels that may result in sub-lethal effects and chronic mortality in molluscs and some other invertebrates based on Day et al. (2016b, 2017). A PK sound level of 226 dB re 1 µPa PK was applied for sponges, based on a study where corals and sponges received maximum sound pressure levels of 226-232 dB re 1µPa PK-PK, but no mortality, damage to soft tissue or skeletal integrity, visible signs of stress, change in abundance or community structure was detected immediately after, and up to four months following exposure (Heyward et al., 2018).

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The benthic habitats and communities present in the Operational Area are likely to be related to the water depth. As described in **Section 4.5**, the Operational Area is located entirely on the Exmouth Plateau KEF. The benthic communities associated with the water depths of the Operational Area (>800 m) include mostly echinoderms (e.g. sea cucumbers and sea stars), with benthic filter feeders and other epifauna likely present, although diversity and abundance is expected to be low. The substrate in these water depths is comprised of fine grain soft sediments, with a lack of hard substrate.

The seismic source will not be operated in shallow water areas where benthic communities are likely to be more diverse than in deeper waters. Seafloor sound levels and ranges were not specifically assessed in the noise modelling report; however, Koessler et al. (2021) note that the distribution of the sound within the water column indicates the ranges at the seafloor would not exceed the reported maximum-over-depth distances. Given the water depths of the Active Source Area (>800 m), it is likely that the ranges at the seafloor are less than the maximum-over-depth distances. Adjusting the PK levels reported in Koessler et al. (2021) by 6 dB (double the sound pressure) to convert to PK-PK levels, the Payne et al. (2008) 202 dB re 1 µPa PK-PK level associated with no impacts to benthic crustaceans is equivalent to 196 dB re 1 µPa PK, which has reported maximum-over-depth distance of 390 m. Similarly, converting the higher PK-PK levels that may result in sub-lethal effects to crustaceans and sub-lethal effects and chronic mortality in molluscs, suggests a maximum-over-depth distance in Koessler et al. (2021) of up to a few tens of metres. The effects ranges on the seafloor are likely to be less and may not be exceeded. The 226 dB re 1 µPa PK level is not expected to be exceeded at the seafloor and so deep water sponges or other similar filter-feeders that may be present in low abundance in the Operational Area will not be impacted.

Given the low diversity benthic communities present in the Operational Area, and the likely received sound levels on the seafloor in the >800 m water depths, impacts to benthic invertebrate communities on the seafloor are expected to be highly localised and temporary. Any impacts are likely to occur in parallel with the continuous natural cycle of death, recovery and recruitment of invertebrates, and therefore it is questionable whether any impacts from seismic exposure would be detectable from natural fluctuations in relative abundance, benthic community composition and structure (Day et al., 2017; Payne et al., 2007, 2008).

It is acknowledged that crystal crabs (also commonly known in Australia as snow crab), a commercial crab species targeted by the West Coast Deep Sea Crustacean Fishery, have been recorded off the west coast of WA in water depths of 300–1200 m (How et al., 2015) and so are considered in this assessment due to having the potential to occur within the Operational Area. However, the species core depth range is 500–800 m and the Ningaloo/North-west Cape region is understood to represent the species' most northerly extent (How et al., 2015). Egg-bearing females also tend to be found in greater abundance in water depths of less than 700 m (How et al., 2015). While some fishing effort was reported on the Exmouth Plateau between 2003 and 2010 (How et al., 2015), reported effort was low (potentially an isolated event) and based on 2010–2019 FishCube data, no fishing effort has been reported here since. Based on this information, it is unlikely that the Operational Area supports any significant numbers of crystal crab.

A study specifically into the effects of seismic on snow crabs (Christian et al., 2003, 2004) exposed captive adult male crabs and egg-bearing female crabs to approximately 197–237 dB re 1 µPa PK. The crabs were exposed to 200 pulses over a 33-minute period. No acute or chronic (12-weeks post-exposure) mortality impacts were observed in the adult crabs. Stress indicators in the snow crabs also showed no evidence of significant acute or chronic impacts. The crabs also did not exhibit any overt startle response during the exposure period or avoidance of the area following exposure.

Given the Operational Area is unlikely to support significant numbers of crystal crab and the limited reported effects of seismic to crustaceans, including to egg-bearing female crabs reported in Christian et al., (2003, 2004), no impacts to the commercial crystal crab stock are expected.

Benthic invertebrates – Impact Assessment Conclusion

Impacts to benthic invertebrates from noise emissions from the seismic source during the acquisition of the survey include potential sub-lethal effects and chronic mortality to some organisms within a few tens of metres below the source. However, given the water depths (>800 m), natural cycle of death, recovery and recruitment, impacts are expected to be slight and short-term, and the activity is not likely to result in any ecologically significant impacts at a population level for any benthic invertebrates that may be present on the seafloor within or adjacent to the Active Source Area.

Fish, Sharks and Rays

Species Sensitivity and Sound Exposure Thresholds

Every species of fish studied to date is able to hear. Fish produce sounds in a wide range of context such as feeding, mating or fighting, and as a result anything that inhibits the detection of these sounds can have a negative effect on their fitness and survival (Popper and Hawkins, 2019). The majority of fish species detect sounds from <50 Hz up to 500-1,500 Hz (Popper and Hawkins, 2019). A smaller number of species can detect sounds over 3 kHz, while very few species can detect ultrasound over 100 kHz (Ladich and Fay, 2013). The critical issue for understanding whether

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an anthropogenic sound will affect the hearing of a fish is whether it is within the hearing frequency range of the fish and loud enough to be detectable above background ambient noise.

The hearing sensitivity of fishes varies depending upon the auditory structures in the inner ear (otoliths surrounded by an epithelium of hair cells) and, if present, the swim bladder (Finneran and Hastings 2000; Nedwell et al., 2004). Otoliths are sensitive only to particle motion, while the swim bladder may provide an indirect route for sound pressure to reach the inner ear. The other main mechano-reception system in fishes is the lateral line system, which runs along the side of the body and is more pronounced in some groups of fish than others. The lateral line system responds to particle motion produced in the near-field of a sound source, as well as to tiny water currents set up by the motions of the fish (Nedwell et al., 2004), therefore all fish are sensitive to the particle motion component of sound at close range from a sound source. Particle motion is the most relevant metric for perceiving underwater sound for most species, but with the exception of a few species (Popper and Fay, 2011; Popper et al., 2014), there is an almost complete lack of relevant data on particle motion sensitivity in fishes (Popper and Hawkins, 2018). Some more specialised fish with a swim bladder that they use for hearing are sensitive to sound pressure and are capable of detecting less intense noise and a wider range of frequencies, compared to less-specialised groups of fish (Popper et al., 2014; Carroll et al., 2017; Hawkins and Popper, 2017). The susceptibility of fishes to injury from noise exposure varies depending on the species and the presence and possible role of a swim bladder in hearing.

In marine fishes, the connection with the swim bladder and ability to detect sound pressure is understood to be present to some varying degree in the families Clupeidae (e.g. herrings, sardines, pilchards and shads), Gadidae (e.g. true cods such as Atlantic cod and whiting), and some nearshore/reef species relevant to tropical Australia, including some species in the families Pomacentridae (e.g. damsel fishes and clown fishes), Holocentridae (soldierfishes and squirrelfishes) and Haemulidae (e.g. grunters and sweetlips) (Nedwell et al., 2004; Braun and Grande, 2008; Popper et al., 2014; Popper and Hawkins, 2018, 2019). However, the vast majority of marine fish species do not have this hearing specialisation.

A great many fish species possess a swim bladder or other gas-filled cavity but do not have a connection with their hearing, for example various demersal snapper, emperor and cod. Fish species that lack a gas-filled cavity altogether include elasmobranchs (e.g. sharks and rays), some flat fishes, some tunas, and mackerels (Casper et al., 2012; Popper et al. 2014).

The sound exposure thresholds applied for fish and elasmobranchs (sharks and rays) in the acoustic modelling study and in this impact assessment are summarised in **Table 6-3** and explained in more detail in the acoustic modelling report (Koessler et al., 2021). The modelling study assessed the ranges for quantitative threshold criteria based on the Popper et al. (2014) guidelines for three types of immediate effects to fish:

- Mortality, including injury leading to death.
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma.
- TTS.

The modelling study considered single pulse (PK) and multiple pulse (SEL_{24h}) metrics for both the entire water column and seafloor in the following categories reflective of the different hearing mechanisms and sensitivity to sound:

- I - Fish without a swim bladder (also appropriate for sharks in the absence of other information).
- II - Fish with a swim bladder that do not use it for hearing.
- III - Fish that use their swim bladders for hearing.

For this impact assessment, it is assumed that all fish can detect signals below 500 Hz and so can 'hear' the seismic source.

Table 6-3: Thresholds for seismic sound exposure for fish, adopted from Popper et al. (2014)

Type	Mortality and Potential Mortality Injury	Impairment			Behaviour
		Recoverable Injury	TTS	Masking	
I Fish: No swim bladder (particle motion detection)	>219 dB SEL_{24h} or >213 dB PK	>216 dB SEL_{24h} or >213 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
II Fish: Swim bladder not involved in hearing (particle motion detection)	>210 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low

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III Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate

Notes: Peak sound level (PK) dB re 1 µPa; SEL_{24h} dB re 1µPa^2·s. All criteria are presented as sound pressure, even for fish without swim bladders, since no data for particle motion exist. Relative risk (high, moderate, or low) is given for animals at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres), and far (F – thousands of metres).

Mortality/Injury

It is noted that while thresholds for fish mortality have been included for consideration in this assessment based on the Popper et al. (2014) guidelines, no studies to date have demonstrated direct mortality of free-swimming adult fishes in response to airgun emissions, even when fired at close proximity (within 1– 7 m) (DFO, 2004; Boeger et al., 2006; Popper et al., 2016; Carroll et al., 2017). Although some fish deaths have been reported during cage experiments, these were more likely caused by experimental artefacts of handling fish or confinement stress (Hassel et al., 2004). For free-swimming fishes that are able to move away from seismic sources as they approach, the potential for lethal physical damage from airgun emissions is even further nullified. However, reef or bottom-dwelling fish that show greater site attachment may be less inclined to flee from a seismic sound source and experience greater effects as a consequence.

Despite mortality being a possibility for fishes exposed to airgun sounds, Popper et al. (2014) did not reference an actual occurrence of this effect. At the time of developing the guidelines, no quantified data on injury and mortality from seismic sources on fish had been reviewed by the Working Group. Therefore, the Popper et al. (2014) exposure guidelines for mortality/potential mortal injury and recoverable injury for fish exposed to seismic source emissions are based solely on data from pile driving conducted on predominantly temperate, freshwater fish species. Although seismic surveys and pile driving both produce impulsive sound, their sound characteristics are markedly different; pile driving impulses result in a more rapid rise time in sound pressure than seismic pulses and it is this rapid rise time that has the greatest potential for trauma (Caltrans, 2001, 2004; Hastings and Popper, 2005; Popper et al., 2006).

Environmental Resources Management Australia (ERM) undertook a detailed literature review of potential fish mortality and physical injury as a result of exposure to seismic sources (ERM, 2017). Of the 28 studies reviewed, only three observed direct mortality and in each case, mortalities occurred to caged fishes at very close proximity to the seismic source (<2 m), which is not representative of real-life exposures from seismic surveys because fish are free-swimming and are not typically exposed at such close range. The received sound levels that resulted in mortality ranged from 220 to 241 dB re 1 µPa PK, however, other studies reported no mortality or injury at levels as high as 246 dB re 1 µPa PK. Therefore, the sound exposure criteria proposed by Popper et al. (2014) for mortality and injury are considered to be highly conservative and provide a precautionary approach in the assessment of potential injury and mortality effects to fishes from exposure to underwater noise from marine seismic surveys.

Temporary Threshold Shift

Temporary hearing impairment, known as temporary threshold shift (TTS), can occur due to fatigue and temporary changes to the epithelium (hair cells) of the inner ear and/or damage to auditory nerves innervating the ear, which has the potential to occur in some fishes exposed to intense sound pressures for prolonged periods of time (Smith et al., 2006; Popper et al., 2014; Liberman, 2015). While experiencing TTS, fishes may have a decrease in fitness in terms of communication, detecting predators or prey, and/or assessing their environment. The period over which normal hearing ability returns following the termination of a sound that causes TTS is variable, and dependent on many factors including the intensity and duration of sound exposure (e.g. Popper and Clarke, 1976; Scholik and Yan, 2001; Amoser and Ladich, 200;, Smith et al., 2004a, 2004b, 2006, 2011; Popper et al., 2005, 2007).

The impact threshold of 186 dB re 1 µPa^2·s proposed by Popper et al. (2014) in **Table 6-3** is based on exposure of a freshwater fish species with a connection between the swim bladder and inner ear (more specialised hearing than the demersal and pelagic fish species likely to occur in the Scarborough 4D B1 MSS Operational Area). Fish that showed TTS recovered to normal hearing levels within 18–24 hours. Given that reliable auditory frequency weightings have not been defined for the three categories of fishes in the way they have for cetaceans, the 186 dB re 1 µPa^2·s SEL_{24h} criteria in **Table 6-3** includes a level of conservatism as:

- Many types of fish that are likely to occur in the Operational Area do not possess a direct connection between the swim bladder and the inner ear; they are therefore sensitive primarily to particle motion rather than sound pressure and may be less sensitive than the types of fish upon which the 186 dB re 1 µPa^2·s threshold is derived;
- Modelled SELs are based on broadband sounds and may therefore account for more sound energy associated with frequencies that are not within the auditory ranges of the fish species likely to occur in the Operational Area; and

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- The main contribution of sound energy to the onset of TTS will occur over just a few hours when the source is at the closest point of approach; the 24-hour modelled accumulation period accounts for additional sound energy accumulated while the seismic source is at greater distances and potentially not audible to fishes.

It is also noted that many of the available studies on TTS are based on captive fish, whereas free-swimming fishes in the wild are likely to make some effort to avoid the intense sound pressures that contribute the most to the onset of TTS. If TTS does occur, the effects will be temporary and recoverable.

Behavioural Effects

Behavioural effects of noise on fish will vary depending on the circumstances of the fish, hearing sensitivity, the activities in which it is engaged, its motivation, and the context in which it is exposed to sounds (Hawkins and Popper, 2017). Responses may include avoidance behaviours, startle reactions, increased swimming speed, change in orientation, change in position in the water column, changes to schooling behaviour (e.g. tightening of school structure), and temporary avoidance of an area (Simmonds and MacLennan, 2005; McCauley et al., 2000a; Fewtrell and McCauley, 2012; Popper et al., 2014; Carroll et al., 2017). Changes in movement patterns may also temporarily divert efforts away from feeding, egg production and spawning success (Hawkins and Popper, 2017). The potential extent and duration of behavioural effects based on studies of seismic exposure are summarised below.

A degree of caution should be given when interpreting behavioural studies, given that many are conducted on captive fishes which may not provide an accurate representation of responses in free-swimming fishes in the wild (Popper et al., 2014; Salgado Kent et al., 2016; Carroll et al., 2017). Behavioural studies are also highly subjective. Extrapolation of observed effects on fish should also be undertaken with caution (Carroll et al., 2017). This is particularly the case given that many exposure experiments report received SPL or SEL, even though the most relevant metric for most fish species is particle motion (Popper and Hawkins, 2018, 2019). Many exposure experiments are undertaken using a single airgun and it is not clear how transferrable the behaviours and received SPL/SEL levels are to a full commercial-sized seismic array, particularly if observed behaviours are in response to particle motion close to the sound source rather than to sound pressure.

Pearson et al. (1992) exposed captive demersal rockfish to multiple 10-minute periods of seismic sound from a seismic source towed at distances of less than 215 m, which is not representative of real-life exposures to a seismic survey. Schools of rockfish were observed to exhibit a ‘startle’ response (shudders, flexions of the body followed by rapid swimming) at sound levels above 200-205 dB re 1µPa SPL. An ‘alarm’ response (change in vertical position in the water column to be closer to the seabed, short-term post-exposure behavioural changes) was found to occur above approximately 180 dB re 1µPa SPL, although it was suggested that some individuals may begin to exhibit subtle changes in behaviour and position in the water column at sound levels above 161 dB re 1µPa SPL. Changes in behaviour were found to return to normal before the end of the sound exposure or within just minutes of the sound ceasing, indicating only very short-term, transient effects and potential habituation to the disturbance.

Santulli et al. (1999) exposed caged European sea bass (a demersal species) to a 2,500 in^3 seismic source. Limited response was observed at 2.5 km distance, a startle response was observed when the array was at a distance of approximately 800 m, but after passing within 180 m, fish behaviour appeared to return to normal within one hour.

The Scott Reef Study associated with the Woodside Maxima 3D survey reported in McCauley et al. (2008), Miller and Cripps (2013), and summarised in Salgado-Kent et al. (2016), included a component that examined how the behaviour of caged fishes exposed to seismic signals changed. The study examined the effects to fish species in the Holocentridae family, which have adaptations linking the swim bladder to the otolith system of the inner ear, as well as to bluestripe snapper, a demersal species without such a hearing adaptation. Fish were exposed to either one or two passes of the active source at three distance categories (45–74 m, 105–131 m, 475–807 m). Alarm responses (including the startle response and behavioural avoidance) occurred within less than 200 m either side of the pass by, but responses were too infrequent to include in analyses. Less significant agitation levels (defined by changing swim direction) in Holocentridae increased with increasing received sound level above 155–165 dB re 1 uPa^2.s SEL, but agitation levels did not seem to increase with increasing received sound levels for the less sensitive bluestripe snapper (McCauley et al., 2008). Fish began to feed and behave normally again within 20-minutes after the passage of the seismic source (McCauley et al., 2008; Miller and Cripps, 2013).

McCauley et al. (2000a, 2003) reported that trials involving captive fishes (of various species, including snappers, emperors, groupers, trevally, bream, herring and others) exposed to seismic sound showed a common ‘startle’ response (C-turns), 'alarm' responses (e.g. swimming faster, darting movements and sudden changes in school structure), or less obvious changes such as moving closer to the seabed or huddling closer together. Subtle responses such as moving closer to the seabed or changes in schooling behaviour were suggested to commence when sound levels exceeded approximately 147 - 151 dB re 1 μPa^2.s SEL. Similar behaviours in pink snapper and trevally were noted by Fewtrell and McCauley (2012) in response to comparable sound levels. These are minimal reactions that are likely to be an indication of awareness and perception of the sound rather than a response that could result in significant ecological impacts. More obvious startle and alarm responses were apparent in trials when received sound levels were in the order of 159-172 dB re 1 μPa^2.s SEL. In situations where a behavioural response was observed, fish were considered to have resumed normal behaviour within 4–31 minutes after cessation of the seismic activity (McCauley et al., 2000, 2003). Startle and alarm responses reduced with time, indicating some

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habituation to the sound. No statistically clear trends in physiological stress response were observed following exposure (McCauley et al., 2000, 2003).

Behavioural observations of two tropical snapper species and another coral reef fish species, spadefish, in field enclosures before, during and after exposure to seismic sound showed that repeated exposure resulted in increasingly less obvious startle responses (Boeger et al., 2006). This is consistent with the potential habituation suggested by McCauley et al. (2000a) and by Fewtrell and McCauley (2012).

McCauley and Salgado Kent (2007) observed the behaviour of goldband snapper in fish traps in the Timor Sea using cameras placed inside the fish traps. A seismic vessel towed two 3090 in^3 seismic sources. Maximum signals reached at the closest trap to each seismic pass-by were 200, 202 and 212 dB re 1 µPa PK-PK (equivalent to approximately 194, 196 and 206 dB re 1 µPa PK). No dramatic behavioural responses of fishes to the passing seismic source were observed. Fishes generally displayed increased activity immediately after entering a trap presumably as they searched for a way out, with this activity reducing with time. Fishes that had been in a trap for some time showed increased activity levels as the operating seismic source approached but were 'quiet' when the array passed at the point of closest approach.

Bruce et al. (2018) tagged tiger flathead and two shark species, which were monitored during a seismic survey undertaken in Australian waters. Sharks moved freely in and out of the study area and exposed sharks did not show any indication of differences in behaviour or distribution compared with control areas. Minor behavioural effects were observed in exposed tiger flathead, which increased their swimming speed during the seismic survey and changed daily movement patterns after the survey, but showed no significant displacement. Overall, there was little evidence for consistent behavioural responses (Bruce et al., 2018).

Paxton et al. (2017) observed temperate reef fish, including snapper and grouper species, in 33 m water depths located 7.9 km from a seismic survey line using video recordings. The authors observed fish abundance and habitat use during the evening hours for three days prior to a seismic survey and then during the evening of the day when seismic activity occurred. The authors attempted to measure sound at two other reefs in closer proximity to the survey, but the hydrophones malfunctioned. No video recordings were made at the other reefs where hydrophone measurements were attempted. While no hydrophone measurements were made at the reef where video recordings took place, maximum sound levels were estimated to be in excess of 170 dB re 1 µPa SPL. Despite no clear visual evidence of behavioural responses in fishes during the seismic survey, the authors noted a 78% decline in abundance in the evening following the survey. No further recordings were made to assess when fish abundance returned to pre-exposure levels or how far they may have moved. Therefore, with limited data, it is not clear from this study if reduced abundance is attributed to the seismic sound or other natural factors such as tidal influence or food availability. However, the study may indicate a possible avoidance response and change in local abundance and distribution.

Meekan et al. (2021) studied the effects of seismic surveys on tropical demersal fishes targeted by commercial fisheries on the North West Shelf of WA. The authors found no short-term (days) or long-term (months) effects of seismic exposure on the composition, abundance, size structure, behaviour of movement of these species, suggesting that seismic surveys have little impact on demersal fishes in this environment (Meekan et al., 2021).

Many pelagic Scombroidei species, including some tuna species do not possess a swim bladder or it is poorly developed (Popper et al., 2014; Bray and Schultz, 2019a, 2019b), indicating they are sensitive only to the particle motion component of sound at close range to a sound source. Some other types of tuna, including southern bluefin tuna, yellowfin tuna, bigeye tuna and billfish have swim bladders but have no apparent specialist connection with the inner ear (Bertrand and Josse, 2000; Song et al., 2006). The lateral line system appears to feature in Scombroidei fishes, again indicating fishes are mainly sensitive to particle motion, but some pressure detection is possible. Song et al. (2006) note that unless bluefin tuna are exposed to very high intensity sounds from which they cannot swim away, short- and long-term effects may be minimal or non-existent. And, considering that bluefin tuna are powerful swimmers and divers, it is possible that if they encounter a sound that is very loud to them, they will move away from the sound rapidly enough to result in minimal exposure.

Some other studies looking at the behavioural response of sound pressure-sensitive Gadidae and Clupeidae species, such as whiting, Atlantic cod and herring, have reported changes in vertical position in the water column, potential avoidance responses and short-term changes in distribution. Chapman and Hawkins (1969) observed that the depth distribution of free-ranging whiting changed in response to an intermittently discharging stationary seismic source, which resulted in fish being exposed to an estimated SPL of 178 dB re 1 µPa. The fish school responded to the sound by shifting downward, forming a more compact layer at greater depth although temporary habituation was observed after one hour of continual sound exposure (Chapman and Hawkins, 1969).

Hawkins et al. (2014) exposed free-swimming sprat (a sound pressure-sensitive Clupeidae species with a swim bladder connected to the inner ear) and Atlantic mackerel (a particle motion detecting species without a swim bladder) to playback of impulsive sound. Sprat schools were more likely to disperse laterally in response to received sound levels of approximately 135 dB re 1 $\mu Pa^2.s$ SEL. Mackerel schools were more likely to alter their depth in the water column in response to approximately 142 dB re 1 $\mu Pa^2.s$ SEL. Hawkins et al. (2014) note how the two different species seemed to respond to the sound playback at similar sound levels despite the differences in sound sensitivity of the two species, but suggested that mackerel were simply more "flighty" than sprat and therefore more likely to react. The tests were also undertaken using low sound level playback in very close proximity to the schools of fish and it is not clear how relevant the sound pressure and sound exposure levels are in relation to mackerel given that their

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response was likely driven by particle motion. The study location, a very small, enclosed, quiet, coastal sea lough, where fishes were not accustomed to heavy disturbance from shipping and other intense sound sources is also very different from an open ocean location.

Slotte et al. (2004) monitored the effects of a 3,090 in³ seismic array on migrating herring (Clupeidae) and whiting (Gadidae), mapping their distribution and abundance in relation to the seismic survey lines. There was no significant evidence of immediate, near-field scaring reactions on the horizontal scale in response to acquiring survey lines, but there was some evidence that fish changed position in the water column, moving closer to the seabed. Some short-term changes in distribution were observed but weren't statistically significant; fish consistently remained within the immediate vicinity of the survey area, but in a limited number of measurements there was an indication that fish abundance was lower near to the survey area and increased with distance out to a maximum range of 37 km. However, results were inconsistent and clear trends were not observed in all cases. Slotte et al. (2004) concluded that it was not possible to determine how much abundance and distribution were attributed to the seismic survey or to the natural migration patterns and food availability of the fish, or other natural factors. Herring and whiting were found to be abundant in the survey area again after a pause in seismic acquisition and monitoring of fishes for three to four days, indicating that if any displacement did occur as a result of seismic sound exposure, the displacement was temporary (i.e. less than three to four days) (Slotte et al., 2004).

In similar studies, Engås et al. (1996) and Engås and Løkkeborg (2002) reported on the effects of seismic surveys on Atlantic cod and haddock (Gadidae) and found that the abundance of fishes were lower in the survey area compared with areas outside of the survey area, which the authors hypothesize may be the result of an avoidance response. Some differences in abundance were still detectable within the survey area five days after the survey was completed (Engås et al., 1996; Engås and Løkkeborg, 2002).

Conversely, Peña et al. (2013) described the real-time behaviour of herring schools exposed to a full-scale 3D seismic survey, observed using sonar. No changes were observed in swimming speed, swimming direction, or school size that could be attributed to a transmitting seismic vessel as it approached from a distance of 27 km to 2 km, over a six hour period. The unexpected lack of a response to the seismic survey was interpreted as a combination of a strong motivation for feeding by the fishes, a lack of suddenness of the onset of sound, and an increased level of tolerance to seismic pulses.

Davidsen et al. (2019) investigated the effects of seismic sound exposure on the physiology and behaviour of captive Atlantic cod (*Gadus morhua*) and saithe (*Pollachius virens*) using a combination of biologgers and acoustic tags, as well as video monitoring. Experimental sound exposures were 18–60 dB above ambient). Fish were held in a large sea cage and exposed over a 3-day period. The cod exhibited reduced heart rate in response to the particle motion component of the sound from the airgun, indicative of an initial flight response. No behavioural startle response to the airgun was observed; both cod and saithe changed both swimming depth and horizontal position more frequently during sound exposure. The saithe became more dispersed in response to the elevated sound levels. The fish seemed to habituate both physiologically and behaviourally with repeated exposure. The authors concluded that sound exposures induced over the time frames used in this study appear unlikely to be associated with long-term alterations in physiology or behaviour.

Hubert et al. (2020) exposed captive Atlantic cod to one hour of playback of seismic airgun sound pulses with a 10 second shot point interval. Cod were placed in a net pen positioned 7.8 m from the speaker. The mean peak sound pressure and particle acceleration levels at a distance of 9.7 m from the speaker were 164 dB re 1 µPa and 101 dB re 1 nm/s2 respectively. At a distance of 16.4 m from the speaker, the mean peak sound pressure and particle acceleration levels were 158 dB re 1 µPa and 99 dB re 1 nm/s2 respectively. These levels compare with a mean SPL of the ambient conditions in the pen of 113 dB re 1 µPa and a mean sound particle acceleration of 61 dB re 1 nm/s2. Results indicated no strong overall pattern of change in swimming patterns or immediate, short-term behaviours during the exposure, compared to baseline periods without playback. However, several individuals changed their time spent in several behavioural states during the one hour sound exposure. Several individuals spent more time transiting and less time being locally active or inactive. This may be indicative of changes in energy expenditure, which may be relevant if sound exposure occurs over the long term. However, due to experimental design limitations, it was not possible to test the significance of these behavioural state trends (Hubert et al., 2020).

Van der Knaap (2021) investigated the effect of a 3.5-day, full-scale, seismic survey exposure on the movement behaviour of free-swimming Atlantic cod, using acoustic telemetry. The closest point of approach to the tagging location was 2.25 km. The study found that during the experimental survey, cod did not leave the detection area more than expected from baseline data. However, cod left more quickly than expected, from two days to two weeks after the seismic survey. Furthermore, behavioural analyses indicated that during the exposure cod decreased their activity, with time spent being locally active (moving over small distances, showing high body acceleration) becoming shorter, and time spent being inactive (moving over small distances, having low body acceleration) longer. Additionally, diurnal activity cycles were disrupted with lower locally active peaks at dusk and dawn, periods when cod is known to actively feed.

The following conclusions are made regarding behavioural effects to fish from seismic airguns, based on the literature above:

- Different fishes may exhibit different behavioural responses when exposed to seismic survey noise, depending on their activities, motivation and the context in which they receive sound.
- Fish may initially change position in the water column (i.e. move closer to the seabed) in response to becoming aware of approaching seismic sound, but this varies depending on hearing sensitivity and context (e.g. Pearson et al., 1992; McCauley et al., 2000, 2003; Slotte et al., 2004; Fewtrell and McCauley, 2012; Miller and Cripps, 2013; Davidsen et al., 2019).
- Exposure to higher sound levels at close range to a seismic source may begin to result in more noticeable startle or alarm responses, such as changes in school structure, increased swimming speed and avoidance of the sound source (typically observed within hundreds of metres of the seismic source) depending on hearing sensitivity and context) (e.g. Simmonds and MacLennan, 2005; McCauley et al., 2000, 2003; Fewtrell and McCauley, 2012; Popper et al., 2014; Carroll et al., 2017).
- Many exposure experiments are undertaken using a single airgun and it is not clear how transferrable the behaviours and received SPL/SEL levels are to a full commercial-sized seismic array, particularly if observed behaviours are in response to particle motion close to the sound source rather than to sound pressure.
- There is some evidence that fish may tolerate gradual increases in sound levels and habituate to repeated sound exposures (Chapman and Hawkins, 1969; McCauley et al., 2000; Boeger et al., 2006; Fewtrell and McCauley, 2012; Peña et al., 2013; Davidsen et al., 2019).
- Many studies indicate that fishes resume normal behaviour shortly after cessation of the acoustic disturbance (within minutes / less than an hour), with no evidence of long-term changes (e.g. Wardle et al., 2001; Pearson et al., 1992; Santulli et al., 1999; McCauley et al., 2000, 2003; Fewtrell and McCauley, 2012; Miller and Cripps, 2013).
- There is some evidence that changes in distribution may persist for longer than the initial change in behaviour, i.e. position in the water column, schooling behaviours and swim speeds may return to normal relatively quickly (within minutes or hours), but their distribution may not return to normal for hours or days. Potential changes in distribution of fish have been observed in some studies for approximately five days following sound exposure, although such changes are limited to studies that focused primarily on migrating sound pressure-sensitive types of fish with a swim bladder-ear connection (e.g. Clupeidae, Gadidae). These studies also acknowledge that it is difficult to attribute these changes in distribution directly to the seismic survey or to natural migration patterns, food availability or other natural factors (Slotte et al., 2004; Engås et al., 1996; Engås and Løkkeborg, 2002). However, it is possible that changes to the behaviour and distribution of some sound-sensitive prey species (e.g. herring, sardines) may have some indirect influence on the distribution of larger predatory fishes during the days following exposure and disturbance.
- Changes in behaviour or disruption to diurnal activities may indicate that activities such as feeding and energy expenditure can be affected if exposed long term (Hubert et al., 2020; Van der Knaap, 2020, 2021).

Given the limited convergence in results from the available studies, the subjective nature of many assessments and the context under which fish received sound, the Popper et al. (2014) ANSI-Accredited Standards Committee Sound Exposure Guidelines for Fishes and Turtles determined that it is not possible to define exact sound level thresholds for changes in fish behaviours. Instead, Popper et al. (2014) applies relative risk criteria (**Table 6-3**). The criteria reflect the potential for substantial changes in behaviour for a large proportion of the animals exposed to a sound, which may alter distribution, and movement from preferred sites for feeding and reproduction. The criteria do not include effects on single animals or small changes in behaviour such as a startle response or minor movements. As such, Popper et al. (2014) indicate that fish without a swim bladder or with no connection between the swim bladder and the inner ear may experience substantial changes in behaviour within tens or hundreds of metres of a seismic source. These peer-reviewed and accredited sound exposure criteria are reflected in Woodside's risk assessment. It is acknowledged that some fishes with swim bladders may show varying levels of awareness of sound pressure at greater distances from the seismic source, but it is important to recognise changes in behaviour that may be of ecological significance from those that are not.

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The Operational Area lies entirely within the Exmouth Plateau KEF. While parts of this KEF are characterised by topographic features including terraces, canyons and pinnacles, in the deep water depths of the Operational Area (~800-1,200 m) sediments are mostly soft and there is a lack of hard substrate, therefore, is expected that abundance and diversity of marine life will be low. However, a range of bony fishes (teleosts) and elasmobranchs (sharks and rays), including benthic, demersal, and pelagic fishes may still be present.

Benthic and demersal fish species recorded on or around the Exmouth Plateau in similar water depths as the Operational Area include grenadiers, slickheads, cusk eels, basketwork eels, and halosaurs, smelts, anglerfish, dogfish sharks and sixgill stingrays (Williams et al., 1996). Pelagic species include small bathy-pelagic and meso-pelagic species, such as lanternfishes (Williams et al., 1996), plus larger pelagic species such as tunas and billfish. Juvenile southern bluefin tuna may occur during their migration south from spawning grounds near Indonesia to more temperate southern waters. Southern bluefin tuna is listed as a conservation dependent species under the EPBC Act

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(DAWE, 2021). Due to the water depths of the Operational Area being greater than 800 m, it does not support any of commercial indicator species such as the snapper, emperor, cod or mackerel species targeted by Commonwealth or WA fisheries on the continental shelf or upper continental slope. For example, the core water depth range for ruby snapper (*Etelis carbunculus*, *Etelis* spp.), an indicator species for the Commonwealth managed Western Deepwater Trawl Fishery and the WA managed Pilbara Line Fishery, is 150–480 m (DPIRD, 2019).

In addition to the elasmobranch species reported in Williams et al. (1996), the EPBC Protected Matters Search **(Appendix C**) identified four shark species and one ray species that may potentially occur within the Operational Area.

Table 6-4 presents the results of the acoustic modelling study for maximum predicted distances to mortality/PMI, recoverable injury and TTS onset in fish. Data is presented for both the entire water column (MOD) and at the seafloor.

Table 6-4: Summary of maximum distances to mortality/PMI, recoverable injury and TTS onset in fish for single pulse and SEL_{24h} modelled scenarios

Relevant hearing group	Potential impact	Sound exposure threshold	Water column (MOD)
			R_{max} (km)
I Fish: No swim bladder	Mortality/PMI	219 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		213 dB re 1 µPa (PK)	0.06
	Recoverable injury	216 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		213 dB re 1 µPa (PK)	0.06
	TTS	186 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	4.5
II Fish: Swim bladder not involved in hearing	Mortality/PMI	210 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		207 dB re 1 µPa (PK)	0.11
	Recoverable injury	203 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		207 dB re 1 µPa (PK)	0.11
	TTS	186 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	4.5
III Fish: Swim bladder involved in hearing	Mortality/PMI	207 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		207 dB re 1 µPa (PK)	0.11
	Recoverable injury	203 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	0.05
		207 dB re 1 µPa (PK)	0.11
	TTS	186 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h})	4.5

The following fish types, associated with the Exmouth Plateau KEF, have been identified for this assessment:

- Deep water demersal fish species.
- Pelagic fish species.
- Shark species.

Demersal fish species

As shown in **Table 6-4**, for all fish with a swim bladder both involved and not involved in hearing (Group II and III fish, which would represent most demersal fish) mortality/PMI and recoverable injury thresholds within the entire water column were reached within 110 m based on the application of the PK threshold. These ranges are reported in Koessler et al., (2021) as maximum-over-depth distances and the ranges at the seafloor may be less. Therefore, injury effects could occur to demersal fish in close proximity to the seismic source within or adjacent to the Active Source Area. However, as discussed above, the thresholds for mortality and injury are considered highly conservative. While injury or mortality to fish in the immediate proximity of the seismic source is theoretically possible, free-swimming fish such as the demersal species are expected to be able to avoid the seismic source as it approaches their position or ramps up during soft starts.

Based on the maximum predicted R_{max} distance to TTS of 4.5 km within the entire water column (SEL_{24h} threshold – refer to **Table 6-4**), individuals in demersal fish communities within the Active Source Area could experience TTS effects. The radii that corresponds to SEL_{24h} typically represent an unlikely worst-case scenario for SEL-based

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exposure since, more realistically, fish would not stay in the same location or at the same range for a period of 24-hours. Therefore, this method is highly conservative and a reported radius of SEL_{24h} criteria does not necessarily mean that animals travelling within this radius of the source will suffer hearing impairment. It is possible that some demersal fishes may not avoid the approaching seismic source completely and some level of TTS is possible, but the effects are temporary and recoverable, and the potential for such effects to have significant implications on fish fitness and survival is low.

The majority of studies relevant to behavioural responses in demersal fish species (e.g. Pearson et al., 1992; Santulli et al., 1999; McCauley et al., 2000a, 2003; McCauley and Salgado Kent, 2007; Woodside, 2011; Fewtrell and McCauley, 2012; Miller and Cripps, 2013; Bruce et al., 2018; Meekan et al., 2021), indicate that exposure to a mobile seismic source and significant changes in behaviour are likely to be limited to durations of minutes or hours and occur within hundreds of metres of the seismic source as it passes.

Popper et al. (2014) suggest that the potential for significant behavioural impacts in the Group II category of fishes is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres). Therefore, the awareness of fishes to the seismic sound and any resultant behavioural responses may be limited to a few hours as the seismic source approaches from several kilometres away and passes, while significant startle or avoidance responses are more likely to be limited to a shorter period (less than an hour) when the seismic source passes close by. Consistent with the studies reviewed earlier in this section, behaviours may return to normal within less than an hour (sometimes just minutes) of the survey vessel passing.

Further, the implications for demersal fishes at a population level are expected to be limited. McCauley (1994) suggests that behavioural changes in fishes may only be localised and temporary, without significant repercussions at a population level. Hawkins and Popper (2017) highlight that some responses to man-made sound may have minimal or no consequences for fish populations. For example, short-term startle responses to sounds that rapidly diminish with repeated presentation, or that do not change the overall behaviour of fishes are unlikely to affect key life functions. In addition, anthropogenic sound events that are transient in nature, such as a seismic survey, and result in short-term impacts do not necessarily translate into long-term consequences to populations (Hawkins and Popper, 2017). Meekan et al. (2021) noted that if behavioural changes to demersal fish species did take place, they had no measurable short- (days) to long-term (weeks) impacts on behaviour or abundance.

Demersal fish communities within the Operational Area may exhibit some temporary behavioural responses to noise emissions from the seismic source; however, this is not likely to have any impact at the ecosystem level.

Pelagic fish species

Pelagic fish species likely to be present in the Operational Area include tuna, billfish and small pelagic species such as lanternfishes. Many species of tuna and billfish do not possess a swim bladder.

As shown in **Table 6-4**, the maximum predicted R_{max} distances to mortality/PMI and recoverable injury for fish with no swim bladder (Group I fish) within the entire water column was within 60 m (PK threshold). For all fish with a swim bladder (Group II and III fish) the maximum predicted R_{max} distance to mortality/PMI within the entire water column was within 110 m. The maximum distance to the TTS threshold in the water column for all fish hearing groups (Group I, II, III) was within 4.5 km.

All pelagic fish species, particularly large, fast-swimming fish species such as tuna and billfish are highly unlikely to experience TTS effects as they are not restricted by seabed habitat and can swim away from a seismic source. Individuals would have to remain within ranges of approximately 4.5 km of the operating seismic source for several hours to be exposed to sound levels that could cause TTS. Pelagic fishes are most likely to exhibit behavioural responses (avoidance) by moving away from an operating seismic source that approaches within a few tens of metres of them. Behaviour may return to normal within minutes. However, it is acknowledged that the behaviours and distributions of the pelagic species could be affected for hours or days following exposure as a result of potential disturbance to more sound-sensitive prey species, such as herrings, sardine's, sprat and shads.

Sharks

Five shark species (great white shark, oceanic whitetip shark, shortfin mako shark, scalloped hammerhead and longfin mako shark) were identified in the EPBC PMST search as potentially occurring within the Operational Area. No sound exposure thresholds currently exist for acoustic impacts from seismic sources that are specific to sharks, which are sensitive only to particle motion. As a conservative and precautionary approach, the Popper et al. (2014) exposure guidelines for fish with no swim bladder for injury; 213 dB re 1 µPa (PK) and 219 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h}); and TTS (186 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h}), have been used for this assessment.

As shown in **Table 6-4**, the maximum predicted R_{max} distances to mortality/PMI/recoverable injury for fish with no swim bladder (incl. sharks) within the entire water column was within 60 m (PK threshold). TTS thresholds across the water column for fish without a swim bladder could be reached within 4.5 km. It is important to appreciate that individual sharks would have to remain within a range of 4.5 km of the operating seismic source (which is also moving) for several hours to be exposed to sound levels that could cause TTS.

It is expected that the potential effects to sharks associated with acoustic noise will be the same as for other pelagic fish species, resulting in minor and temporary behavioural change such as avoidance. This aligns with the Popper et

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al. (2014) guidelines, which detail that there is the potential for high risk of behavioural impacts in fish species near the seismic source (tens of metres), moderate risk within hundreds of metres, and low risk at thousands of metres from the seismic source.

Fish, Sharks and Rays – Impact Assessment Conclusion

The potential impacts of noise emissions from the seismic source on fish, sharks and rays during the acquisition of the survey are considered to be localised and of no lasting effect, and restricted to temporary behavioural changes (avoidance) in any isolated individuals that may transit the area in close proximity to the operating seismic source. Based on the duration (up to 80-days) of seismic acquisition, and the proposed control measures, predicted noise levels from seismic acquisition are not considered likely to cause mortality/PMI, recoverable injury or significant TTS effects to fish communities or result in any ecologically significant impacts at a population level.

Cetaceans

Species Sensitivity and Sound Exposure Thresholds

Marine mammals and especially cetaceans rely on sound for important life functions including individual recognition, socialising, detecting predators and prey, navigation and reproduction (Weilgart, 2007; Erbe et al., 2015; Erbe et al., 2018). Underwater noise can affect marine mammals in various ways including interfering with communication (masking), behavioural changes, a shift in the hearing threshold, physical damage and stress (Erbe, 2012; Rolland et al., 2012).

When exposed to intense or moderately intense noise levels (e.g. seismic airguns), marine mammals can experience physiological impacts such as physical damage to the auditory apparatus, for example loss of hair calls or permanently fatigued hair cell receptors, which could cause permanent or temporary loss of hearing sensitivity. While the loss of hearing sensitivity is usually strongest in the frequency range of the emitted noise, it is not limited to the frequency bands where the noise occurs but can affect a broader hearing range. This is because animals perceive sound structured by a set of auditory bandwidth filters that proportionately increase in width with frequency.

Exposure to sufficiently intense sound may lead to an increased hearing threshold in any living animal capable of perceiving acoustic stimuli. If this shift is reversed and the hearing threshold returns to normal, the effect is called a temporary threshold shift (TTS). The onset of TTS is often defined as threshold shift of 6 dB above the normal hearing threshold (Southall et al., 2007). If the threshold shift does not return to normal, the residual shift is called a permanent threshold shift (PTS). PTS is hearing loss from which marine fauna do not recover (permanent hair cell or receptor damage).

Threshold shifts can be caused by acoustic trauma from a very intense sound of short duration, as well as from exposure to lower level sounds over longer time periods (Houser et al., 2017). Injury to the hearing apparatus of a marine animal may result from a fatiguing stimulus measured in terms of sound exposure level (SEL), which considers the sound level and duration of the exposure signal. Intense sounds may also damage the hearing apparatus independent of duration, so an additional metric of peak pressure level (PK) is needed to assess acoustic exposure injury risk.

In marine mammals, the onset level and growth of TTS is frequency specific, and depends on the temporal pattern, duty cycle and the hearing test frequency of the fatiguing stimuli. Sounds generated by seismic airguns have been proven to cause noise-induced threshold shifts in marine mammals at high received levels. However, there is considerable individual difference in all TTS-related parameters between subjects and species tested so far. Furthermore, TTS requires relatively high noise levels and thus occurs at shorter distances compared with behavioural effects, which are likely to occur at much lower levels (Dunlop et al., 2017).

There are no published data on the sound levels that cause PTS in marine mammals. Hence, PTS effects in marine mammals should be viewed as theoretical, as they have never actually been demonstrated in either captive or wild animals.

In response to noise from seismic airguns marine mammals were observed to exhibit localised spatial avoidance and temporary displacement, however different species of cetaceans may adopt different strategies for responding to acoustic disturbance (Stone and Tasker, 2006).

The sound exposure thresholds applied for cetaceans in the acoustic modelling study, and in this impact assessment, are summarised in **Table 6-5**. Noise thresholds have been defined for both the per-pulse sound energy released (PK), as well as the total sound energy (accumulated) (SEL) that marine fauna is subjected to over a defined period of time. For recent regulatory assessments of seismic surveys the period of total sound energy integration (i.e. accumulation) has been typically defined as 24-hours; hence, this was the period used for modelling and in this assessment (SEL_{24h}). The PK and frequency-weighted accumulated SEL presented in **Table 6-5** are from the U.S. National Oceanic and Atmospheric Administration (NOAA) Technical Guidance (NMFS, 2018) for the onset of PTS and TTS in marine mammals and are consistent with a detailed review published by Southall et al. (2019). The marine mammal behavioural threshold presented in **Table 6-5** is based on the current NOAA (2019) criterion for marine mammals of 160 dB re 1 µPa sound pressure level (SPL) for impulsive sound sources.

Table 6-5: Acoustic effects thresholds applicable to cetaceans

Hearing group	NOAA (2019)	NMFS (2018), Southall et al. (2019)			
	Behaviour	PTS onset thresholds* (received level)		TTS onset thresholds* (received level)	
	Unweighted SPL (L_{pk}; dB re 1 µPa)	Weighted SEL_{24h} (L_E,24h; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)	Weighted SEL_{24h} (L_E,24h; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)
Low-frequency (LF) cetaceans	160	183	219	168	213
High-frequency (HF) cetaceans		185	230	170	224

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered. L_p–denotes sound pressure level period and has a reference value of 1 µPa. L_{pk}, flat–peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa. L_E - denotes cumulative sound exposure over a 24-hour period and has a reference value of 1 µPa^{2}s.

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The type and scale of the effect of seismic sound on cetaceans will depend on a number of factors including; the level of exposure, physical environment, location of the animal in relation to the sound source, how long the animal is exposed to the sound, the exposure history, how often the sound is repeated (repetition period) and the ambient sound level. The context of the exposure plays a critical and complex role in the way an animal might respond (Gomez et al., 2016; NMFS, 2016). Without appropriate control measures in place, noise emissions from the seismic source have the potential to impact cetaceans by causing injury or changes to hearing (PTS and TTS) as a result of high sound levels at close range to the seismic source, or behavioural disturbance impacts (refer to the sound exposure thresholds for PTS, TTS and behavioural disturbance described above).

Based on the information presented in **Section 4.6.3**, there are no BIAs for cetaceans identified within the Operational Area; however, a pygmy blue whale migration and foraging BIAs are located 14 km south-east and 154 km south of the Operational Area, respectively. The Operational Area overlaps the pygmy blue whale distribution range and includes the recorded presence of an individual (Thums et al. 2022).The pygmy blue whale may be encountered within the Operational Area during their northbound migration from April to July, and southbound migration from October to January; however the likelihood of encountering migrating or foraging pygmy blue whales is considered low.

As described in **Section 4.6.3.1**, there is the possibility that some migrating northbound pygmy blue whales may also be opportunistically foraging to the west of the migration BIA (during the peak period of northbound migration), as indicated by the track of one northbound individual animal tagged off North West Cape in early June 2020 (in **Figure 4-7**). This represents <5% of total number of tagged whales (refer to Thums et al. (2022)). As shown in **Figure 4-7**, the track of this one individual partially overlapped the eastern edge of the Operational Area and the south-east corner of the Active Source Area, with recorded presence as shown by the satellite track in June 2020 (peak northbound migration).Acoustic and telemetry data indicate faster migration speeds for the southbound migration compared to the northbound migration and no evidence of foraging by southbound pygmy blue whales within the Operational Area.

A humpback whale migration BIA is located 138 km south-east of the Operational Area. An additional seven cetacean species listed under the EPBC Act (three threatened and migratory, and four migratory), including baleen and toothed whales were identified as potentially occurring within the Operational Area. Similarly, other migratory cetacean species including the humpback, fin, sei and killer whale, may occur within or adjacent to the Operational Area during the acquisition of the survey, however, the presence of these species is likely to be limited to infrequent occurrences of individuals or small groups.

Considering the NMFS (2018) SEL_{24h} threshold criterion, LF cetaceans could reach PTS thresholds within 380 m from the nearest survey line based on the application of the multiple pulse SEL_{24h} threshold, but within 30 m based on the single pulse PK metric (**Table 6-6**). TTS thresholds could be reached within 60.7 km based on the application of the multiple pulse SEL_{24h} threshold, and within 60 m based on the single pulse PK metric (**Table 6-6**). For HF cetaceans, PTS and TTS thresholds were not reached within the limits of the modelling resolution or 20 m (i.e. either the threshold will not be exceeded, or the range to exceedance will be limited to the immediate proximity of the seismic source).

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Table 6-6: Maximum predicted horizontal distances (R_{max}) to PTS, TTS and behavioural response thresholds in cetaceans

Hearing Group	Sound Exposure Threshold	R_{max} distance (km)*
PTS		
LF cetaceans	219 dB re 1 µPa (PK)	0.03
	183 dB re 1 µPa².s (SEL_{24h})	0.38
HF cetaceans	230 dB re 1 µPa (PK)	-
	185 dB re 1 µPa².s (SEL_{24h})	-
TTS		
LF cetaceans	213 dB re 1 µPa (PK)	0.06
	168 dB re 1 µPa².s (SEL_{24h})	60.7
HF cetaceans	224 dB re 1 µPa (PK)	-
	170 dB re 1 µPa².s (SEL_{24h})	-
Behavioural Response		
LF cetaceans	160 dB re 1 µPa (SPL)	7.28
HF cetaceans		

N.B. A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

The 24-hour SEL is a cumulative metric that reflects the dosimetric (measured dose) impact of noise levels within 24-hours, based on the conservative assumption that an animal is consistently exposed to such noise levels at a fixed position. This represents a conservative worst-case scenario. More realistically, whales would not stay in the same location and may not remain within range of the survey line for 24-hours. This would particularly be the case for an animal migrating through offshore waters that do not represent a migratory or foraging BIA. Therefore, a reported radius for SEL_{24h} criterion does not mean that a whale travelling within this radius of the source will experience PTS or TTS, but rather that an animal could be exposed to the sound levels associated with these effects if it remained in that range for 24-hours (Koessler et al., 2021).

It is highly unlikely that an individual whale (e.g. pygmy blue whale) would remain within a range of 380 m (predicted distance for PTS for LF cetaceans, based on the SEL_{24h} metric) from the operating seismic source (which is moving) for a full 24-hour period, or even for a few hours. Should an individual remain within the range for potential impact, some recoverable TTS could occur. However, the likelihood of TTS occurring is reduced to some degree by the implementation of control measures including a shut-down zone of 500 m and a low-power zone of 2 km under Part A of the EPBC Policy Statement 2.1, which reduces the potential for close range sound exposures where the greatest sound contribution is received.

For both LF and HF cetaceans, a behavioural response could occur within 7.28 km of the seismic source.

Based on the noise modelling results in Koessler et al. (2021), received sound levels at the pygmy blue whale foraging BIA and the humpback whale migration BIA are predicted to be below 130 dB re 1 µPa SPL. No significant behavioural responses are expected and the BIAs are well beyond the maximum range in which TTS effects could occur.

The Blue Whale Conservation Management Plan (BWCMP) (Action Area 2) states that anthropogenic noise in BIAs should be managed such that any blue whale continues to utilise the area without injury (DoE, 2015a). Although TTS in cetaceans has previously been regarded as hearing impairment, not injury, advice from NOPSEMA and DAWE is that TTS should be considered a form of injury to pygmy blue whales and this should be prevented within the BIAs Therefore, the potential for TTS effects (and therefore injury) to pygmy blue whales and management of this risk warrants further evaluation to ensure no inconsistency with the (BWCMP)..

Pygmy blue whales migrate as solitary animals or in small groups along the continental slope, typically at depths between 500 m and 1000 m on the way to the Banda and Molucca seas near Indonesia, where calving is understood to occur (Double et al., 2014). The northern migration typically passes north-western Australia between approximately April to July with the return southern migration between October and January.

The modelled range to TTS effects in LF cetaceans, such as the pygmy blue whale, of 60.7 km may be overly conservative for the following reasons:

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- The 60.7 km range to TTS is based on the modelled maximum-over-depth range and may correspond with water depths that are greater than the depths at which pygmy blue whales typically swim and dive to.
- As explained above, the SEL_{24h} criterion is a cumulative metric that reflects the dosimetric impact of sound energy accumulated over a 24-hour period and assumes that an animal is consistently exposed to such noise levels at a fixed location. The radii that correspond to SEL_{24h} typically represent an unlikely worst-case scenario for SEL-based exposure since, more realistically, marine fauna would not stay in the same location or at the same range for 24 hours (Koessler et al., 2021). It is noted that the accumulation of sound energy is not linear and rapid growth in accumulated exposures may occur over a matter of hours as the seismic source approaches an animal's location, but the criterion and modelling are still limited by the assumption that animals remain in a fixed location for this period.

To account for the movement of pygmy blue whales within the water column, Woodside commissioned JASCO to undertake animal movement (animat) modelling. The JASCO Animal Simulation Model Including Noise Exposure (JASMINE) was used to predict the exposure of animats (pygmy blue whales) to sound arising from the seismic activity. Given that the Scarborough 4D B1 MSS is adjacent to the migration BIA for pygmy blue whales, migratory behaviour was the only behavioural profile considered. The behavioural profile applied for pygmy blue whales was derived from a range of sources that used multi-sensor tags to record fine-scale dive and movement behaviour (Owen et al. 2016, Möller et al. 2020). Where information was unavailable for pygmy blue whales, parameters were derived from blue whale (*B. musculus*) tagging data (Goldbogen et al. 2011). Owen et al. (2016) monitored the fine-scale movement and diving behaviours of a migrating sub-adult pygmy blue whale off the west coast of WA. To reduce energy expenditure during migration, the whale dives to a depth that is likely to allow it to avoid surface wave drag and maximize horizontal movement. The mean depth of migratory dives (82% of all dives) was 14 m ± 4 m, and the whale spent 94% of observed time and completed 99% of observed migratory dives at water depths of less than 24 m. The mean maximum depth of exploratory dives was 107 ± 81 m (range 23–320 m) and did not appear to be related to seafloor depth. The behaviour of migrating pygmy blue whales was modelled to represent the animals migrating along the west coast of Australia, to and from Indonesia (Double et al., 2014; DoE, 2015a). The speed for travel for migratory behaviour (1.17 ± 0.60 m/s) and exploratory dives (0.88 ± 0.14 m/s) were calculated from data presented in Möller et al. (2020).

The estimated sound fields produced by source and propagation models for the seismic survey were incorporated into a sound exposure model to estimate the radial distance within which 95% of the exposure exceedances occur ($ER_{95\%}$). The maximum distance within which exposure exceedances occur (ER_{max}) was also included given the sensitivity of pygmy blue whales and the limited knowledge about their behaviour within the migratory BIA. Noise effect metrics included peak pressure level (PK), sound exposure levels (SEL_{24h}), and sound pressure level (SPL).

The animat modelling indicated that no whales within the pygmy blue whale migration BIA were exposed to sound levels exceeding the threshold criteria for PTS, TTS and a behavioural response within the 95th percentile exposure ranges ($ER_{95\%}$) and maximum exposure ranges (ER_{max}) (Koessler et al., 2021; **Appendix G**). However, to provide context a second simulation was run that did not limit the distribution of whales to the migration BIA. A summary of these results are presented in **Table 6-7** below.

Table 6-7: Summary of animat simulation results for migrating pygmy blue whales. The 95th percentile exposure ranges ($ER_{95\%}$) and maximum exposure ranges (ER_{max}) in kilometres and probability of animats being exposed above thresholds with the $ER_{95\%}$ and ER_{max} ranges

Threshold			Maximum acoustic radial distance to threshold (km)	$ER_{95\%}$		ER_{max}	
Description		Threshold level (dB)		Distance (km)	Probability of exposure (%)	Distance (km)	Probability of exposure (%)
TTS	PK	213[1]	0.06	0.05	88	0.06	84
	SEL_{24h}	168[2]	60.7	15.02	42	21.73	32
PTS	PK	219[1]	0.03	0.04	73	0.04	71
	SEL_{24h}	183[3]	0.38	0.06	80	0.13	65
Behavioural response		160[3]	7.28	6.54	71	7.33	67

[1] PK (Lpk; dB re 1 µPa)
[2] LF-weighted SEL_{24h} (L_E,24h; dB re 1 µPa^2 ·s)
[3] SPL (Lp; dB re 1 µPa)

As shown in **Table 6-7**, maximum exposure ranges (ER_{max}) to SEL_{24h} thresholds were 130 m and 21.73 km for PTS and TTS respectively. For PK thresholds, ER_{max} distances were 40 m to PTS and 60 m to TTS.

The 95th percentile exposure ranges ($ER_{95\%}$) to SEL thresholds for PTS were 60 m, and for TTS were 15.02 km. For PK thresholds, $ER_{95\%}$ distances were 40 m to PTS and 50 m to TTS.

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Based on these results, the conservative range for potential TTS effects in pygmy blue whales is approximately 22 km from the seismic source, compared with the 60.7 km range previously predicted in Koessler et al. (2021) when animal movement was not factored into the model. The closest point of approach from the Active Source Area and the pygmy blue whale migration BIA is ~25 km and therefore, pygmy blue whales will continue to utilise the migration BIA without injury or significant behavioural disturbance, which is not inconsistent with the BWCMP (**Section 6.8.3**) There is no impact to the foraging BIA.

The potential for masking impacts to migrating pygmy blue whales within the migration BIA is limited, as the intermittent nature and relatively short duration of the seismic pulses is unlikely to result in any significant masking of whale calls. During seismic operations the longest line acquired within the Active Source Area is 105 km, which would take approximately 12.5 hours to acquire, however on average lines will take ~9 hours to acquire data. The source array is then shut-down and recovered during line turns, which would take approximately 3–4 hours, before the source is deployed and activated again for seismic acquisition on the next line in the 'race track' pattern. Hence, there would be at least one silent period of several hours within each 24-hour period and migrating whales would be exposed to the seismic pulses for less than a day. A tagging study of blue whales showed that migrating individuals can travel 50 to 100 km per day (Double et al., 2014). This equates to an average swimming speed of 2–4 km/hr over a 24-hour period. In comparison, the seismic vessel will be travelling at around 4.5 knots (8 km/hr) therefore individual pygmy blue whales are expected to pass through the ensonified area in less than 24 hours. Consequently, masking impacts from sound exposure are unlikely to cause any long-term masking (<24 hours) for migrating individuals.

In relation to the southbound migration there is the potential for acoustic emissions from the seismic source to mask calls between migrating pygmy blue whale mothers and calves. Potential impacts are limited by a number of factors, including the source is ~25km from the migratory BIA, background ambient noise levels and the fact that mother-calf pairs will be communicating with each other over very short distances (tens to hundreds of metres). It is likely that pygmy blue whales will respond to noise interference according to the context and the signal produced and masking between mother and calves is not expected.

To account for the potential presence of blue pygmy whales within the distribution range (and possibly west of the migratory BIA) in the peak northbound migratory season, additional adaptive management procedures will be implemented to manage potential impacts to pygmy blue whales (refer to **Control 4.5** in ALARP table below) and to ensure the activity is not inconsistent with the BWCMP (Action Area 2 and 3 see Section 6.8.3).

Cetaceans - Impact Assessment Conclusion

Based on the assessment above, the implementation of controls and the absence of any TTS effects within the pygmy blue whale migration BIA, and no impact to the foraging BIA, the implementation EPBC Statement Policy 2.1 management procedures during the survey and an additional control during the peak northbound migration when there has been recorded presence, the potential impacts of noise emissions from the seismic source on cetaceans during the acquisition of the survey are considered to be slight and short-term. Impacts to cetaceans are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause injury effects (based on adopted controls). This is not inconsistent with the BWCMP (**Section 6.8.3**).

Marine Reptiles

Species Sensitivity and Sound Exposure Thresholds

Acute noise, or temporary exposure to loud noise, may result in the avoidance of important habitats and in some situations physical damage to turtles. However, there is a scarcity of data regarding the responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Marine turtles have the best hearing sensitivity and low frequencies in the range of 100-700 Hz (Bartol and Musick, 2003; Finnernan et al., 2017), and are known to have poor auditory sensitivity (Bartol and Ketten, 2006; Dow Piniak et al., 2012). Accordingly, PTS and TTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al., 2014).

McCauley et al. (2000b) observed the behavioural response of caged sea turtles—green (*Chelonia mydas*) and loggerhead (*Caretta caretta*)—to an approaching seismic airgun. For received levels above 166 dB re 1 µPa (SPL), the turtles increased their swimming activity and above 175 dB re 1 µPa (SPL) they began to behave erratically, which was interpreted as an agitated state.

The 166 dB re 1 µPa level has been used as the threshold level for a behavioural response to sea turtles by NMFS and applied in the Arctic Programmatic Environmental Impact Statement (PEIS) (NSF, 2011) and the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a). The 175 dB re 1 µPa level from McCauley et al. (2000b) is recommended as the threshold for behavioural disturbance.

Some additional data suggest that behavioural responses occur closer to an SPL of 175 dB re 1 µPa, and TTS or PTS at even higher levels (Moein et al., 1995), but the received levels were unknown and the NSF (2011) PEIS maintained the earlier NMFS criteria levels of 166 and 180 dB re 1 µPa (SPL) for behavioural response and injury, respectively. Popper et al. (2014) suggested injury to turtles could occur for sound exposures above 207 dB re 1 µPa (PK) or above 210 dB re 1 $\mu Pa^2 \cdot s$ (SEL_{24h}). Sound levels defined by Popper et al. (2014) show that animals are very likely to exhibit a behavioural response when they are near an airgun (tens of metres), a moderate response if they encounter the

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source at intermediate ranges (hundreds of metres), and a low response if they are far (thousands of metres) from the airgun.

The sound exposure thresholds applied for marine turtles in the acoustic modelling study, and in this impact assessment, are summarised in **Table 6-8**. The peak pressure levels (PK) and frequency-weighted accumulated sound exposure levels (SEL) presented in **Table 6-8** are as reported in Finnernan et al. (2017) for PTS and TTS effects in turtles. The behavioural response threshold presented in **Table 6-8** is based on the NMFS and applied in the Arctic Programmatic Environmental Impact Statement (PEIS) (NSF, 2011), and the behavioural disturbance threshold is based on the level reported in McCauley et al. (2000b).

Table 6-8: SPL, SEL_{24h}, and PK thresholds for acoustic effects on marine turtles

Effect Type	Criterion	Unweighted SPL (L_{pk}; dB re 1 µPa)	Weighted SEL_{24h} (L_E,24h; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)
Behavioural response	NSF (2011)	166	N/A	
Behavioural disturbance	McCauley et al. (2000a, 2000b)	175		
PTS onset thresholds* (received level)	Finneran et al. (2017)	N/A	204	232
TTS onset thresholds* (received level)			189	226

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered. L_p denotes sound pressure level period and has a reference value of 1 µPa. L_{pk}, flat denotes peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa. L_E denotes cumulative sound exposure over a 24-hour period and has a reference value of 1 μPa^2s.

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As presented in **Section 4.6.2**, there are no BIAs or Habitat Critical to the survival of marine turtles within the Operational Area. The nearest BIAs and Habitat Critical are for flatback turtles, located approximately 135 km south-east and 147 km south-east of the Operational Area, respectively. The Recovery Plan for Marine Turtles (DoEE, 2017a) specifies a 60 km internesting buffer for flatback turtles, and 20 km internesting buffer for green, hawksbill and loggerhead turtles. The 60 km internesting buffer for flatback turtles (DoEE, 2017a) is based primarily on longshore movements in nearshore coastal waters or travel between island rookeries and the adjacent mainland (Whittock et al., 2014).

Whittock et al. (2016) defined suitable internesting habitat as water 0–16 m deep and within 5–10 km of the coastline, while unsuitable internesting flatback habitat was defined as waters >25 m deep and >27 km from the coastline. There is no evidence to date to indicate that flatback turtles swim out into deep offshore waters during the internesting period (Whittock et al., 2016).

It is important to note that flatback turtle hatchlings do not undertake oceanic migrations offshore to deep, pelagic waters. Instead, juveniles grow to maturity in shallow coastal waters close to their natal beaches (Musick and Limpus, 1996).

Additionally, one other marine turtle species was also identified as potentially occurring within the Operational Area. However, there are no BIAs nearby, and therefore their occurrence within or adjacent to the Operational Area is considered unlikely, as are any impacts to these species as a result of underwater sound from the seismic source.

Table 6-9 presents the results of the acoustic modelling study for the maximum R_{max} distances to PTS (injury), TTS, behavioural response and behavioural disturbance thresholds in turtles, for all modelled source scenarios. The results for the thresholds applied for PTS and TTS consider both metrics (single pulse PK and multiple pulse SEL_{24h}).

Table 6-9: Maximum predicted horizontal distances (R_{max}) to PTS, TTS, behavioural response and behavioural disturbance thresholds in turtles, for all modelled scenarios

Hearing group	Sound effect threshold	R_{max} distance (km)
Marine turtles	Behavioural response	
	166 dB re 1 µPa (SPL)	3.87
	175 dB re 1 µPa (SPL)	0.76

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	PTS	
	232 dB re 1 µPa (PK)	-
	204 dB re 1 µPa².s (SEL_{24h})	0.05
	TTS	
	226 dB re 1 µPa (PK)	-
	189 dB re 1 µPa².s (SEL_{24h})	0.28

N.B. A dash indicates that the threshold is not reached within the limits of the modelling resolution (20 m).

As shown in **Table 6-9**, based on the application of the multiple pulse SEL_{24h} thresholds, marine turtles could experience PTS within 50 m of the active source, and experience TTS within 280 m of the active source. Single pulse PK PTS thresholds were not reached within the limits of the modelling resolution for PTS or TTS.

The SEL_{24h} is a cumulative metric that reflects the doisimetric impact of noise levels within 24-hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position, and represents an unlikely scenario. More realistically, marine turtles would not stay in the same location for 24-hours, but rather a shorter period, depending upon their behaviour and the proximity and movements of the source. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine reptiles travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either PTS or TTS) if it remained in that location for 24-hours (Koessler et al., 2021; **Appendix G**).

No PTS or TTS effects to marine turtles are expected given the small distances to SEL_{24h} thresholds, 50 m and 280 m respectively, and the low likelihood of marine turtles being present within the offshore waters of the Operational Area.

Based on the 166 dB re 1 µPa SPL behavioural threshold criterion a behavioural response could occur within 3.87 km, and based on the 175 dB re 1 µPa SPL behavioural threshold criterion a behavioural disturbance could occur within 760 m.

Given that there are no marine turtle BIAs or Habitat Critical within the Operational Area, and the nearest are located 135 km south-east of the Operational Area, marine turtles are unlikely to occur within the area of potential impact. Should any marine turtles occur within 3.87 km of the seismic source, they may experience some behavioural disturbance, however it is expected that turtles within this area will not be evenly distributed and are likely to be moving in and out of the area, and similarly, the sound levels within this potential impact area with change as the seismic vessel moves throughout the survey for a period of up to 80-days.

Marine Reptiles - Impact Assessment Conclusion

Based on the assessment above, the potential impacts of noise emissions from the seismic source on marine reptiles (turtles) during the acquisition of the survey are considered to be slight and short-term. Impacts are likely to be restricted to temporary behavioural changes (avoidance) to transient turtles that may pass within 3.87 km of the seismic source. Turtles would be exposed to noise levels above behavioural threshold levels for a short period of time as the vessel moves through the survey area (up to 80-days).

Seabirds

Impact Assessment

Very little is known about the effects of intense underwater sound (e.g. seismic surveys) on seabirds. However, impacts to seabirds have not been observed previously during seismic surveys (Turnpenny and Nedwell, 1994), and it is generally thought that noise produced from activities associated with seismic surveys may impact only those species of birds that spend large quantities of time underwater, either swimming or plunge diving while foraging for food (US DoIMMS, 2004). Pichegru et al. (2017) found that penguins showed a strong avoidance of their preferred foraging areas during seismic activities, foraging significantly further from the survey vessel when in operation and increasing overall foraging effort.

As outlined in **Section 4.6.4**, 21 species of birds were identified by the EPBC Act PMST as potentially occurring within the Operational Area or EMBA, including three threatened species. There are no BIAs for birds located within the Operational Area.

Birds foraging within the Operational Area have the potential to be exposed to increased sound levels generated by the operating seismic source, while diving for small pelagic fishes near the sea surface. Such behaviours may result in a startle response during diving. Birds resting on the surface of the water in proximity to the seismic vessel have limited potential to be affected by sound emissions underwater due to the limited transmission of sound energy between the water/air interface, but may be startled by seismic pulses in close proximity to the seismic source. However, given the likely avoidance response from fish and other prey species in waters immediately surrounding the seismic source, birds are unlikely to forage near the operating seismic source. In the unlikely event that birds dive and forage near the seismic source, this is likely to only affect individual birds, resulting in a startle response with the affected birds expected to move away from the area as a result.

Impact Assessment

Seabirds– Impact Assessment Conclusion

In the absence of foraging BIAs it is not likely that seabirds would be impacted by the seismic survey. The behaviour and distribution of some fish may be affected for short periods during and after exposure to the seismic source, which may result in short-term and localised changes in the distribution of target prey species for some bird species. However, it is expected that the behaviours and distribution of prey at any one time will remain largely unaffected within the Operational Area. Furthermore, it is expected that wedge-tailer shearwaters will not be displaced from the wider areas of the breeding BIA. Therefore, impacts to seabird populations are extremely unlikely to occur.

Commercial Fisheries

Noting that no commercial fisheries operate within or near the Operational Area (refer to **Section 4.10.2**) and the Operational Area does not provide suitable habitat or water depths for target fish or crustacean species, no physical or behavioural impacts are predicted to commercial fish stocks and no impacts are predicted to commercial fishery catch rates.

Commercial Fisheries – Impact Assessment Conclusion

Based on the assessment above and the implementation of the identified control measures, the consequence of occasional short-term and localised disturbance to the target species and catch rates of commercial fisheries is of no lasting effect (less than one month) and impacts will not be significant to commercial fisheries.

Marine Protected Areas

Impact Assessment

As described in **Section 4.9**, the Operational Area does not overlap with any Commonwealth or State Marine Parks. However, Australian Marine Parks (AMPs) are located in the wider EMBA that are part of the North-west Marine Park Networks.

The nearest marine park is the Gascoyne AMP, located 33 km south of the Operational Area and approximately 44 km of the Active Source Area at the closest point. Maximum received sound levels at the boundary of the Gascoyne AMP are predicted to be approximately 140 dB re 1 µPa (SPL).

The potential impacts to the natural, social and economic values of the Gascoyne AMP are summarised as follows.

- Exmouth Plateau KEF – The Operational Area and Active Source Area are located within the KEF. As assessed above, the potential impacts to benthic communities will be highly localised, temporary and negligible in the context of natural variability. The productivity, ecological function and value of the KEF will not be affected.
- Continental slope demersal fish communities KEF – The KEF is located over 150 km from the Active Source Area. Underwater sound emissions will not affect the demersal fish communities in this KEF.
- Canyons linking Cuvier abyssal plain and Cape Range peninsula KEF – The KEF is located over 105 km from the Active Source Area. Underwater sound emissions will not affect the benthic invertebrate or fish communities in this KEF.
- Commonwealth waters adjacent to Ningaloo Reef KEF – The KEF is located over 170 km from the Active Source Area. Underwater sound emissions will not affect the coral reef communities, deep water filter feeder communities or marine fauna that aggregate or migrate within the KEF.
- Humpback whale migratory pathway – As assessed above, received sound levels at the humpback whale migration BIA are predicted to be below 130 dB re 1 µPa SPL. No significant behavioural response is expected and the BIA is well beyond the maximum range in which TTS effects could occur.
- Pygmy blue whale migratory pathway and possible foraging habitat – As assessed above, the animat modelling demonstrates that TTS effects are not expected to occur in the migration BIA. Impacts to cetaceans are likely to be limited to temporary behavioural changes (avoidance) in individuals migrating through the Operational Area. Received sound levels at the pygmy blue whale foraging BIA are predicted to be below 130 dB re 1 µPa SPL. No significant behavioural response is expected and the foraging BIA is well beyond the maximum range in which TTS effects could occur.
- Internesting habitats for marine turtles – As assessed above, no impacts are expected to turtles within designated internesting habitats, which are located over 150 km from the Active Source Area.

Given that the other marine parks within the EMBA are located a greater distance from the Operational Area no impacts will occur as a result of underwater sound from the survey.

The objectives of the North-west Marine Parks Network Management Plan are to provide for:

- the protection and conservation of biodiversity and other natural, cultural and heritage values of marine parks in the North-west Network
- ecologically sustainable use and enjoyment of the natural resources within marine parks in the North-west Network, where this is consistent with objective (a).

Impact Assessment
The Petroleum Activities Program will be undertaken in a manner that is consistent with the management objectives for the AMPs and the North-west Marine Park Network. No long-term impacts are predicted and the values will be conserved and protected. *Marine Protected Areas – Impact Assessment Conclusion* Based on the proposed timing and duration (up to 80-days) of the seismic acquisition and the control measures proposed, predicted noise levels from seismic acquisition are not considered likely to cause any ecologically significant impacts to the natural values of the AMPs. ***Cumulative Assessment*** *Previous Seismic Surveys* Cumulative impacts from successive seismic surveys in the same area can occur when timing between the surveys is less than the recovery rate of any potential receptors, which can be in the order of minutes to hours for some receptors (e.g. zooplankton and fish), or weeks to months for others (e.g. benthic invertebrates), as described above. A summary of the marine seismic surveys that have been undertaken in the last five years (2016-2021) within approximately 150 km of the Scarborough 4D B1 MSS Active Source Area is presented in **Table 6-10** and **Figure 6-4**. As shown in **Table 6-10** and **Figure 6-4**, there is no spatial overlap between the Scarborough 4D B1 MSS Operational Area and any other seismic survey Operational Areas. **Table 6-10: Previous seismic surveys completed within 150 km of the Scarborough 4D B1 MSS from 2016-2021**

Survey Name	Operator	Acquisition Period(s)	Spatial overlap
Cimatti 4D MSS	Woodside Energy Ltd	13/04/2020–23/04/2020	None
Laverda 4D MSS	Woodside Energy Ltd	09/03/2020–11/04/2020	None
Harmony 4D MSS	Woodside Energy Ltd	12/02/2020–04/03/2020	None
Pluto 4D MSS	Woodside Energy Ltd	05/01/2020–09/02/2020	None
Bianchi-Hockey 3D MSS	Quadrant Northwest Pty Ltd	23/01/2017–09/03/2017	None
Exmouth SLB15 MC 3D MSS	Schlumberger Australia	07/12/2016–01/05/2017	None
Gorgon OBN MSS	Chevron Australia Pty Ltd	03/11/2015–07/04/2016	None

Impact Assessment

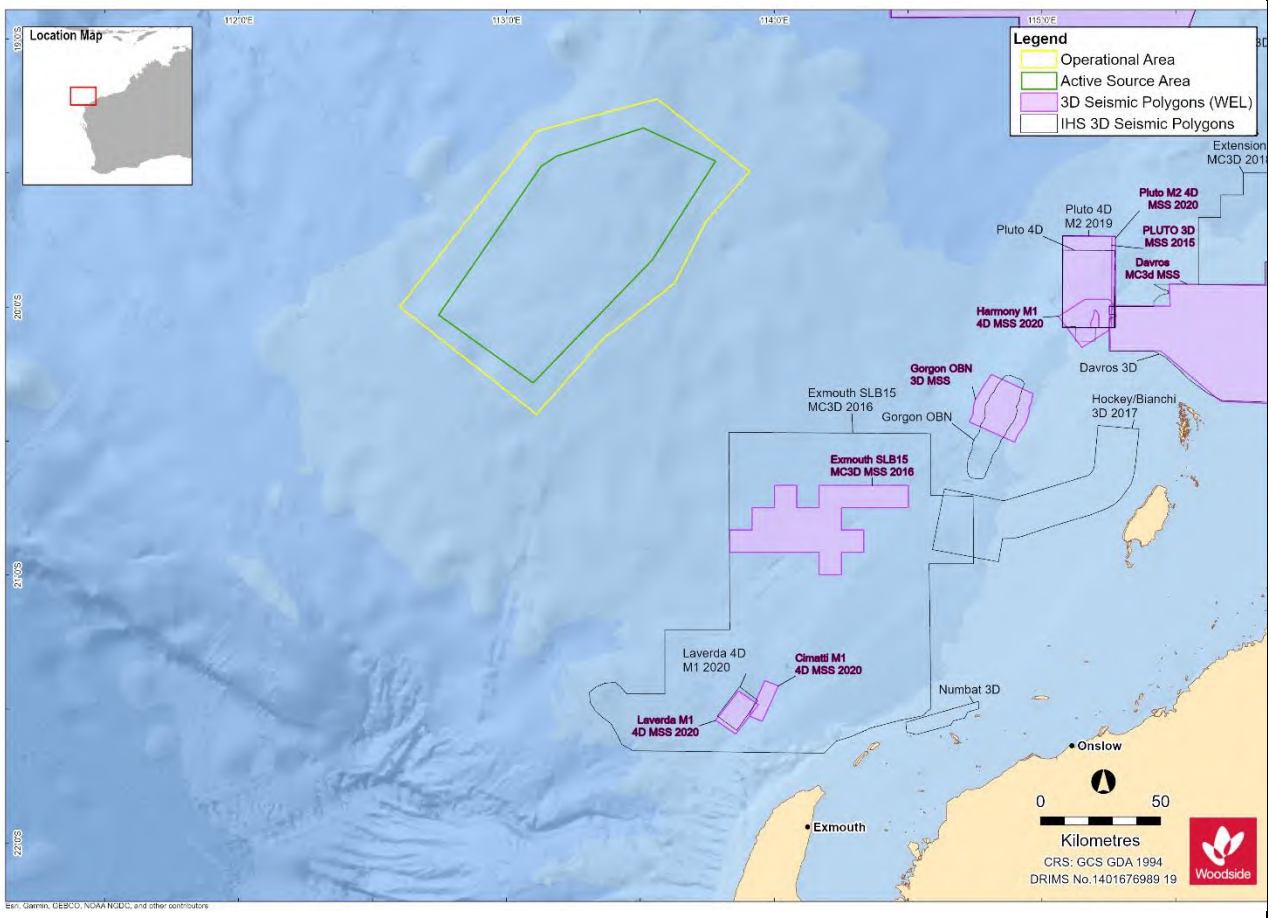

Figure 6-4: Previous seismic surveys that have occurred in the region

Marine fauna

The footprint of any significant underwater noise effects to marine fauna resulting from the proposed seismic survey has been assessed as being within approximately 22 km from the seismic source, based on the maximum range to TTS and behavioural effects for any receptor, in this case pygmy blue whales. However, a 150 km buffer has been selected as a conservative criterion to assess potential cumulative impacts. The maximum recovery rate for marine fauna receptors is in the order of weeks to months, particularly for sharks, marine turtles and cetaceans. Given that there have been no seismic surveys completed over the same area of seabed as the Scarborough 4D B1 MSS in the past five years, ecological receptors are expected to have recovered.

Therefore, cumulative impacts to marine fauna are not expected to occur as a result of any of the identified previous seismic surveys in the region and the proposed Scarborough 4D B1 MSS.

Commercial fisheries

There is only one Commonwealth managed fishery (Western Deepwater Trawl Fishery) and one State managed fishery (West Coast Deep Sea Crustacean Managed Fishery) that have historically had catch/effort within the Operational Area, however there has been no recent fishing catch/effort within the Operational Area from 2008-2019 (Patterson et al., 2020) and 2010-2019 (DPIRD, 2021), respectively (refer to **Section 4.10.2**).

There are three previous seismic surveys within 150 km of the Scarborough 4D B1 MSS Operational Area (Cimatti 4D MSS, Laverda 4D MSS and Exmouth SLB15 MC 3D MSS) with partial overlap with the Western Deepwater Trawl Fishery management boundary and West Coast Deep Sea Crustacean Managed Fishery management boundary. The most recent seismic survey (Cimatti 4D MSS) was completed in late-April 2020. It is acknowledged that the behaviours and distribution of pelagic fish species could be affected for hours to days following exposure, as a result of potential to disturbance to more sound-sensitive prey species. Crustaceans were found to recover from impacts from seismic noise exposure within weeks to months after exposure. No long-term impacts on the abundance or community structure of either species were not found. Therefore, it is expected that any impacts to commercially targeted fish or crustacean species will have recovered. Given the lack of recent fishing effort within the Operational Area, the Scarborough 4D B1 MSS is expected to have limited to no impact to this commercial fishery, and no cumulative impacts are expected to occur.

Impact Assessment

Concurrent Seismic Surveys

Over the scheduled duration of the Scarborough 4D B1 MSS there are four other seismic surveys proposed in the broader NWMR. **Table 6-11** presents the seismic surveys that may occur within the same EP timeframes, and have either been accepted by NOPSEMA or have been submitted to NOPSEMA for public comment period or assessment. The below assessment does not assess cumulative impacts from seismic surveys in the region that occur after the Scarborough 4D B1 MSS or that have not yet submitted an Environmental Plan to NOPSEMA.

Table 6-11: Other potential seismic surveys occurring in the region

Survey Name	Operator	Survey Location	Survey Timing	EP Status
Capreolus-2 3D MSS	TGS-Nopec Geophysical Company Pty Ltd	~ 275 km east of the Operational Area	1/10/2020–31/12/2024	The EP is accepted and valid to 2024
INPEX 2D MSS (WA-532-P, WA-533-P, WA-50-L)	INPEX	~ 700 km east of the Operational Area	1/11/2021–31/05/2022 Contingency: 1/11/2022–31/05/2023; 1/11/2023–31/12/2023	The EP is accepted and valid to 2023
Archer 3D MSS	Santos WA Northwest Pty Ltd	~450 km east of the Operational Area	1/02/2021–31/07/2021; 1/02/2022–31/07/2022	The EP is accepted and valid to 2022
Keraudren Extension 3D MSS	Santos WA Northwest Pty Ltd	~500 km east of the Operational Area	1/02/2020–31/07/2020; 1/02/2021–31/07/2021; 1/02/2022–31/07/2022	The EP is accepted and valid to 2022

The individual sound fields produced by separate concurrent seismic surveys has the potential to interact where sound waves from the separate seismic sources may be received either in synchrony (“in synch”) or out of synchrony (“out of synch”). The way in which these sound waves might react was considered by JASCO Applied Sciences and ERM for the Santos Keraudren Extension 3D MSS EP (Santos, 2020a). An increase in sound levels may occur temporarily at locations where the received signals from each source occur in synch. However, in most instances, pulses will be out of synch and increased received PK-PK sound levels will not occur often.

Given that different seismic sources are unlikely to be discharged at exactly the same time, different surveys will have different source impulse intervals. Additionally, given that each pulse will be a few hundred milliseconds in duration with several seconds in between, pulses will generally be out of synch with one another. Pulses may still line up occasionally for a brief moment at some locations, and when they do, the amplitudes will then be too unequal for the sum level to differ much from the stronger of the two components. However, in the unlikely case that two pulses interact and are exactly synchronised with each other, then the combined SPL would be 3 dB higher than the individual SPL, which represents a doubling of sound energy. Further explanation is provided in Santos (2020a).

A minimum separation distance of at least 40 km will be maintained between the Scarborough 4D B1 MSS and any other concurrently operating seismic source during data acquisition activities to prevent acoustic interference and preserve seismic data integrity. As a result of this separation, underwater sound from the seismic source is not expected to combine to significantly raise the SPL to levels which receptors may be exposed. Modelling of the seismic source for the Scarborough 4D B1 MSS shows that sound levels will be below 150 dB re 1µPa at 20 km from the source (half way between two seismic sources at their minimum separation distance) (Koessler et al. 2021; **Appendix G**). A combination of seismic sound from two similar seismic sources at this distance would therefore be expected to result in an SPL of no greater than 153 dB re 1µPa.

While the overall sound levels are not expected to be significantly increased, it is acknowledged that the result of multiple seismic vessels operating concurrently will represent a wider spatial area of potential exposure to seismic sound for receptors, as well as the potential for receptors to be exposed to separate sound fields from multiple surveys. There are no planned seismic surveys with overlap with the Scarborough 4D B1 MSS Operational Area.

Impact Assessment

Zooplankton

Based on the maximum worst case mortality exposure suggested by McCauley et al. (2017) and modelling completed by CSIRO (Richardson et al., 2017), impacts to zooplankton are only expected to be significant within a short range (< 15 km) of seismic survey areas. The maximum predicted distances to mortality for zooplankton during the Scarborough 4D B1 MSS was approximately 110 m (**Table 6-2**). Beyond 22 days of acquisition, Richardson et al. (2017) found that no further relative increase in zooplankton mortality occurs, due to recruitment of zooplankton via currents from adjacent areas, and conditions return to normal within a few days of a survey ceasing. At the regional scale, these impacts are not expected to be significant (Richardson et al., 2017). Further, natural mortality rate in zooplankton can be high, and therefore limited impacts are expected relative to the natural variation in zooplankton concentrations and mortality rate.

There are no significant, discernible cumulative impacts to zooplankton, expected to occur given the minimum separation distance of 40 km between the Scarborough 4D B1 MSS and any other operating seismic sources. The cumulative impacts to zooplankton are expected to be negligible.

Benthic Invertebrates

The maximum worst case impacts reported for invertebrates include sub-lethal impacts such as statocyst impairment, temporary reduced immune response function, temporary impaired reflexes, and potentially some chronic effects that lead to mortality of a very small number of sessile benthic invertebrates over and above natural mortality rates. Repeated exposures to seismic noise for some sessile invertebrates, such as bivalves, have been observed to result in additional chronic mortality in the weeks and months following exposure compared with invertebrates exposed to just one pass of a seismic source (i.e. an increase of approximately 2-5%) (Day et al., 2016b). However, such effects may still be within the range of naturally occurring mortality rates documented in the wild (Day et al., 2017). Therefore, given that repeat exposures will affect only a small proportion of benthic organisms, and the natural cycle of death and recruitment will occur in parallel, the impacts of repeated seismic exposure may not be detectable from natural fluctuations in benthic invertebrates.

The Scarborough 4D B1 MSS seismic source will be operated in water depths >800 m, where benthic invertebrate diversity and abundance are expected to be low, and it is not expected that there would be any impact to benthic invertebrates from noise emissions from the seismic source. Impacts to benthic invertebrates during other seismic surveys are expected to occur at close range to the seismic source, within a few hundred metres.

Given the minimum separation distance of 40 km between the Scarborough 4D B1 MSS and other operating seismic sources, no significant, discernible cumulative impacts to benthic invertebrates are expected to occur.

Fish, Sharks and Rays

No significant, discernible cumulative impacts to fish, sharks and rays are expected to occur given the minimum separation distance of 40 km between the Scarborough 4D B1 MSS and any other operating seismic sources. Behavioural impacts to fish are expected to occur within tens to hundreds of metres of a seismic source (Popper et al., 2014), returning to normal within minutes to hours or days, depending on the species, hearing sensitivity and situational context.

Individual groups of fishes in each seismic survey Active Source Area may be subject to occasional behavioural disturbances, however no cumulative overlap of strong behavioural responses is expected to occur. Some changes in fish abundance and distribution could occur as a result of sound exposure from multiple operating seismic sources, although these changes are expected to return to normal within hours to days.

Whale sharks may experience localised disturbance when passing each of the other seismic survey Operational Areas, particularly as they overlap with a whale shark foraging BIA. However, as all vessels will maintain a minimum separation distance of 40 km, and the Scarborough 4D B1 MSS Active Source Area does not overlap with the whale shark foraging BIA, separate and isolated incidents of disturbance are not expected to result in significant cumulative impacts.

Cetaceans

There are no significant, discernible cumulative impacts to cetaceans, expected to occur given the minimum separation distance of 40 km between the Scarborough 4D B1 MSS and any other operating seismic sources. As above, combined seismic sound from two similar seismic sources at a distance of half the minimum separation distance (20 km) would be expected to result in an SPL lower than the defined behavioural response thresholds for cetaceans of 160 dB re 1µPa (**Table 6-5**). Any behavioural avoidance or deviations are expected to be small relative to the long distances (i.e. thousands of kilometres) over which cetaceans usually travel during their migrations.

Table 6-12 provides an assessment of cumulative impacts to migrating pygmy blue whales. There are no other potential seismic surveys occurring near the pygmy blue whale foraging BIA, located 154 km south of the Scarborough 4D B1 MSS Operational Area.

Table 6-12: Assessment of cumulative impacts to migrating pygmy blue whales

	Pygmy blue whales
Woodside Scarborough 4D B1 MSS	The Scarborough 4D B1 MSS Operational Area is located approximately 14 km north-west of the pygmy blue whale migration BIA. At its closest point, the Active Source Area is 25 km from the migration BIA. TTS effects to pygmy blue whales were predicted to occur up to 22 km from the seismic source (**Table 6-7**). Therefore, no TTS effects are predicted to migrating pygmy blue whales within the migration BIA. Short-term behavioural impacts may occur up to 7.3 km from the seismic source (**Table 6-6**). Therefore, short-term behavioural impacts to migrating pygmy blue whales are not expected within the migration BIA.
TGS Capreolus-2 3D MSS (TGS, 2020)	The Capreolus-2 3D MSS overlaps with the pygmy blue whale migration BIA. The seismic source will not be operated within 24 km of the pygmy blue whale migration BIA during the migration periods for the species (April to August and October to December). Maximum predicted distances to TTS thresholds for pygmy blue whales within the migration BIA is 24 km. Therefore, no TTS effects are predicted to migrating pygmy blue whales within the migration BIA. Short-term behavioural impacts may occur up to 9.5 km from the seismic source. Therefore, short-term behavioural impacts to migrating pygmy blue whales are not expected within the migration BIA.
INPEX 2D MSS (INPEX, 2021)	The INPEX 2D MSS overlaps with the pygmy blue whale migration BIA. The seismic source will not be operated within 24 km of the pygmy blue whale migration BIA during the migration periods for the species (April to August and October to December). The maximum predicted distance to TTS thresholds for pygmy blue whales is approximately 23 km. Therefore, no TTS effects are predicted to migrating pygmy blue whales within the migration BIA. Short-term behavioural impacts may occur up to 6.5–8 km from the seismic source in continental slope waters. Migrating pygmy blue whales may deviate from their normal course by several kilometres to avoid the seismic sound source, however this distance does not constrain the migration path of pygmy blue whales. Therefore, occasional and localised short-term behavioural impacts are predicted to migrating pygmy blue whales within the migration BIA.
Santos Keraudren Extension 3D MSS (Santos, 2020a)	The Keraudren Extension 3D MSS Operational Area is located approximately 30 km north-west of the pygmy blue whale migration BIA, and the Active Source Area is located over 100 km from the pygmy blue whale migration BIA. Timing of the survey also only coincides with part of the northbound migration. Maximum predicted distances to TTS thresholds for pygmy blue whales is 31 km. Therefore, no TTS effects are predicted to migrating pygmy blue whales within the migration BIA. Short-term behavioural impacts may occur up to 9 km from the seismic source. Therefore, short-term behavioural impacts to migrating pygmy blue whales are not expected within the migration BIA.

Based on the assessment provided in **Table 6-12**, no significant cumulative TTS or behavioural impacts are expected to pygmy blue whales within the migration BIA. No TTS or behavioural impacts as a result of the Scarborough 4D B1 MSS seismic survey are expected to migrating pygmy blue whales, and the other concurrent planned seismic surveys in the region do not constrain the migration route for pygmy blue whales (only partial overlap with the Operational Areas and migration BIAs). It is expected that pygmy blue whales will continue to utilise the migration routes without injury or displacement.

Other cetacean species that may occur within the region, for example humpback, fin and sei whales, are expected to be transient and no changes to migration or other life stages are expected. Localised disturbances may occur when passing the concurrent seismic surveys, however these isolated incidents of disturbance are not expected to result in significant cumulative impacts.

Marine Reptiles

No significant, discernible cumulative impacts to marine turtles are expected to occur given the minimum separation distance of 40 km between the Scarborough 4D B1 MSS and any other operating seismic sources. Any behavioural avoidance or deviations are expected to be small relative to the long distances over which marine turtles usually travel.

Impact Assessment
Marine turtles may experience a short-term behavioural response up to approximately 4 km from the Scarborough 4D B1 MSS operating source, based on the NMFS criterion of 166 dB re 1 µPa SPL (**Table 6-9**). The Scarborough 4D B1 MSS Operational Area is located 135 km north-west of the nearest internesting buffer for flatback turtles, and 147 km north-west of the nearest Habitat Critical for flatback turtles (refer to **Section 4.6.2**). Given that there is no expected impact to marine turtles as a result of the Scarborough 4D B1 MSS, no cumulative behavioural effects to marine turtles are expected within internesting buffer BIAs or Habitat Critical areas. Localised disturbances to marine turtles may occur when passing the concurrent seismic surveys, however these isolated incidents of disturbance are not expected to result in significant cumulative impacts. <u>Commercial Fisheries</u> Cumulative impacts to commercial fisheries may occur if multiple seismic surveys occur concurrently or in quick succession within a fishery, resulting in displacement of commercial fishing vessels or changes in catch rates due to behavioural changes in target fish or crustacean species. The expected range and duration of impacts to fish abundance, distribution and catch rates is relatively small compared to wider areas within which the fisheries operate. There is only one Commonwealth managed fishery (Western Deepwater Trawl Fishery) and one State managed fishery (West Coast Deep Sea Crustacean Managed Fishery) that have historically had catch/effort within the Operational Area, however there has been no recent fishing catch/effort within the Operational Area from 2008-2019 (Patterson et al., 2020) and 2018-2022 (DPIRD, 2022), respectively (refer to **Section 4.10.2**). There are no concurrent seismic surveys proposed in the region that overlap with the Western Deepwater Trawl Fishery or the West Coast Deep Sea Crustacean Managed Fishery. In the absence of any other surveys, and lack of recent fishing effort within the Scarborough 4D B1 MSS Operational Area, cumulative impacts to commercial fisheries are not expected. *Concurrent Woodside Activities* Scarborough drilling and completion activities may be undertaken within WA-61-L; however, there will be no temporal overlap with acquisition of the Scarborough 4D B1 MSS (activities will not occur concurrently) and therefore no cumulative underwater noise impacts are predicted with from this activity (**Section 6.3**). *Concurrent Other Oil & Gas Projects* Acquisition of the Scarborough 4D B1 MSS may coincide with other oil and gas activities in the region – e.g. drilling of the Sasanof-1 exploration well in WA-519-P, and activities associated with the Jansz-Io Compression project. However, these activities will take place at locations that are >50 km (Sasonof-1) and >90 km (Jansz-Io) from the Active Source Area, and consequently no cumulative underwater noise impacts are predicted with from these activities.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Application of EPBC Policy Statement 2.1 Part A Standard Management Procedures to whales and Part B.4, as outlined below: • observation zone: - 3 km+ to the limits of visibility for large unidentified whales - 2 km to 3 km for all other whales • shut-down zone: - to limits of visibility for positively	F: Yes. CS: Extending the shut-down zones may result in additional shut-downs potentially resulting in extending the survey and additional costs	Reduces the likelihood of individual whales being within proximity of the acoustic source where TTS could occur and eliminates the potential for PTS. Single pulse PTS and TTS impacts to LF-cetaceans (such as pygmy blue whales) are predicted to be constrained to within 40 m and 60 m of the seismic source, respectively (**Table 6-6**). Therefore, application of a shut-down zone of a minimum of 2 km is an	Benefits outweigh cost/sacrifice. Benefits outweigh cost/sacrifice. Extending the shut-down zone further for pygmy blue whales was considered, including: • shut-down zones past the limits of	Yes **C 4.1**

1 Qualitative measure

identified (certain or probable confidence level) pygmy blue whales, humpback whales or large unidentified whales; - 2 km for all whales • Observation and compliance reporting: - Use of trained vessel crew in marine fauna observations and monitoring compliance to Policy Statement 2.1. - Records kept of marine fauna observations during all surveys. • Pre start-up visual observation (30 minutes) • Soft start procedure (30 minutes) • Start-up delay procedure (if sighting occurs) • Operations procedure • Stop work (shut down) procedure • Night-time and low visibility procedure		effective control in ensuring that no PTS and TTS impacts will occur to pygmy blue whales from short-term exposure to seismic noise at close range to the source. As the activity is taking place within the distribution range for pygmy blue whales where there is a lower possibility of encountering individual whales as compared to the migration BIA (Thums et al., 2022). If this occurs, the application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and extended observation and shutdown zones (Part B.4) will minimise the likelihood of TTS effects. The pygmy blue whale migration BIA is located ~25 km from the Active Source Area. Based on an overlap of three different metrics (occupancy, number of whales in a cell and move persistence) Thums et al. (2022) identified the most important foraging areas for pygmy blue whales offshore from WA. This included the area off the shelf edge from Ningaloo Reef to the Rowley Shoals but not the Operational Area. Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered of low likelihood but possible, with the occasional individual or small group of whales within the Operational Area and mostly likely in the peak period of the northbound migration (May and June), based on the recorded presence of one pygmy blue whale. Cumulative PTS and TTS impacts to LF-cetaceans (such as pygmy blue whales) are predicted to be constrained to within 0.13 km and ~22 km of the seismic source, respectively (**Table 6-7**). A	visibility; and • extending shut-down zone to the limits of visibility for large unidentified whales. However as impacts to pygmy blue whales are already reduced to ALARP and acceptable levels considering impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes', no TTS is predicted in the pygmy blue whale migration BIA and no significant behavioural impacts are predicted, further extension of the shut-down zones is considered disproportionate to the environmental benefits. Given the application of EPBC Act Policy Statement 2.1 Part A Standard Management Measures and Part B.4 - Increased precaution zones and buffer zones, the risk of TTS is reduced to ALARP and acceptable levels.	

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
		tagging study of blue whales showed that migrating individuals can travel 50 to 100 km per day (Double et al., 2014). This equates to an average swimming speed of 2-4 km/hr over a 24-hour period. In comparison, the seismic vessel will be traveling at around 4.5 knots (~8 km/hr). Migrating pygmy blue whales at greatest risk of seismic noise exposure are likely to be moving parallel to the survey lines (i.e. migrating). At a speed of 8 km/hr it will take the survey vessel ~9 hours on average to acquire lines in the Active Source Area (with the longest line taking ~12.5 hours), and then the source is shut down during line turns. As sound levels from the seismic source will only exceed the PTS SEL_{24hr} metric for LF-cetaceans at a range up to 0.13 km from the vessel, application of the 'to the limits of visibility' shut-down zone will ensure that this threshold is not exceeded. Similarly for cumulative TTS exposure, sound levels from the seismic source will exceed the TTS SEL_{24hr} metric for LF-cetaceans for up to 22 km from the vessel. As a whale is expected to pass through the ensonified area in less than 24-hours, an isolated individual is highly unlikely to remain within the reported SEL_{24hr} radius for the full 24-hours leading to TTS exposure, particularly due to the lack of foraging grounds within the region.		
Application of EPBC Act Policy Statement 2.1 Part B.1 – MMOs: • Employ four dedicated MFOs to undertake	F: Yes. CS: Minimal cost. Standard practice.	Two dedicated MFOs per observing vessel (seismic vessel and spotter vessel) provides improved marine fauna identification, distance estimation and	Benefits outweigh cost/sacrifice.	Yes **C 4.2**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
observations for EPBC Act Policy Statement 2.1.		implementation of EPBC Act Policy Statement 2.1. Two MFOs on board each vessel allows at least one MFO to be undertaking observations with the potential to increase effort as needed. Two MFOs on board each vessel also provides contingency in the event one is unavailable and for managing work shift fatigue.		
Application of EPBC Act Policy Statement 2.1 Part B.5 – PAM: • A PAM system will be installed aboard the survey vessel to detect odontocete whales (specifically sperm and beaked whales). • Employ two dedicated PAM operators wherever possible.	F: Yes CS: Minimal cost.	Two dedicated PAM operators provides improved marine fauna identification and implementation of EPBC Act Policy Statement 2.1. Two PAM operators on board provides contingency in the event one is unavailable and for managing work shift fatigue.	Benefits outweigh cost/sacrifice.	Yes **C 4.3**
Application of EPBC Act Policy Statement 2.1 Part B.6 – Adaptive Management measures to minimise the potential impacts to pygmy blue whales from seismic noise. The following adaptive measures will be implemented: • If there are three or more shut-downs for pygmy blue whales within a 24-hour period (including spotter vessel MFO shutdowns), then the seismic operations must not be undertaken thereafter at night-time or during low visibility conditions. • Seismic operations cannot resume at night-time or during low visibility conditions, until there has been a cumulative 24-hour period of seismic operations (daylight hours with good visibility) during which there has	F: Yes CS: Increased costs of the survey during no seismic operations, prolonging the survey duration. Any delays to the seismic program could result in significant cost and operational implications. It would also extend the duration of the survey, potentially increasing impacts to other receptors. However, observation zone has been selected to be protective of pygmy blue whales.	PTS or TTS effects to pygmy blue whales are not predicted to occur from exposure to a single impulse. However, adaptive management measures are considered conservative and appropriate to provide protection to pygmy blue whales that may be exposed to multiple pulses at close range.	Benefits outweigh cost/sacrifice.	Yes **C 4.4**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
been less than three shut-downs for pygmy blue whales				
EPBC Act Policy Statement 2.1 Part B.3 – Use of additional vessels to detect presence of cetaceans, during all daylight activities with seismic source discharge: • Use of two MFOs aboard a dedicated spotter vessel travelling ~5 km out ahead of the seismic vessel to implement C 4.1.	F: Yes. Increases potential likelihood of environmental impacts, health and safety impacts to personnel due to additional vessel in the field. CS: Significant cost of additional vessel and personnel.	Two dedicated additional MFOs aboard a dedicated spotter vessel provides improved marine fauna detection and identification, and implementation of EPBC Act Policy Statement 2.1. The spotter vessel MFOs will work in tandem with survey vessel MFOs to implement C 4.1 (Policy Statement 2.1 Part A Standard Management Procedures and Part B.4) and C 4.4 (Adaptive Management Measures for pygmy blue whales). Stationing the spotter vessel ~5 km ahead of the survey vessel and acoustic array allows for the spotter vessel MFO observation zone (3km+ in good visibility) to extend ahead of the seismic source out to and beyond the 7.28 km behavioural disturbance distance for LF cetaceans. As a result of the extended MFO observation coverage there is an extended range for the implementation of the PBW / large unidentified whale shut down zone. Thus minimising the potential for biologically significant behavioural disturbances. Adaptive management and the use of the pygmy blue whale sightings (e.g numbers are greater than predicted) to trigger the implementation of this control were considered in line with the precautionary principle, to limit potential impacts. However, this could not be implemented due to logistical constraints surrounding vessel availability at short notice. As such the control will be applied throughout the duration of the activity	Benefits outweigh cost/sacrifice.	Yes **C 4.6**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
		extending beyond the precautionary principle.		
The seismic source will not be discharged outside of the Active Source Area.	F: Yes CS: CS: Minimal cost. Standard practice.	Limits the effects of underwater sound to the extent that is assessed in this EP.	Benefits outweigh cost/sacrifice.	Yes **C 5.1**
Good Practice				
Seismic source validation.	F: Yes CS: Source modelling can be undertaken at minimal cost and relatively quickly.	If the seismic source selected for the Petroleum Activities Program is different to the source modelled and assessed in Koessler et al. (2021; **Appendix G**), then additional source modelling will be undertaken to confirm whether the sound levels are consistent with levels assessed as acceptable in this EP.	Benefits outweigh cost/sacrifice.	Yes **C 3.1**
No operation of the seismic source within 25 km of the pygmy blue whale migration BIA.	F: Yes CS: Minimal cost. The Active Source Area is located >25 km from the pygmy blue whale migration BIA.	ANIMAT modelling (**Appendix G**) predicts that the maximum range at which pygmy blue whales may experience TTS is at 21.73 km. Preventing operation of the seismic source within 25 km of the pygmy blue whale migration BIA provides some additional conservatism and prevents TTS effects and injury to pygmy blue whales in the migration BIA.	Benefits outweigh cost/sacrifice.	Yes **C 4.5**
A 40 km separation distance between the Petroleum Activities Program and any identified concurrent seismic survey	F: Yes CS: In the event that other surveys are present in the region, a 40 km separation distance may result in delays due to vessel downtime or loss of survey area.	The Bureau of Ocean Energy Management (BOEM, 2014) published an environmental review of geological and geophysical survey activities in the south Atlantic Ocean. To minimise impacts to marine life by providing a 'corridor' between vessels, the environmental impact statement from this review included a requirement for a 40 km geographic separation distance (based on worst case scenarios) between the sources of simultaneous seismic surveys.	Benefits outweigh cost/sacrifice.	Yes **C 6.1**
Reduce size of Active Source Area to minimise potential for	F: Yes	There is no overlap between the Active Source	Disproportionate.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
behavioural responses in pygmy blue whales	CS: Significant cost and schedule impacts. The Active Source Area has been designed to cover both the Scarborough and Jupiter fields, so that the survey provides new 3D / baseline 4D seismic data over both fields. Reducing the size of the Active Source Area would mean that the Jupiter extension would have to be acquired as part of a separate additional survey.	Area or the Operational Area with the pygmy blue whale migration BIA. Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause injury effects. Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly likely in the peak period of the northbound migration (May and June). An additional control of a dedicated spotter vessel travelling ahead of the seismic vessel increases the ability to detect pygmy blue whales, refer to **C 4.6**.	The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction during the pygmy blue whale northbound and southbound migrations.	
Professional Judgement – Eliminate				
Reprocess previously acquired data	F: No. Woodside has re-processed the 2004 vintage seismic survey, HEX-003 on two separate occasions, in 2010 and 2018, on the latter occasion the processing involved the implementation of state-of-the-art Full Wave Equation	Not considered‑control not feasible.	Not considered‑control not feasible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	imaging. No further uplift can be gained from this data Additionally the original survey does not extend over the full Scarborough gas field or over the Jupiter gas field. CS: Not considered – control not feasible.			
Use of alternative technologies to acquire data	F: No. Marine seismic vibrator technology is still in research and development and is yet to be offered commercially. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Vary the timing of the Petroleum Activities Program to avoid migration periods of pygmy blue whales	F: Yes CS: Significant cost and schedule impacts due to difficulties in securing a survey vessel for specific timeframes outside migration periods for pygmy blue whales. Reduces timeframe for acquisition to 4-months (Feb-Mar and Aug-Sept), which would limit the possibility of using a 'vessel of opportunity' that may be in the region.	There is no overlap between the Active Source Area or the Operational Area with the pygmy blue whale migration BIA. Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause injury effects. Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale	Disproportionate. The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction during the pygmy blue whale northbound and southbound migrations.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
		overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly likely in the peak period of the northbound migration (May and June). An additional control of a dedicated spotter vessel travelling ahead of the seismic vessel increases the ability to detect pygmy blue whales, refer to **C 4.6**.		
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Reduce seismic source capacity (volume) to minimise potential for behavioural responses in pygmy blue whales	F: Yes CS: Significant cost and schedule impacts. The seismic source specifications were selected following a technical assessment, and a review of legacy seismic survey parameters. The source specifications have considered the range of water depths within the Active Source Area and depth of the targets within the subsurface geology to ensure adequate seismic imaging. It was determined that a maximum volume of 3150 cu in is required to adequately image subsurface prospects, and to provide a 4D baseline for potential future monitoring surveys. Reducing the source capacity would result in the acquisition of inadequate 3D data, potentially requiring all or parts of the	There is no overlap between the Active Source Area or the Operational Area with the pygmy blue whale migration BIA. Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause injury effects. Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly likely in the peak period of	Disproportionate. The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction during the pygmy blue whale northbound and southbound migrations.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	survey to be re-acquired.	the northbound migration (May and June). An additional control of a dedicated spotter vessel travelling ahead of the seismic vessel increases the ability to detect pygmy blue whales, refer to **C 4.6**.		
EPBC Act Policy Statement 2.1 Part B.3 – Use of spotter aircraft to detect presence of cetaceans	F: Yes. Increases potential likelihood of environmental impacts, health and safety impacts to personnel due to aircraft in the field. Unacceptable risk to personnel in operating aircraft so far offshore. CS: Significant cost of aircraft and personnel. Aircraft range limits observation time at the Operational Area requiring multiple aircraft/crew to cover daylight periods.	Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly likely in the peak period of the northbound migration (May and June). Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause TTS effects.	Disproportionate. The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction during the pygmy blue whale northbound and southbound migrations.	No
Use of Unmanned Aerial Vehicles (UAVs – drones) to detect presence of cetaceans	F: Yes. Unproven technology in monitoring cetaceans in offshore marine environments. Dependent on suitable weather conditions (low wind speeds and good visibility). CS: Additional cost of drones and pilots.	Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly	Disproportionate. The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
		likely in the peak period of the northbound migration (May and June). Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause TTS effects.	during the pygmy blue whale northbound and southbound migrations.	
Use of sonobuoys to detect presence of cetaceans	F: Yes. Signal reception relies on VHF radio frequencies, and therefore line-of-sight between the transmitter (sonobuoy) and the antenna on the vessel. Therefore, does not extend cetacean detection range beyond that achievable via visual observations (MFOs) or PAM. CS: Additional cost of sonobuoys and operators.	Based on the evidence presented in Thums et al. (2022), the likelihood of encountering migrating or foraging pygmy blue whales is considered low. However, based on the recorded presence of one pygmy blue whale overlapping with the Operational Area there may be the occasional individual or small group of whales transiting the area, mostly likely in the peak period of the northbound migration (May and June). Given the implementation of adaptive management measures and the absence of any TTS effects within the pygmy blue whale migration BIA, the potential impacts of noise emissions from the seismic source on pygmy blue whales are likely to be restricted to temporary behavioural changes (avoidance) in individuals moving through the Operational Area, with predicted noise levels from the seismic acquisition not considered likely to cause TTS effects.	Disproportionate. The cost / sacrifice outweighs the benefit gained. Implementing EPBC Policy Statement 2.1 Part A, and selected Part B measures will achieve an acceptable level of risk reduction during the pygmy blue whale northbound and southbound migrations.	No
ALARP Statement				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type B), Woodside considers the adopted controls appropriate to manage the impacts and risks of noise emissions generated from seismic source. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
Migratory and threatened cetaceans	**Principles of ESD** The impact assessment has considered the relevant principles of ESD: • The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. • Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes' (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (**Appendix A**) • Woodside Risk Management Policy (**Appendix A**). **External Context** Impacts to cetaceans was raised during consultation and this feedback was considered in the finalisation of the EP. Woodside recognises that First Nations have cultural interest to whales, and this has been raised in consultation and has been considered (See Section 6.9). **Other Requirements** The proposed control measures exceed the required standards and control measures set out in EPBC Policy Statement 2.1. Part A Standard Management Measures (DEWHA, 2008). The proposed activity and control measures are not inconsistent with the requirements of recovery plans or wildlife conservation plans/advice as demonstrated in	The predicted level of impact for migratory and threatened cetaceans is considered to be of an acceptable level given that the: • the Petroleum Activities Program is consistent with the relevant principles of ESD • the proposed controls have considered the environmental consequence and are consistent with Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will be managed in a manner that prevents physical injury or displacement of pygmy blue whales from migration and foraging BIAs • the Petroleum Activities Program will be managed in a manner that prevents physical injury to pygmy blue whales and other cetacean species • the Petroleum Activities Program will be managed in a manner that reduces potential biologically significant behavioural disturbances to pygmy blue whales and other cetacean species • the Petroleum Activities Program will be managed in a manner that is consistent with management objectives for relevant WHAs, AMPs, recovery plans and conservation plans/advices • the predicted level of impact has been reduced to ALARP.

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	Section 6.8. The impact assessment has determined that seismic acquisition may be undertaken in a manner that is not inconsistent with the requirements of the Conservation Management Plan for the Blue Whale, specifically that '*Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area*'. Acoustic modelling and ANIMAT modelling have demonstrated that TTS effects will not occur in the pygmy blue whale migration BIA and sound levels will not result in displacement from foraging areas. The impact assessment and proposed control measures are consistent with NOPSEMA Acoustic Impact Evaluation and Management Guideline (N-04750-IP1765 Rev2 Dec 2018). No significant or long-term impacts are expected to occur to key habitats of EPBC Act listed species included as values of the Montebello and Gascoyne AMPs.	**Environmental Performance Consideration** To manage impacts to migratory and threatened cetaceans to an acceptable level, the following EPOs have been applied: **EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 4**: Undertake seismic acquisition in a manner that prevents injury to whales, and minimises the potential for biologically significant behavioural disturbance. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP. **EPO 6**: Undertake seismic acquisition in a manner that reduces potential cumulative impacts resulting from the Petroleum Activities Programme and other seismic survey operations as far as reasonably practicable.
Migratory and threatened marine turtles	**Principles of ESD** The Petroleum Activities Program is consistent with the relevant principles of ESD: • The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. • Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes' (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over	The predicted level of impact for migratory and threatened marine turtles is considered to be of an acceptable level given that the: • the Petroleum Activities Program is consistent with the relevant principles of ESD • the proposed controls have considered the environmental consequence and are consistent with Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will be undertaken in a manner that prevents displacement of marine turtles

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (Appendix A) • Woodside Risk Management Policy (Appendix A). **External Context** During consultation turtles were raised and Woodside recognises that First Nations have cultural interest in turtles. This feedback was considered in the finalisation of the EP (See Section 6.9). **Other requirements** The proposed control measures are not inconsistent with the applicable objectives and actions of the Recovery Plan for Marine Turtles (DoEE, 2017a). Specifically, controls measures will '*manage anthropogenic activities to ensure marine turtles are not displaced from identified habitat critical to the survival' of marine turtles and 'given that the impacts of noise are unknown, a precautionary approach [will] be applied to seismic work, such that surveys planned to occur inside important internesting habitat should be scheduled outside the nesting season*'. Received noise levels from seismic acquisition are not likely to cause injury impacts, displace any individuals from Habitat Critical or internesting BIAs, or result in any ecologically significant impacts at a population level for any species of marine turtle that may be present within or adjacent to the Operational Area during the Petroleum Activities Program. The impact assessment and proposed control measures are consistent with NOPSEMA Acoustic Impact Evaluation and Management Guideline (N-04750-IP1765 Rev2 Dec 2018). Nesting and internesting marine turtle habitats are identified as a natural value of the Montebello and Gascoyne AMPs. No significant impacts to internesting marine turtles are predicted and the Activity will be undertaken consistent with marine park objectives.	from Habitat Critical/important internesting habitats during nesting/internesting periods • the Petroleum Activities Program will be managed in a manner that is consistent with management objectives for relevant WHAs, AMPs, recovery plans and conservation plans/advices • the predicted level of impact has been reduced to ALARP. **Environmental Performance Considerations** The Petroleum Activities Program will not disturb or displace any individuals from Habitat Critical or internesting BIAs, or result in any ecologically significant impacts at a population level for any species of marine turtle. The following EPOs have been applied: **EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP.
Migratory and threatened fishes and elasmobranchs	**Principles of ESD** The Petroleum Activities Program is consistent with the relevant principles of ESD:	The predicted level of impact for migratory and threatened fishes and elasmobranchs (including whale sharks) is considered to be of an acceptable level given that the:

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
(including whale sharks)	• The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. • Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to localised impacts with no lasting effect (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (Appendix A) • Woodside Risk Management Policy (Appendix A). **External Context** During stakeholder consultation with relevant stakeholders no concerns specifically relating to fish were raised. Activities do not have a significant impact on MNES (**Section 2.9.2**) including those with an Indigenous connection with, or traditional use in nearshore areas as defined in **Section 4.10.1** **Other Requirements** There are no legislative requirements applicable to managing the effects of seismic surveys in relation to sharks. Seismic noise has not been identified as a threat to whale sharks (or other shark species identified as possibly present in the region) in recovery plans or wildlife conservation plans/advice. Noise pollution is not identified as a pressure to whale sharks in the Marine Bioregional Plan for the NWMR (DSEWPaC, 2012a).	• the Petroleum Activities Program is consistent with the relevant principles of ESD • the proposed controls have considered the environmental consequence and are consistent with Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • impacts and risks to cultural values have been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will not result in physical injury to migratory and threatened fishes and elasmobranchs (including whale sharks) • the Petroleum Activities Program will be managed in a manner that is consistent with management objectives for relevant WHAs, AMPs, recovery plans and conservation plans/advices • the predicted level of impact has been reduced to ALARP. **Environmental Performance Considerations** The Petroleum Activities Program will not result in physical injury to migratory and threatened fishes and elasmobranchs (including whale sharks). The following EPOs have been applied: **EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP.

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	The impact assessment and proposed control measures are consistent with NOPSEMA Acoustic Impact Evaluation and Management Guideline (N-04750-IP1765 Rev2 Dec 2018).	
Fish spawning and commercial fisheries	**Principles of ESD** The Petroleum Activities Program is consistent with the relevant principles of ESD: • The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. • Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes' (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (**Appendix A**) • Woodside Risk Management Policy (**Appendix A**). **External Context** During stakeholder consultation with relevant persons no concerns specifically relating to fish spawning or commercial fisheries were raised. Potential impacts to fish spawning have been considered in this EP through review of overlap of behavioural response zones for fish and potential spawning areas, and demonstration that impacts and risks will be managed to levels that are ALARP. The potential impacts of noise emissions from the seismic source on spawning of key indicator commercial fish species are considered to be slight and short-term, and the	The predicted level of impact for fish spawning and commercial fisheries is considered to be of an acceptable level given that the: • the Petroleum Activities Program is consistent with the relevant principles of ESD • the proposed controls have considered the environmental consequence and are consistent with Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • impacts and risks to cultural values have been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will not result in changes to the spawning biomass or changes in recruitment of commercially important species that may be discernible from normal natural variation • the Petroleum Activities Program will not impact commercial fishery catch rates • the predicted level of impact has been reduced to ALARP. **Environmental Performance Considerations** The Petroleum Activities Program will not result in changes to the spawning biomass or changes in recruitment of commercially important species that may be discernible from normal natural variation. The Petroleum Activities Program will not impact commercial fishery catch rates. The following EPOs have been applied:

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	Activity is not likely to result in any ecologically significant impacts at a population level for any key indicator commercial fish species that may be spawning within or adjacent to the Operational Area during acquisition activities. Similarly, the potential impacts on commercial catch rates are considered to be slight, as the activity is not likely to result in any ecologically significant impacts at a population level for any key indicator species and the Petroleum Activities Program is not located in an area targeted by commercial fisheries. Activities do not have a significant impact on MNES (**Section 2.9.2**) including those with an Indigenous connection with, or traditional use in nearshore areas as defined in **Section 4.10.1** **Other Requirements** There are no legislative requirements applicable to managing the effects of seismic surveys in relation to fish spawning and commercial fisheries. The proposed control measures are consistent with key mitigation strategies for seismic surveys published in the WA Department of Fisheries Guidance statement on undertaking seismic surveys in Western Australian waters (DoF, 2013) – e.g. use of soft starts; minimise the sound intensity and exposure time of surveys. Woodside has also considered DPIRD's ecological risk assessment of seismic impacts to marine finfish and invertebrates (Webster et al., 2018) during the assessment of impacts and risks to fish spawning and commercial fisheries, noting that the DPIRD risk assessment considers worst-case potential impacts to individual finfish and invertebrates assuming they do not move to avoid an approaching seismic source. This is not representative of real-life sound exposures and does not represent impacts at a population level. Woodside has, therefore, considered additional information to assess impacts to fish spawning and fish stock populations. The impact assessment and proposed control measures are consistent with NOPSEMA Acoustic Impact Evaluation and Management Guideline (N-04750-IP1765 Rev2 Dec 2018).	**EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP.
AMPs	**Principles of ESD** The Petroleum Activities Program is consistent with the relevant principles of ESD: • The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. • Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	The predicted level of impact for AMPs is considered to be of an acceptable level given that the: • the Petroleum Activities Program is consistent with the relevant principles of ESD • the proposed controls have considered the environmental consequence and are consistent with

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes' (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (**Appendix A**) • Woodside Risk Management Policy (**Appendix A**). **External Context** N/A **Other Requirements** The proposed controls and consequence/residual risk level are consistent with: • Australian IUCN Reserve Management Principles and objectives of the IUCN Category VI Zone, as outlined in the North-west Marine Parks Network Management Plan (DNP, 2018a) • the zone management categories outlined in the North-west Marine Parks Network Management Plan and values of the Montebello and Gascoyne AMPs.	Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will not be inconsistent with the principles or management objectives of the North-west Marine Parks Network Management Plan (DNP, 2018a) • the Petroleum Activities Program will be undertaken in a manner that is consistent with the zone management categories outlined in the North-west Marine Parks Network Management Plan and values of the Montebello and Gascoyne AMPs • the predicted level of impact has been reduced to ALARP. **Environmental Performance Considerations** The Petroleum Activities Program will not impact the values or management objectives of AMPs or the North-west Marine Park Network. The following EPOs have been applied: **EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP.
Other environmental values (ecosystems/habitats, species and socio-economic)	**Principles of ESD** The Petroleum Activities Program is consistent with the relevant principles of ESD: • The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.	The predicted level of impact is considered to be of an acceptable level given that the: • the Petroleum Activities Program is consistent with the relevant principles of ESD

Demonstration of Acceptability		
Receptor	***Acceptability Criteria and Assessment***	***Statement of Acceptability***
	• Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. Impacts are considered consistent with these principles given controls adopted and that impacts will be inherently limited to 'Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes' (**Section 2.6.4**). Other principles of ESD were considered not relevant given underwater noise emissions from the seismic source do not represent a threat of "serious or irreversible environmental damage", they will not result in impacts that affect the maintenance or enhancement of the "health, diversity and productivity of the environment" over generational timeframes, and they have no relevance to "improved valuation, pricing and incentive mechanisms." **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy (Appendix A) • Woodside Risk Management Policy (Appendix A). **External Context** Impacts to plankton was raised during consultation (**Section 5**), including as an environmental value of cultural interest to First Nations, and this feedback was considered in the finalisation of the EP (See Section 6.9) **Other Requirements** No additional legislative requirements applicable to managing the effects of seismic surveys in relation to other identified environment values have been identified.	• the proposed controls have considered the environmental consequence and are consistent with Woodside's internal policies, procedures and standards • feedback from stakeholders has been taken into consideration • legislative requirements/industry standards have been adopted • the Petroleum Activities Program will be managed in a manner that prevents any long term impacts to ecosystems/habitats, species and socio-economic values • the Petroleum Activities Program will be managed in a manner that is consistent with management objectives for relevant WHPs, AMPs, recovery plans and conservation plans/advices • the predicted level of impact has been reduced to ALARP. **Environmental Performance Considerations** The Petroleum Activities Program will not result in long term impacts to ecosystems/habitats, species and socio-economic values. The following EPOs have been applied: **EPO 3:** Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP. **EPO 5:** Limit underwater sound production from the seismic source to the area defined and assessed in this EP.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 3 Far-field source levels for the selected seismic source for the Scarborough 4D B1 MSS are consistent with levels assessed in this EP.	**C 3.1** Seismic source validation.	**PS 3.1** In the event that a seismic source is selected for the Scarborough 4D B1 MSS that is significantly different to the modelled source[28], additional acoustic source modelling will be undertaken using the JASCO AASM model to confirm that the far-field horizontal source level specifications of the seismic source selected for the Scarborough 4D B1 MSS are comparable to those assessed in this EP.	**MC 3.1.1** Acoustic source modelling report for selected seismic source
EPO 4 Undertake seismic acquisition in a manner that prevents injury to whales, and minimises the potential for biologically significant behavioural disturbance	**C 4.1** Application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and Part B.4 to whales, as outlined below: • observation zone: - 3 km+ to the limits of visibility for large unidentified whales - 2 km to 3 km for all other whales • shut-down zone: - to limits of visibility for positively identified (certain or probable confidence level) pygmy blue whales, humpback whales and large unidentified whales; - 2 km for all whales • observation and compliance reporting: - Use of vessel crew to supplement dedicated MFOs in marine fauna observations and monitoring compliance to Policy Statement 2.1. - Records kept of marine fauna	**PS 4.1** EPBC Policy Statement 2.1 – Part A Standard Management Procedures and Part B.4 as outlined below: • observation zone: - 3 km+ to the limits of visibility for large unidentified whales - 2 km to 3 km for all other whales • shut-down zone: - to limits of visibility for positively identified (certain or probable confidence level) pygmy blue whales, humpback whales or large unidentified whales - 2 km for all whales • observation and compliance reporting: - Use of vessel crew to supplement dedicated MFOs in marine fauna observations and monitoring compliance to Policy Statement 2.1. - Records kept of marine fauna	**MC 4.1.1** Records demonstrate compliance with Policy Statement 2.1 Part A Standard Management Procedures and Part B.4.

[28] "Significantly different" is defined as a difference of 3 dB or greater than the modelled peak source pressure levels in the broadside, endfire and vertical directions (see Table 9 in Koessler et al., 2021; **Appendix G**), as determined by seismic contractor in-house modelling of their proposed array (e.g. Gundalf, Nucleus+ outputs).

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	observations during all surveys. • pre start-up visual observation (30 minutes) • soft start procedure (30 minutes) • start-up delay procedure (if sighting occurs) • operations procedure • stop work procedure • night-time and low visibility procedure.	observations during all surveys. • pre start-up visual observation (30 minutes) • soft start procedure (30 minutes) • start-up delay procedure (if sighting occurs) • operations procedure • stop work procedure • night-time and low visibility procedure.	
	C 4.2 Application of EPBC Policy Statement 2.1 Part B.1 – MFOs: Employ four dedicated MFOs to undertake observations for EPBC Act Policy Statement 2.1.	**PS 4.2.1** Two dedicated MFOs per observing vessel (survey vessel and spotter vessel) will be employed to undertake observations for EPBC Act Policy Statement 2.1.	**MC 4.2.1** Records demonstrate two dedicated MFOs per observing vessel (survey vessel and spotter vessel) are on board and undertake observations in accordance with EPBC Act Policy Statement 2.1.
		PS 4.2.2 All MFOs engaged for the Petroleum Activities Program will have, previous experience complete relevant training detailing marine fauna identification and EPBC Act Policy Statement 2.1 requirements.	**MC 4.2.2** Records demonstrate that all MFOs engaged for the Petroleum Activities Program have previous experience, received training in marine fauna identification and EPBC Act Policy Statement 2.1 requirements.
		PS 4.2.2 At least one dedicated MFO undertaking observations during daylight hours per observing vessel (survey vessel and spotter vessel). If required additional MFO will be used during times of increased whale sightings.	**MC 4.2.2** Log book demonstrates at least one MFO was on duty during daylight hours per observing vessel (survey vessel and spotter vessel) and additional observation effort initiated as required.
	C 4.3 Application of EPBC Policy Statement 2.1 Part B.5 – PAM: • A PAM system will be installed aboard the survey vessel to detect odontocete whales (specifically sperm and beaked whales) • Employ two dedicated PAM operators wherever possible.	**PS 4.3.1** EPBC Policy Statement 2.1 Part B.5 – PAM. • PAM observations are undertaken on a 24-hour basis by two competent and experienced PAM Operators trained in the PAM system software used. • During daylight hours, PAM detections will be validated against MFO observations and ranges to determine the error (if	**MC 4.3.1** Records demonstrate that an operational PAM system is aboard the survey vessel. Calibration records of PAM detections and visual observations during daylight hours. PAM Master Observation Sheet provides acoustic detection record for the surveys. Records (CV) verify the PAM Operators are competent to a standard equivalent to

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
		any) in PAM detection distances. • At night and during periods of low visibility PAM will be used to trigger: - shutdown for any sperm and beaked whales detected in the 2 km shutdown zone.	those in the International Association of Geophysical Contractors (IAGC) Guidance on the Use of Towed Passive Acoustic Monitoring during Geophysical Operations (IAGC, 2014).
		PS 4.3.2 If the PAM system has malfunctioned or become damaged during daylight/periods of good visibility, operations may continue for 20 minutes without PAM while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM equipment must be repaired to solve the problem, operations may continue for an additional 2-hours without PAM monitoring as long as all of the following conditions are met: • The PAM operator believes it can be repaired within this period • It is a period of good visibility • No marine mammals were detected solely by PAM in the relevant mitigation zones in the previous 2-hours • Two MFOs maintain watch at all times during operations when PAM is not operational • The time and location of all operations without an active PAM system are documented. Operations with an active source, but without an active PAM system, do not exceed a cumulative total of 4-hours in any 24-hour period. If the PAM system becomes non-operational at night or during periods of low visibility the seismic source will be shut	**MC 4.3.2** Records demonstrate that operations with an active source, but without an active PAM system do not exceed a cumulative total of 4 hours in any 24-hour period.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
		down and acquisition will cease until such time as the system can be restored.	
	C 4.4 Adaptive Management Measures to minimise the minimum potential impacts to pygmy blue whales from seismic noise. The following adaptive management measures procedures will be implemented: • If there are three or more shut-downs for pygmy blue whales within a 24-hour period (including spotter vessel MFO shutdowns), then the seismic operations must not be undertaken thereafter at night-time or during low visibility conditions. • Seismic operations cannot resume at night-time or during low visibility conditions, until there has been a cumulative 24-hour period of seismic operations (daylight hours with good visibility) during which there has been less than three shut-downs for pygmy blue whales.	**PS 4.4** Adaptive Management Measures to minimise the minimum potential impacts to pygmy blue whales from seismic noise. The following adaptive management measures procedures will be implemented: • If there are three or more shut-downs for pygmy blue whales within a 24-hour period (including spotter vessel MFO shutdowns), then the seismic operations must not be undertaken thereafter at night-time or during low visibility conditions. • Seismic operations cannot resume at night-time or during low visibility conditions, until there has been a cumulative 24-hour period of seismic operations (daylight hours with good visibility) during which there has been less than three shut-downs for pygmy blue whales.	**MC 4.4.1** Records demonstrate compliance with pygmy blue whale adaptive management measures as described.
	C 4.5 No operation of the seismic source within 25 km of the pygmy blue whale migration BIA.	**PS 4.5** No operation of the seismic source within 25 km of the pygmy blue whale migration BIA.	**MC 4.5.1** Records demonstrate compliance with the 25 km buffer from the migration BIA.
	C 4.6 EPBC Act Policy Statement 2.1 Part B.3 – Use of additional vessels to detect presence of cetaceans, during all daylight activities with seismic source discharge activities: • Use of two MFOs aboard a dedicated spotter vessel travelling ~5 km out ahead of the seismic vessel and acoustic array to implement C 4.1.	**PS 4.6** Use of two MFOs aboard a dedicated spotter vessel ahead of the seismic vessel to implement C 4.1.	**MC 4.6.1** Records demonstrate the use of two MFOs aboard a dedicated spotter vessel. **MC 4.1.1 refer to above.**

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 5 Limit underwater sound production from the seismic source to the area defined and assessed in this EP.	**C 5.1** No operation of the seismic source outside of the Active Source Area.	**PS 5.1** No operation of the seismic source outside of the Active Source Area.	**MC 5.1.1** Records demonstrate compliance with seismic source operation exclusively within the Active Source Area.
EPO 6 Undertake seismic acquisition in a manner that reduces potential cumulative impacts resulting from the Petroleum Activities Programme and other seismic survey operations as far as reasonably practicable.	**C 6.1** A 40 km separation distance between the Petroleum Activities Program and any identified concurrent seismic survey	**PS 6.1** A 40 km separation distance between the Petroleum Activities Program and any identified concurrent seismic survey	**MC 6.1.1** Records demonstrate compliance with the 40 km separation distance. Records demonstrate consultation with other seismic companies of seismic surveys and titleholders with acreage within 40 km of the Operational Area prior to commencement of the activity.

6.6.3 Routine Acoustic Emissions: Project Vessels

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Generation of noise from project vessels and mechanical equipment during normal operations (excluding seismic survey equipment).						X		A	F	-	-	LCS GP	Broadly acceptable	EPO 7

Description of Source of Impact

During the Petroleum Activities Program, both atmospheric and underwater noise will be generated from the project vessels (seismic vessel support vessel chase vessel and spotter vessel) and associated mechanical equipment during normal operations.

Project Vessels

Project vessels will generate noise, due to the operation of thruster engines, propeller cavitation, on-board machinery etc. These noises will contribute to and have the potential to exceed ambient noise levels which range from around 90 dB re 1 µPa (root square mean sound pressure level [SPL]) under very calm, low wind conditions, to 120 dB re 1µPa (SPL) under windy conditions (McCauley, 2005).

The sound level and frequency characteristics ('signature') of discernible ships depend on their size, number of propellers, number and type of propeller blades, blade biofouling condition and machinery/transmission maintenance condition. In general, the larger the ship the louder the source level and the lower its frequency. A typical support vessel's peak frequency or band ranges from 1–500 Hz at a peak source level of 170-190 dB re 1 µPa at 1 m. It is expected that similar noise levels will be generated by vessels used for this Petroleum Activities Program.

Impact Assessment

Potential Impacts to Environmental Values

Receptors

The Operational Area is located in water depths ranging from about 800 m to 1150 m. The fauna associated with this area will be predominantly pelagic fish species, with the potential for the transient presence of other species such as cetaceans, turtles and whale sharks (refer to **Section 4**).

Based on the information presented in **Section 4.6.3**, there are no BIAs for cetaceans identified within the Operational Area; however, a pygmy blue whale migration and foraging BIAs are located 14 km south-east and 154 km south of the Operational Area, respectively. The Operational Area overlaps the pygmy blue whale distribution range and includes the recorded presence of an individual (Thums et al. 2022). The pygmy blue whale may be encountered within the Operational Area during their northbound migration from April to July, and southbound migration from October to January; however the likelihood of encountering migrating or foraging pygmy blue whales is considered low.

As described in **Section 4.6.3.1**, there is the possibility that some migrating northbound pygmy blue whales may also be opportunistically foraging to the west of the migration BIA (during the peak period of northbound migration), as indicated by the track of one northbound individual animal tagged off North West Cape in early June 2020 (in **Figure**

4-7). This represents <5% of total number of tagged whales (refer to Thums et al. (2022)). As shown in **Figure 4-7**, the track of this one individual partially overlapped the eastern edge of the Operational Area and the south-east corner of the Active Source Area, with recorded presence as shown by the satellite track in June 2020 (peak northbound migration).Acoustic and telemetry data indicate faster migration speeds for the southbound migration compared to the northbound migration and no evidence of foraging by southbound pygmy blue whales within the Operational Area.

There are no marine turtle BIAs within the Operational Area or EMBA, however internesting buffer BIAs for the flatback, green and hawksbill turtles are located just outside of the EMBA. There is one habitat critical area for flatback turtles that overlaps the EMBA (147 km south-east of the Operational Area). The nearest internesting buffer for flatback turtles, located approximately 135 km south-east of the Operational Area. The 80 km internesting buffer for flatback turtles in the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) is considered very conservative, and it is likely that the EMBA represents unsuitable internesting habitat (>25 m water depth and >27 km from the coastline) (Whittock et al., 2016). The occurrence of all marine turtle species within the Operational Area is expected to be limited to infrequent occurrences of transitory individuals.

The Operational Area does not represent important habitat for whale sharks. However, a whale shark foraging BIA is located approximately 136 km south-east of the Operational Area, and therefore due to the species widespread distribution and highly migratory nature, individuals may transit through the Operational Area.

Potential Impact of Noise

As described in **Section 6.6.2**, elevated underwater noise can affect marine fauna, including cetaceans, turtles, fish, sharks and rays in three main ways (Richardson et al., 1995; Simmonds et al., 2004):

- By causing direct physical effects on hearing or other organs. Hearing loss may be temporary (temporary threshold shift [TTS]; referred to as auditory fatigue), or permanent threshold shift (PTS; injury)
- By masking or interfering with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey)
- Through disturbance leading to behavioural changes or displacement from important areas (e.g. BIAs). The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation.

The potential impacts associated with noise emissions from the seismic equipment are presented in **Section 6.6.2**, detail on impacts specific to noise from project vessels provided below.

Project Vessels

Noise generated by the project vessels is expected to be up to 190 dB re 1 µPa at 1 m. The potential for received levels to exceed weighted thresholds defined for PTS or TTS for marine mammals is considered not credible due to propagation and reduction of sound from the source. Behavioural response thresholds for marine mammals are estimated to be exceeded out to several kilometres from the project vessels. Currently, there are no quantitative sound exposure thresholds for behavioural responses in marine turtles resulting from continuous noise sources.

Marine fauna associated with the Operational Area will be predominantly pelagic fish species, with the potential for species such as whale sharks, rays, marine turtles and cetacean species to transit through the Operational Area. As outlined above, there are no marine fauna BIAs within the Operational Area. Therefore, potential impacts from vessel noise are likely to be restricted to temporary avoidance behaviour to individuals, and are therefore considered localised with no lasting effect.

Compliance with EPBC Regulation 2000 – Part 8 Interacting with Cetaceans to reduce the likelihood of collisions with cetaceans (i.e., vessels are to travel slower) may also further incidentally reduce the noise generated by vessels close to cetaceans and marine turtles—slower vessel speeds may reduce underwater noise.

In summary, potential impacts from vessel noise are likely to be restricted to temporary avoidance behaviour of individuals transiting through the Operational Area with no lasting effect. Individuals may deviate slightly from their activities, but are expected resume normal behaviours as they move away from the activities.

Summary of Potential Impacts to environmental value(s)

Given the adopted controls, it is considered that noise generated by project vessels will not result in a potential impact greater than a localised, temporary disruption to a small portion of the population for any marine fauna species exposed, with no lasting effects.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [29]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[30]: • Project vessels will not travel faster than six knots within 300 m of a cetacean (caution zone) • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bowriding). • If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots.	F: Yes CS: Minimal reduction in vessel speed and manoeuvrability resulting in minimal delay	By managing the interactions with cetaceans and restricting the proximity between vessels and cetaceans, impacts from vessel-generated noise are reduced.	Control is a legislative requirement – must be adopted	Yes **C 7.1**
Good Practice				
Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[45]	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a whale shark occurring. The consequence of a collision is unchanged.	Benefits outweigh cost/sacrifice. Control is also standard practice	Yes **C 7.2**
Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots[45].	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a turtle occurring. The consequence of a collision is unchanged.	Benefits outweigh cost/sacrifice. Control is also standard practice	Yes **C 7.3**

[29] Qualitative measure

[30]For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[29]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Eliminate use of vessels.	F: No. The use of vessels is required to conduct the Petroleum Activities Program. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Conduct the Petroleum Activities Program away from sensitive receptors	F: No. The location of the petroleum activities is determined by the predicted location of hydrocarbons and the legislative requirement to explore for hydrocarbons CS: Requirement to conduct activity.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e., Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of project vessel noise emissions. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, project vessel noise disturbance are unlikely to result in a potential impact greater than localised and temporary disruption to a small proportion of the population, with no lasting effects, and no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet the requirements of Part 8 (Division 8.1) of the EPBC Regulations 2000. The Activity is not inconsistent with Recovery or Threat Abatement Plans (**Section 6.9.3**), including the **BWCMP** (**Table 6-21**). Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of vessel noise emissions to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 7 Minimise impacts of noise generated from the Petroleum Activities Program on threatened and migratory cetacean species listed under the EPBC Act in the Operational Areas	**C 7.1** EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans including the following measures[31]: • Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots.	**PS 7.1** Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, to minimize impacts from underwater noise emissions.	**MC 7.1.1** Records demonstrate compliance with the EPBC Regulations 2000 (Part 8 Division 8.1).
	C 7.2 Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[45]	**PS 7.2.1** When within 250 m of a whale shark vessels will not travel greater than 6 knots and vessels will not approach closer than 30 m to a whale shark	**MC 7.2.1** Records demonstrate no breaches of speed requirements when within 250 m of a whale shark
	C 7.3 Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots[45].	**PS 7.3.1** When within 300 m of a turtle, vessels will not travel greater than 6 knots.	**MC 7.3.1** Records demonstrate no breaches of speed requirements when within 300 m of a turtle

[31]For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

6.6.4 Routine Atmospheric and GHG Emissions

Context		
Project Vessels – **Section 3.5.5** Helicopters – **Section 3.5.6**	Physical Environment – **Section 4.4**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Exhaust emissions from internal combustion engines and incinerators on project vessels and helicopters within the Operational Area.				X				A	F	-	-	LCS	Broadly Acceptable	EPO 8

Description of Source of Impact

Atmospheric and greenhouse gas (GHG) emissions will be generated by the project vessels and helicopters from internal combustion engines (including all equipment and generators) and incineration activities (including onboard incinerators) during the Petroleum Activities Program. These have been classified in the following two categories:

Atmospheric emissions (non-greenhouse gas emissions) are gases or particles produced from vessels and helicopters, within the Operational Area, which are discharged to the atmosphere and pose a recognised level of adverse effect on flora, fauna and/or human health.

GHG emissions refer to gases that trap heat within the atmosphere through the adsorption of longwave radiation reflected from the earth's surface. Considering all vessels included in the activity (including during mobilisation) and potential helicopter travel, the activity is expected to result in GHG emissions of up to 30,000 ktCO_2e.

Impact Assessment

Potential Impacts to Environmental Values

Air Quality

Fuel combustion has the potential to result in localised, temporary reduction in air quality. Potential impacts include a localised reduction in air quality and contribution to greenhouse gas emissions. Given the short duration and exposed location of project vessels (which will lead to the rapid dispersion of the low volumes of atmospheric emissions), the potential impacts are expected to be localised and of no lasting effect.

Greenhouse Gas Emissions

GHG emissions from the Petroleum Activities Program contribute to global concentrations of GHG emissions. It is important to acknowledge that climate change impacts cannot be directly attributed to any one activity, as they are instead the result of global GHG, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution.

Ecosystems that are particularly susceptible to adverse effects of climate change include alpine habitats, coral reefs, wetlands and coastal ecosystems, polar communities, tropical forests, temperate forests and arid and semi-arid environments (DoEE, 2019). In Australia, this includes coral reefs, alpine regions, rainforests, arid and semi-arid environments, mangroves, grasslands, temperate forests and sclerophyll forests. Future climate change (increased temperature and decreased, but more variable, rainfall) has the potential to have a range of impacts on ecological factors and threaten biodiversity in the Australian Mediterranean ecosystem (CSIRO, 2017).

Impact Assessment
Summary of Potential Impacts to Environmental Values(s)
Given the adopted controls, it is considered that the release of a small volume of atmospheric and greenhouse gas emissions will not result in a potential impact greater than a temporary impact to local air quality with no lasting effect.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [32]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 97 (Marine Pollution Prevention – Air Pollution), which details requirements for: • International Air Pollution Prevention (IAPP) Certificate, required by vessel class • use of low sulphur fuel (shall not exceed 0.50% m/m) • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator to comply with Marine Order 97.	F: Yes CS: Minimal cost	Legislative requirements to be followed may reduce the consequences of air pollution.	Control based on legislative requirements – must be adopted	Yes **C 8.1**
Good Practice				
Evaluation of tenders will include consideration of vessel fuel usage / emissions and low carbon / alternative fuels (e.g. LNG)	F: Yes CS: Fuel costs are considered in evaluation of responses, allowing for competitive consideration of low carbon alternatives (e.g. LNG).	Minimises cost and emissions through eco-efficiency approach recognising cost of fuel and carbon emissions for the Petroleum Activities Program	Control effectively allocates a cost to emissions to recognise that vessels with higher fuel consumption / emissions do not represent overall best value.	Yes **C 8.2**
Professional Judgement – Eliminate				
Do not combust fuel.	F: No. There are no vessels that do not use internal combustion engines. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				

[32] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [32]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e., Decision Type A), Woodside considers the adopted controls appropriate to manage the potential impacts of release of atmospheric emissions within the Operational Area. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, atmospheric emissions during the Petroleum Activities Program will not result in a potential impact greater than a temporary decrease in local air quality with low impact to the environment or human health and no lasting effects. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of the described emissions within the Operational Area to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 8 Fuel combustion emissions and incineration during the Petroleum Activities Program will be in compliance with marine order requirements and restrict emissions to those necessary to perform the activity.	**C 8.1** Marine Order 97 (Marine Pollution Prevention – Air Pollution) which details requirements for: • International Air Pollution Prevention (IAPP) Certificate, required by vessel class • use of low sulphur fuel (shall not exceed 0.50% m/m) • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator to comply with Marine Order 97.	**PS 8.1** Project vessels compliant with Marine Order 97 (marine pollution prevention – air pollution) to restrict emissions to those necessary to perform the activity. Vessel marine assurance process implemented, to ensure suitability and compliance with vessel combustion certification / Marine Order requirements.	**MC 8.1.1** Records demonstrate compliance with Marine Order 97.
	C 8.2 Evaluation of tenders will include consideration of vessel fuel usage / emissions and low carbon / alternative fuels (e.g., LNG)	**PS 8.2** Evaluation of tenders for the Petroleum Activities Program considers of vessel fuel usage / emissions	**MC 8.2.1** Records demonstrate that fuel usage / emissions were considered in tender evaluations

6.6.5 Routine Discharge: Bilge Water, Grey Water, Sewage, Putrescible Wastes and Deck Drainage Water

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Routine discharge of sewage, grey water and putrescible wastes to marine environment from project vessels within the Operational Area			X		X			A	F	-	-	LCS	Broadly acceptable	EPO 9
Routine discharge of deck and bilge water to marine environment from project vessels within the Operational Area			X		X			A	F	-	-			

Description of Source of Impact

The project vessels routinely generate/discharge:

- Small volumes of treated sewage, putrescible wastes and grey water to the marine environment (impact assessment based on approximate discharge of 15 m³ per vessel per day), using an average volume of 75 L/person/day and a maximum of 200 persons on board. However, it is noted that these vessels will have considerably less persons on board.
- Routine/periodic discharge of relatively small volumes of bilge water. Bilge tanks on the project vessels receive fluids from many parts of the vessel. Bilge water can contain water, oil, detergents, solvents, chemicals, particles and other liquids or solids.
- Variable water discharge from project vessel decks directly overboard or via deck drainage systems. Water sources could include rainfall events and/or from deck activities such as cleaning/wash-down of equipment/decks.

Routine discharges generated from the Petroleum Activities Program have the potential to cause temporary and localised reduction in water quality.

Environmental risk relating to the disposal/discharges above regulated levels or incorrect disposal/discharge of waste would be unplanned (non-routine/accidental) and are addressed in **Section 6.7.5.**

Impact Assessment

Potential Impacts to Environmental Values

The main environmental impact associated with ocean disposal of sewage and other organic wastes (i.e. putrescible waste) is eutrophication. Eutrophication occurs when the addition of nutrients, such as nitrates and phosphates, causes adverse changes to the ecosystem, such as oxygen depletion and phytoplankton blooms. Other contaminants of concern occurring in these discharges may include ammonia, *E. coli*, faecal coliform, volatile and semi-volatile organic compounds, phenol, hydrogen sulphide, metals, surfactants and phthalates.

Woodside monitored sewage discharges at its Torosa-4 Appraisal Drilling campaign which demonstrated that a 10 m³ sewage discharge reduced to about 1% of its original concentration within 50 m of the discharge location. In addition

Impact Assessment
to this, monitoring at distances of 50, 100 and 200 m downstream of the platform and at five different water depths confirmed that discharges were rapidly diluted and no elevations in water quality monitoring parameters (e.g. total nitrogen, total phosphorous and selected metals) were recorded above background levels at any station (Woodside Energy Limited, 2011). Mixing and dispersion would be further facilitated in deep offshore waters, consistent with the location of the Operational Area, through regional wind and large scale current patterns resulting in the rapid mixing of surface and near surface waters where sewage discharges may occur. Studies investigating the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas (McIntyre and Johnston, 1975). Furthermore, open marine waters do not typically support areas of increased ecological sensitivity, due to the lack of nutrients in the upper water column and lack of light penetration at depth. Therefore, presence of receptors such as fish, reptiles, birds and cetaceans, in significant numbers within the Operational Area is unlikely. Research also suggests that zooplankton composition and distribution are not affected in areas associated with sewage dumping grounds (McIntyre and Johnston, 1975). Plankton communities are expected to rapidly recover from any such short-term, localised impact, as they are known to have naturally high levels of mortality and a rapid replacement rate. Other discharges outlined, which may include other non-organic contaminants (e.g. bilge water) will be rapidly diluted through the same mechanisms as above and are expected to be in very small quantities and concentrations as to not pose any significant risk to any relevant receptors. As such, no significant impacts from the planned discharges that are listed above are anticipated because of the minor quantities involved, the expected localised mixing zone and high level of dilution into the open water marine environment of the Operational Area. The Operational Area is more than 12 nm from land, which exceeds the 12 nm exclusion zones required under the relevant Marine Orders.
Summary of Potential Impacts to Environmental Values(s)
Given the adopted controls, it is considered that routine discharges described will not result in a potential impact greater than localised contamination not significant to environmental receptors, with no lasting effect.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [33]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Orders 95 – pollution prevention – Garbage (as appropriate to vessel class), which requires putrescible waste and food scraps to pass through a macerator so it is capable of passing through a screen with no opening wider than 25 mm.	F: Yes CS: Minimal cost. Standard practice.	No reduction in consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 9.1**
Marine Orders 96 - pollution prevention – sewage (as appropriate to vessel class), specifically: • a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class • an ASMA approved sewage treatment plant • sewage commuting and disinfecting system • a sewage holding tank sized appropriately to	F: Yes CS: Minimal cost. Standard practice.	No reduction in consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 9.2**

[33] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [33]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land • discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land • discharge of sewage will occur at a moderate rate while the vessel is proceeding (>4 knots), to avoid discharges in environmentally sensitive areas.				
Marine Orders 91 – oil (as relevant to vessel class) requirements, which include mandatory measures for the processing of oily water prior to discharge: • machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water separator) with an on-line monitoring device to measure Oil in Water (OIW) content to be less than 15 ppm prior to discharge • IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capably of recirculating in the event that OIW concentration exceeds 15 ppm • a deck drainage system shall be capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or	F: Yes CS: Minimal cost. Standard practice.	No reduction in consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 9.3**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [33]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
hazardous chemical contamination • there shall be a waste oil storage tank available, to restrict oil discharges • in the event that machinery space bilge discharges cannot meet the oil content standard of <15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore • a valid IOPP Certificate, as required by vessel class.				
Good Practice				
None identified.				
Professional Judgement – Eliminate				
Storage, transport and treatment/ disposal onshore treatment of sewage, greywater, putrescible and bilge wastes.	F: No. Would present additional safety and hygiene hazards resulting from the storage, loading and transport of the waste material. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts of planned routine discharges from the project vessels. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, planned (routine) discharges from projects vessels are unlikely to result in a potential impact greater than a temporary contamination above background levels and/or national/international quality standards and/or known biological effect concentrations outside a localised mixing zone with no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements under Marine Orders 91, 95 and 96.

Demonstration of Acceptability
Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 No impact to water quality greater than a consequence level of F[34] from discharge of sewage, greywater, putrescible wastes, bilge and deck drainage to the marine environment during the Petroleum Activities Program.	**C 9.1** Marine Orders 95 – pollution prevention – Garbage (as appropriate to vessel class), which requires putrescible waste and food scraps to pass through a macerator so it is capable of passing through a screen with no opening wider than 25 mm.	**PS 9.1** Project vessels compliant with Marine Orders 95 – pollution prevention – Garbage.	**MC 9.1.1** Records demonstrate project vessels are compliant with Marine Orders 95 – pollution prevention (as appropriate to vessel class).
	C 9.2 Marine Orders 96 - pollution prevention – sewage (as appropriate to vessel class) specifically: • a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class • an ASMA approved sewage treatment plant • sewage commuting and disinfecting system • a sewage holding tank sized appropriately to contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land • discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land • discharge of sewage will occur at a moderate rate while the vessel is proceeding (>4 knots), to avoid discharges in	**PS 9.2** Project vessels compliant with Marine Order 96 - pollution prevention – sewage (as appropriate to vessel class).	**MC 9.2.1** Records demonstrate project vessels are compliant with Marine Orders 96 - pollution prevention – sewage (as appropriate to vessel class).

[34] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors.'

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	environmentally sensitive areas.		
	C 9.3 Marine Orders 91 – oil (as relevant to vessel class) requirements, which include mandatory measures for the processing of oily water prior to discharge: • machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water separator) with an on-line monitoring device to measure Oil in Water (OIW) content to be less than 15 ppm prior to discharge • IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capably of recirculating in the event that OIW concentration exceeds 15 ppm • a deck drainage system shall be capable of controlling the content of discharges for areas of high risk of fuel/oil/grease or hazardous chemical contamination • there shall be a waste oil storage tank available, to restrict oil discharges • in the event that machinery space bilge and deck drainage discharges cannot meet the oil content standard of <15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore • a valid IOPP Certificate, as required by vessel class.	**PS 9.3** Deck drainage and bilge water will be discharged to meet the oil content standard of <15 ppm without dilution	**MC 9.3.1** Records demonstrate discharge specification met for project vessels.

6.6.6 Routine Light Emissions: External Lighting on Project Vessels

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Routine light emissions from project vessels within the Operational Area.						X		A	F	-	-	LCS GP	Broadly acceptable	N/A

Description of Source of Impact

Routine light emissions include light sources that alter the ambient light conditions in an environment. Project vessels (including the seismic vessel) will routinely use external lighting to navigate and conduct safe operations at night throughout the Petroleum Activities Program. External light emissions from project vessels are typically managed to maintain good night vision for crew members. Vessel lighting will also be used to communicate the vessel's presence to other marine users (i.e. navigation/warning lights). Lighting is required for safely operating project vessels and cannot reasonably be eliminated.

The vessels that may be required for the Petroleum Activities Program in the Operational Area are outlined in **Section 3.5.5**. External lighting is located on the vessel decks, with most external lighting directed towards working areas such as the main decks. These areas are typically <20 m above sea level.

Lighting from vessels may appear as a direct light source from an unshielded lamp with direct line of sight to the observer or through sky glow. Direct lighting falling upon a surface is referred to as light spill. Sky glow is the diffuse glow caused by light that is screened from view, but through reflection and refraction creates a glow in the atmosphere. The distance at which direct light and sky glow may be visible from the source depends on the vessel lighting and environmental conditions.

Impact Assessment

Potential Impacts to Environmental Values

Receptors that have important habitat within a 20 km radius of the Operational Area were considered for the impact assessment, based on recommendations of the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (NLPG). The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15–18 km and fledgling seabirds grounded in response to artificial light 15 km away (NLPG, 2020).

Light emissions can affect fauna in two main ways:

- Behaviour: Many species are adapted to natural levels of lighting and the natural changes associated with the day and night cycle as well as the night-time phases of the moon. However, artificial lighting has the potential to create a constant level of light at night that can override these natural levels and cycles.
- Orientation: Species such as marine turtles and birds may also use lighting from natural sources to orient themselves in a certain direction at night. If an artificial light source is brighter than a natural source, the artificial light may override natural cues, leading to disorientation.

Impact Assessment

The fauna within and immediately adjacent to the Operational Area are predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, cetaceans and migratory shorebirds and seabirds.

Marine Turtles – Hatchlings

Turtle hatchlings emerge from the nest and orient towards the sea. After entering the water, hatchlings use a combination of cues (wave direction and currents) to orient and travel into offshore waters. Impacts to the sea-finding behaviour of hatchlings are more common for light sources behind a beach, as lighting offshore will orient emerging hatchlings towards the sea. Artificial light at close distances can also impact hatchling dispersal once they are in the water. Light spill may 'entrap' hatchling swimming behaviour, reducing the success of their seaward dispersion and potentially increasing their exposure to predators via silhouetting (Salmon et al., 1992).

Flatback turtle hatchlings do not undertake oceanic migrations offshore to deep, pelagic waters. Instead, juveniles grow to maturity in shallow coastal waters close to their natal beaches (Musick and Limpus, 1996).

The nearest nesting sites in relation to the Operational Area are Barrow Island and the Montebello Islands (over 200 km east of the Operational Area); therefore, sky glow and light spill from project vessels will not reach any nesting beach. Any impacts to hatchling turtles from artificial light will be limited to possible localised behavioural impacts to isolated individual hatchlings offshore, with no lasting effect to the species.

Marine Turtle – Adults

Although individuals undertaking behaviours such as internesting, migration, mating (adults) or foraging (adults and pelagic juveniles) may occur within Operational Area, marine turtles do not use light cues to guide these behaviours. Furthermore, there is no evidence, published or anecdotal, to suggest that internesting, mating, foraging or migrating turtles are impacted by light from offshore vessels. As such, light emissions from the vessels are unlikely to result in displacement of, or behavioural changes to individuals in these life stages (Pendoley Environmental [PENV], 2020).

Artificial lighting may affect the location where nesting adult turtles emerge onto the beach, the success of nest construction, whether nesting is abandoned, and the seaward return of adults (Salmon et al., 1995a, 1995b; Salmon and Witherington, 1995). Such lighting is typically from residential and industrial development at the coastline, rather than offshore from nesting beaches. Barrow Island and the Montebello Islands (over 200 km east of the Operational Area) are known nesting locations, however, light from the project vessels will not be visible as sky glow or light spill to nesting adult turtles. As such, vessel light sources will not discourage females from nesting, or affect nest site selection, and therefore will not displace females from nesting habitat.

There is no emergent habitat within the Operational Area and therefore nesting aggregations of marine turtles would not be expected. There are no BIAs or Habitat Critical to the survival of marine turtles within the Operational Area. The nearest BIAs and Habitat Critical are for flatback turtles are located approximately 135 km south-east and 147 km south-east of the Operational Area, respectively. The 80 km internesting buffer for flatback turtles in the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) is considered very conservative. There is no evidence to date to indicate that flatback turtles swim out into deep offshore waters during the internesting period. Additionally, suitable areas of internesting habitat were located close to many known flatback turtle rookeries across the region (Whittock et al., 2016).

The presence of marine turtles in the Operational Area is considered highly unlikely. Light emissions from project vessels are unlikely to result in more than localised behavioural disturbance to isolated transient individuals, with no lasting effect to the species.

Seabirds

Artificial lighting can attract and disorient seabird species resulting in species behavioural changes (e.g. circling light sources or disrupted foraging), injury or mortality near the light source as a result of collision (Longcore and Rich, 2004, Gaston et al., 2014). The Operational Area may be occasionally visited by seabirds; however, there is no emergent land that could be used for roosting or nesting habitat within the Operational Area. The nearest shoreline is Barrow Island (over 200 km east of the Operational Area). In addition, the Operational Area does not overlap with any BIAs or critical habitat for any bird species.

The risk associated with collision from seabirds attracted to the light is considered to be low, given the slow moving speed of project vessels within the Operational Area. Impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, with no lasting effect or displacement from important habitat.

Other Marine Fauna

Lighting from project vessel activities in the Operational Area may result in the localised aggregation of fish around the vessel. These aggregations of fish due to light are considered localised and temporary. Any long-term changes to fish species composition or abundance is considered highly unlikely. Any localised impacts to fish are not expected to impact on any commercial fisheries in the area. Krill or plankton may also aggregate around the source of light. These aggregations of fish, krill or plankton would be confined to a small area. Based on the short duration and localised nature of the Petroleum Activities Program, these aggregations are not expected to attract pygmy blue whales, humpback whales or whale sharks.

Impact Assessment
Summary of Potential Impacts to Environmental Values(s)
Light emissions from project vessels will not result in an impact greater than a localised and temporary disturbance to marine fauna in the vicinity of the Operational Area with no lasting effect to any species (i.e. Environmental Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [35]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified.				
Good Practice				
None identified.				
Professional Judgement – Eliminate				
Restrict the Petroleum Activities Program to daylight hours, eliminating the need for external work lights	F: Yes. Restricting the Petroleum Activities Program to daylight hours is technically feasible, although not considered to be reasonably practicable. CS: Significant cost sacrifice. Limiting the survey to daylight hours would significantly increase the duration of the survey, and therefore result in further potential for interference with other marine users (in particular commercial fisheries).	Negligible reduction in consequence given the duration and nature of the activity.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the potential impacts from routine light emissions from project vessels within the Operational Area to be ALARP. This includes consideration of the nature of light emissions for the duration of the Petroleum Activities Program, and the requirements for external lighting for safe operations. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that routine light emissions from project vessels may result in impacts limited to temporary behavioural disturbance to marine fauna within a localised area and with no lasting effect on any species. Further opportunities to reduce the impacts have been investigated above. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential impacts and the

[35] Qualitative measure

Demonstration of Acceptability
NLPG were taken into consideration during the impact evaluation. Therefore, Woodside considers standard operations appropriate to manage the impacts and risks of routine light emissions to a level that is broadly acceptable.

6.7 Unplanned Activities (Accidents, Incidents, Emergency Situations)

6.7.1 Quantitative Spill Risk Assessment Methodology

Quantitative hydrocarbon spill modelling was undertaken by RPS (2019), on behalf of Woodside, using a three-dimensional (3D) hydrocarbon spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program), which is designed to simulate the transport, spreading and weathering of specific hydrocarbon types under the influence of changing meteorological and oceanographic forces.

A stochastic modelling scheme was followed in this study, whereby SIMAP was applied to repeatedly simulate the defined credible spill scenarios using different samples of current and wind data. These data samples were selected randomly from an historic time-series of wind and current data representative of the study area. Results of the replicate simulations were then statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point.

The model simulates surface releases and uses the unique physical and chemical properties of a hydrocarbon type to calculate rates of evaporation and viscosity change, including the tendency to form oil in water emulsions. Moreover, the unique transport and dispersion of surface slicks and in-water components (entrained and dissolved) are modelled separately. Thus, the model can be used to understand the wider potential consequences of a spill, including direct contact of hydrocarbons due to surface slicks (floating hydrocarbon) and exposure of organisms to entrained and dissolved aromatic hydrocarbons in the water column.

During each simulation, the SIMAP model records the location (by latitude, longitude and depth) of each of the particles (representing a given mass of hydrocarbons) on or in the water column, at regular time steps. For any particles that contact a shoreline, the model records the accumulation of hydrocarbon mass that arrives on each section of shoreline over time, less any mass that is lost to evaporation and/or subsequent removal by current and wind forces.

The collective records from all simulations are then analysed by dividing the study region into a 3D grid. For surface hydrocarbons (floating oil), the sum of the mass in all hydrocarbon particles located within a grid cell, divided by the area of the cell, provides hydrocarbon concentration estimates in that grid cell at each model output time interval. For entrained and dissolved aromatic hydrocarbon particles, concentrations are calculated at each time step by summing the mass of particles within a grid cell and dividing by the volume of the grid cell. The process is also subject to the application of spreading filters that represent the expected mass distribution of each distinct particle. The concentrations of hydrocarbons calculated for each grid cell, at each time step, are then analysed to determine whether concentration estimates exceed defined threshold concentrations.

All hydrocarbon spill modelling assessments undertaken by RPS undergo initial sensitivity modelling to determine appropriate time to add to the simulation after the cessation of the spill. The amount of time following the spill is based on the time required for the modelled concentrations to practically drop below threshold concentrations anywhere in the model domain in the test cases. This assessment is done by post-processing the sensitivity test results and analysing time-series of median and maximum concentrations in the water and on the surface.

6.7.1.1 Hydrocarbon Characteristics

As part of the risk identification process, Woodside identified the range of credible hydrocarbon spill scenarios that may occur from the Petroleum Activities Program. These scenarios are considered in the risk assessments of accidental hydrocarbon spill scenarios (refer to **Section 6.7.2**).

The characteristics of the hydrocarbons, used as the basis for the modelling studies used to inform the assessment, are summarised in **Table 6-13**.

Table 6-13: Hydrocarbon characteristics

Hydrocarbon Type	Initial Density (g/cm³)	Viscosity (cP)	Component BP (°C)	Volatiles <180 °C	Semi volatiles 180–265 °C	Low Volatility (%) 265–380 °C	Residual (%) >380 °C	Aromatic (%) of whole oil <380 °C BP
				Non-Persistent			Persistent	
Marine diesel	0.829 @ 25 °C	4.0 @ 25 °C	% of total	6.0	34.6	54.4	5.0	3.0
			% aromatics	1.8	1.0	0.2	-	-

6.7.1.2 Environment that May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling are used to assess the environmental risk if a credible hydrocarbon spill scenario occurred, by delineating which areas of the marine environment could be exposed to hydrocarbon levels exceeding the adopted hydrocarbon threshold concentrations (see **Table 6-14**). The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the 'environment that may be affected' (EMBA; **Section 4.1**), which is driven by the worst-case credible hydrocarbon spill scenario. For this Petroleum Activities Program the worst-case credible hydrocarbon spill scenario is a vessel collision resulting in fuel tank rupture (see **Section 6.7.2**).

As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, the EMBA combines the potential spatial extent of the different hydrocarbon fates. Note, no shoreline accumulation of hydrocarbons above threshold concentrations resulted from the modelled worst-case credible spill.

The EMBA covers a larger area than that which will be affected during any single spill event, as the model was run for a variety of weather and metocean conditions (100 simulations in total at one release location). The EMBA therefore represents the total extent of all the locations where the adopted hydrocarbon thresholds could be exceeded from all modelling runs. Given the EMBA comprises the results of many individual simulations, the total area covered at the thresholds has been smoothed to create a continuous boundary for the purpose of describing the environment within it.

A conservative approach for defining thresholds for the EMBA was used by adopting the guideline impact thresholds (NOPSEMA 2019) for floating, entrained, dissolved and accumulated hydrocarbons. An additional threshold has been included to define the boundary within which socio-cultural impacts may occur, based on surface hydrocarbons at 1 g/m² impacting the visual amenity of the marine environment. These hydrocarbon thresholds are presented in **Table 6-14** and described in the following subsections.

Table 6-14: Summary of thresholds applied to the quantitative hydrocarbon spill risk modelling results

Hydrocarbon Type	EMBA				Socio-cultural EMBA	Scientific Monitoring Plan EMBA
	Surface hydrocarbon (g/m²)	***Dissolved hydrocarbon (ppb)***	***Entrained hydrocarbon (ppb)***	***Accumulated hydrocarbon (g/m²)***	***Surface hydrocarbon (g/m²)***	***Accumulated hydrocarbon (g/m²)***
Marine Diesel	10	50	100	100	1	10

Surface Marine Diesel Hydrocarbon Threshold Concentrations

The spill modelling outputs defined the EMBA for surface hydrocarbon spills (contact on surface waters) using the ≥10 g/m² threshold (dull metallic colours) based on the relationship between film thickness and appearance (Bonn Agreement, 2015) (refer to **Table 6-15**). This threshold

concentration, expressed in terms of g/m^2, is geared towards informing potential oiling impacts for wildlife groups and habitats that may break through the surface slick from the water or the air (e.g. emergent reefs, vegetation in the littoral zone and air-breathing marine reptiles, cetaceans, seabirds and migratory shorebirds).

Thresholds for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10–25 g/m^2 (French et al., 1999; Koops et al., 2004; NOAA, 1996; French-McCay, 2018). Potential impacts of surface slick concentrations in this range for floating hydrocarbons may include harm to seabirds through ingestion from preening of contaminated feathers, or the loss of the thermal protection of their feathers. The 10 g/m^2 threshold is the reported level of oiling to instigate impacts to seabirds, and is also applied to other wildlife, although it is recognised that 'unfurred' animals (where hydrocarbon adherence is less) may be less vulnerable. 'Oiling' at this threshold is taken to be of a magnitude that can cause a response from the most vulnerable wildlife such as seabirds. Due to weathering processes, surface hydrocarbons have a lower toxicity due to changes in their composition over time. Potential impacts to shoreline sensitive receptors may be markedly reduced in instances where there is extended duration until the slick contacts the shoreline.

Woodside recognises that hydrocarbons may be visible at low concentrations of approximately 1 g/m^2. Therefore, the threshold for visible surface oil (1 g/m^2) was used to define an additional boundary within which socio-cultural impacts to the visual amenity of the marine environment may occur. This area is referred to as the socio-cultural EMBA. Any ecological impacts from dissolved and entrained hydrocarbons above prescribed thresholds, as in **Table 6-14**, may also result in socio-cultural impacts. Potential impacts to socio-cultural values assessed within these EMBAs include the following:

- Protected areas.
- National and Commonwealth Heritage Listed places.
- Tourism and recreation.
- Commercial fisheries.

The boundaries of the two EMBAs may differ due to the different thresholds, hydrodynamics and weathering of the released hydrocarbons.

Table 6-15: The Bonn Agreement oil appearance code

Appearance (following Bonn visibility descriptors)	Mass per area (g/m^2)	Thickness (µm)	Volume per area (L/km^2)
Discontinuous true oil colours	50 to 200	50 to 200	50,000 to 200,000
Dull metallic colours	5 to 50	5 to 50	5000 to 50,000
Rainbow sheen	0.30 to 5.00	0.30 to 5.00	300 to 5000
Silver sheen	0.04 to 0.30	0.04 to 0.30	40 to 300

Dissolved Marine Diesel Hydrocarbon Threshold Concentrations

The dissolved aromatic threshold of 50 ppb for diesel has been selected as a medium level threshold to approximate the potential toxic effects, particularly sub-lethal effects to sensitive species, as consistent with the NOPSEMA Oil Spill Modelling Guidance Bulletin (NOPSEMA, 2019). Dissolved hydrocarbons present a narcotic effect resulting from uptake into the tissues of marine organisms. This effect is additive, increasing with exposure concentration or with time of exposure (French-McCay, 2002; NRC, 2005).

Entrained Marine Diesel Hydrocarbon Threshold Concentrations

The spill modelling outputs are used to define the EMBA by defining the spatial variability of entrained hydrocarbons above a set concentration threshold contacting sensitive receptors (expressed in ppb).

Entrained hydrocarbons present a number of possible mechanisms for toxic exposure to marine organisms. The entrained hydrocarbon droplets may contain soluble compounds, hence have the potential for generating elevated concentrations of dissolved aromatic hydrocarbons (e.g. if mixed by breaking waves against a shoreline). Physical and chemical effects of the entrained hydrocarbon droplets have also been demonstrated through direct contact with organisms, for example through physical coating of gills and body surfaces, and accidental ingestion (National Research Council 2005).

The entrained threshold for diesel has been selected to be consistent with the NOPSEMA Oil Spill Modelling Guidance Bulletin (NOPSEMA, 2019). An entrained threshold of 100 ppb is therefore considered to be appropriate given the oil characteristics for informing potential impacts to receptors.

Accumulated Marine Diesel Hydrocarbon Threshold Concentrations

Owens et al. (1994) define accumulated hydrocarbon <100 g/m^2 to have an appearance of a stain on shorelines. French-McCay (2009) defines accumulated hydrocarbons ≥100 g/m^2 to be the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat. A threshold of ≥100 g/m² has therefore been adopted to define the EMBA for a marine diesel spill. Further, any ecological impacts at the accumulated thresholds concentration EMBA may also result in socio-cultural impacts.

6.7.1.3 Scientific Monitoring

A planning area for scientific monitoring is also described in **Section 5.5** of the Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). This planning area has been defined with reference to the low exposure entrained value of 10 ppb detailed in NOPSEMA Bulletin #1 Oil Spill Modelling (2019). This low exposure threshold is based on the potential for exceeding water quality triggers.

A scientific monitoring program would be activated following a Level 2 or 3 unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire predicted EMBA and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the worst-case credible spill scenario(s) or other identified unplanned hydrocarbon releases associated with the operational activities.

6.7.2 Accidental Hydrocarbon Release: Vessel Collision

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5** Socio-Economic Environment – **Section 4.10**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-Economic	Decision Type	Consequence/Impact	Likelihood	Current Risk Rating	ALARP Tools	Acceptability	Outcome
Hydrocarbon release to the marine environment due to a vessel collision (between Project vessels or third-party vessels)			X		X	X	X	A	D	1	M	LC S GP	Acceptable	EPO 10

Description of Source of Risk

Background

The seismic vessel may have a fuel distributed into multiple isolated tanks. Individual marine diesel tanks.

At least one support vessel will accompany the seismic vessel during the Petroleum Activities Program. Typical project support vessels for seismic operations have multiple marine diesel tanks typically ranging in size.

In the unlikely event of a vessel collision involving a Project vessel during the Petroleum Activities Program, the vessel will have the capability to pump marine diesel from a ruptured tank to a tank with spare volume in order to reduce the potential volume of fuel released to the environment. A volume of 250 m³ of MDO is considered an appropriate worst-case for a single fuel tank, based on existing facilities.

Project vessels (seismic vessel and support vessel(s)) will be present in the Operational Area for the duration of the Petroleum Activities Program. This presence in the area will result in a navigational hazard for other marine users within the immediate area of the vessel (as discussed in **Section 6.6.1**).

Industry Experience

Registered vessels or foreign flag vessels in Australian waters are required to report events to the Australian Transport Safety Bureau (ATSB), AMSA or Australian Search and Rescue.

From a review of the ATSB marine safety and investigation reports, one vessel collision occurred in 2011–2012 that resulted in a spill of 25–30 L of oil into the marine environment as a result of a collision between a tug and activity support vessel off Barrow Island. Two other vessel collisions occurred in 2010, one in the port of Dampier, where an activity support vessel collided with a barge being towed. Minor damage was reported and no significant injury to personnel or pollution occurred. The second 2010 vessel collision involved a vessel under pilot control in port connected with a vessel alongside a wharf causing it to sink. No reported pollution resulted from the sunken vessel. These incidents demonstrate the likelihood of only minor volumes of hydrocarbons being released during the highly unlikely event of a vessel collision occurring.

From 2010 to 2011, the ATSB's annual publication defines the individual safety action factors identified in marine accidents and incidents: 42% related to navigation action (2011). Of those, 15% related to poor communication and 42% related to poor monitoring, checking and documentation. The majority of these related to the grounding instances.

Credible Spill Scenario

For a vessel collision to result in the worst-case scenario of a hydrocarbon spill potentially impacting an environmental receptor, several factors must align as follows:

- The identified causes of vessel interaction must result in a collision.
- The collision must have enough force to penetrate the vessel hull.
- The collision must be in the exact location of the fuel tank.
- The fuel tank must be full, or at least of volume which is higher than the point of penetration.

The probability of the chain of events described above aligning, to result in a breach of fuel tanks resulting in a spill that could potentially affect the marine environment is considered remote. Given the offshore location of the Operational Area, vessel grounding is not considered a credible risk.

The environmental risk analysis and evaluation identified and assessed a range of potential scenarios that could result in a loss of vessel structural integrity, resulting in damage to fuel storage tank(s) and a loss of marine diesel to the marine environment (**Table 6-16**). The scenarios considered damage to single and multiple fuel storage tanks in a project vessel due to dropped objects and various combinations of vessel-to-vessel collision scenarios.

The scenarios considered comprised of a collision of the support vessel and the seismic vessel with each other or with a third party vessel (i.e. commercial shipping, other petroleum related vessels and commercial fishing vessels). The likelihood of a collision was assessed as being remote, given standard vessel operations and equipment in place to prevent collision at sea, the standby role of a support vessel (low vessel speed) and its operation in close proximity to the seismic vessel (SNA), and the construction and placement of storage tanks. The largest tank of the support vessel is unlikely to exceed 250 m³. For the purposes of this assessment a worst-case instantaneous loss of 250 m³ from a diesel tank on the seismic vessel has been considered.

Table 6-16: Summary of credible hydrocarbon spill scenario as a result of vessel collision

Scenario	*Hydrocarbon Volumes*	*Preventative and Mitigation Controls*	*Credibility*	*Max. Possible Volume loss (m^3)*
Hydrocarbon release caused by vessel collision (seismic vessel)	250 m^3 instantaneous	Typically double wall, tanks which are located mid-ship (not bow or stern). Vessels are not anchored and steam at low speeds when relocating within the Operational Areas or providing stand-by cover. Normal maritime procedures would apply during such vessel movements.	**Credible** A vessel collision could potentially result in a release from a seismic vessel fuel tank.	250 m^3
Hydrocarbon release caused by vessel collision (support vessel)	250 m^3 instantaneous	Typically double wall, tanks which are located mid-ship (not bow or stern). Vessels are not anchored and steam at low speeds when relocating within the Operational Areas or providing stand-by cover. Normal maritime procedures would apply during such vessel movements.	**Credible** A vessel collision could potentially result in a release from a support vessel fuel tank.	250 m^3

Quantitative Hydrocarbon Risk Assessment

To inform the impact assessment, quantitative hydrocarbon spill modelling was undertaken for the worst-case hydrocarbon release scenario (RPS, 2019). It is not practicable for spill modelling to be undertaken at every potential spill location within the Operational Area. The release location was selected by considering locations that would:

- have the greatest potential environmental consequence to the receiving environment (closest to sensitive receptors)
- be considered at greater risk of a spill event.

Existing modelling for a spill of MDO within WA-61-L at the approximate location of the proposed FPU (the installation and operation of the FPU is outside the scope of this Activity) was selected as an analogue for the worst case spill scenario for this location. The FPU location is within the Operational Area and considered conservative, as it is located closer to shoreline receptors than the other locations within the Operational Area. The loss of containment volume applied in the existing study aligns with the worst case credible loss of containment scenario for this activity. The coordinates of the spill release location for 250m^3 are:.

Location	Coordinates
Location of the FPU	19° 55'33.60" S 113° 14' 31.20"E

Hydrocarbon Characteristics

DO is a non-persistent fuel oil and contains a small proportion of heavy components (or low volatile components) that tend to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but may re-float to the surface if these conditions abate. In the event of a substantial spill, the heavier components can remain entrained or remain on the sea surface for an extended period. The characteristics of the marine diesel are given in **Table 6-13**.

When spilt into the warm tropical and subtropical marine environment expected, MDO spreads rapidly and forms a very thin slick, with most of the volatile components typically evaporating in less than a day. Approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending on the prevailing wind conditions, with further evaporation slowing over time. The heavier (low volatility) components of the oil tend to entrain into the upper water column due to wind-generated waves, but can subsequently resurface depending on conditions (RPS, 2019).

RPS conducted weathering simulations to illustrate the potential behaviour of MDO when exposed at the water's surface under constant (5 knots) and variable wind conditions (**Figure 6-5**). Variable wind conditions generate greater entrainment of the hydrocarbon in the water column. Approximately 24 hours after the spill, around 45% of the oil mass is forecast to have entrained and a further 36% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s).

Variable wind does result in a higher percentage of biological and photochemical degradation, with an approximate rate of 1.8% per day. Whereas the constant wind scenario shows ~50% of the oil evaporates within 36 hours with negligible entrainment, but with a rate of only ~0.2% degradation per day.

Given the environmental conditions experienced in the Operational Area, marine diesel is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Marine diesel distillates tend not to form emulsions at the temperatures found in the region. The characteristics of the marine diesel are given in **Table 6-13**.

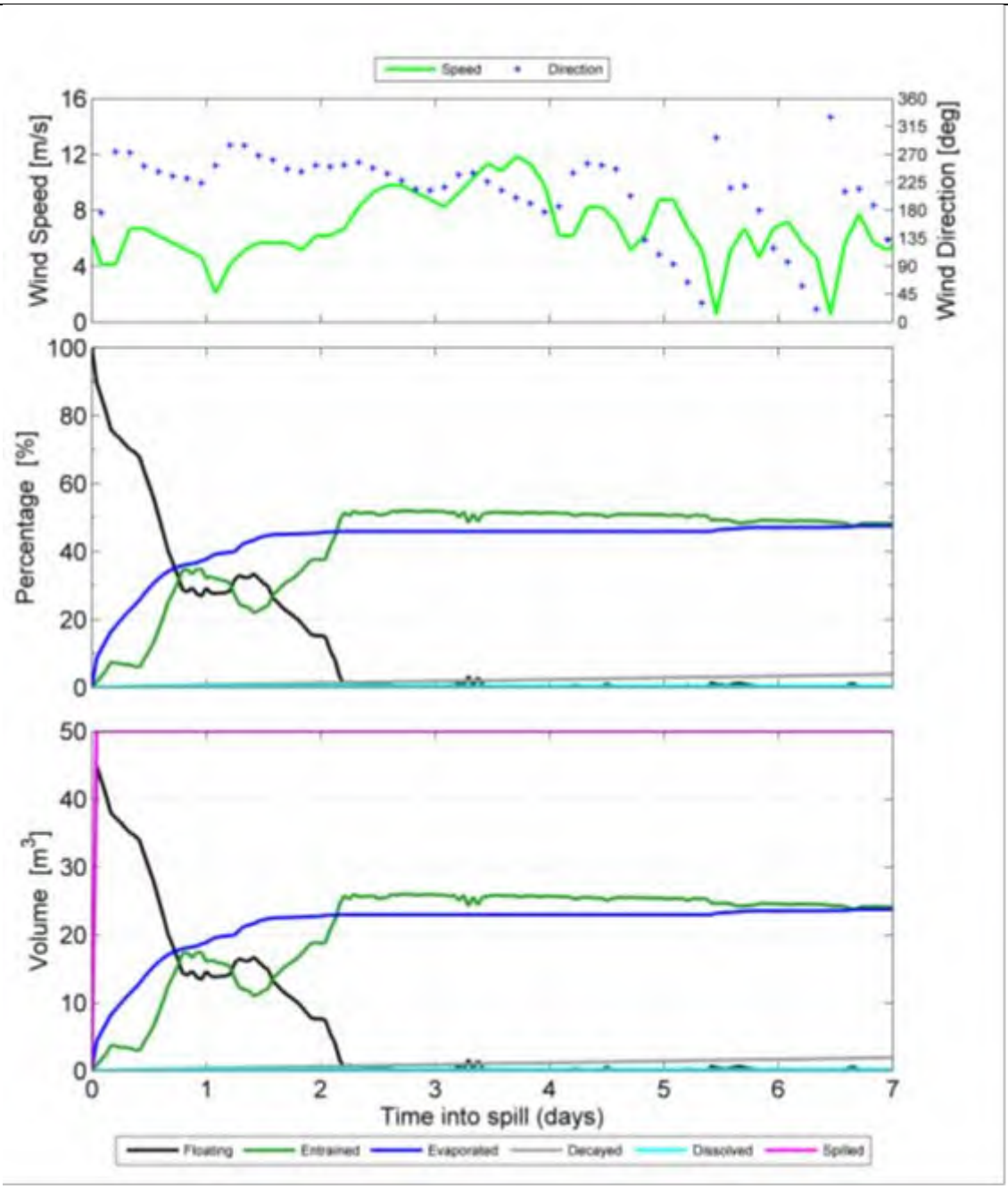

Figure 6-5: Proportional mass balance plot representing weathering of a surface spill of marine diesel spilled as a one-off release (at a rate of 50 m³/hr) and subject to variable wind at 27 °C water temperature and 25 °C air temperature (RPS, 2019)

Consequence Assessment

Potential Impacts Overview

Environment that May Be Affected

The overall EMBA for the Petroleum Activities Program is based on stochastic modelling, which compiles data from 100 hypothetical worst-case spills under a variety of weather and metocean conditions (as described in **Section 6.7.1**). Spill modelling was undertaken based on an instantaneous surface release of 250 m^3 of marine diesel.

Consequence Assessment
As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean transport mechanism, a different EMBA is discussed for each fate. ***Surface hydrocarbons*** Quantitative hydrocarbon spill modelling results for surface hydrocarbons are shown in **Table 6-17**. The modelling indicates that the spill would be localised and confined to open water, extending up to approximately 52 km (at or above the 10 g/m^3 impact threshold) from the release location. A socio-cultural EMBA for surface hydrocarbons which includes the threshold for visible surface hydrocarbons of 1 g/m^2 may extend up to approximately 58 km from the release site. ***Entrained hydrocarbons*** Quantitative hydrocarbon spill modelling results for entrained hydrocarbons are shown in **Table 6-17**. If a vessel collision scenario occurred, the plume of entrained hydrocarbons would form down-current of the release location, with the trajectory dependent on the prevailing current conditions at the time. The modelling indicates that locations exposed to entrained hydrocarbons at or above the threshold concentration of 100 ppb are restricted to offshore areas up to approximately 236 km from the release site. The only receptor predicted to be contacted by entrained oil concentrations at the 100 ppb threshold was Gascoyne Marine Park (**Table 6-17**). The maximum entrained oil concentration forecast for Gascoyne Marine Park was 998 ppb. Concentrations above 100 ppb are not expected to exceed depths of approximately 15 m below mean sea level (BMSL). ***Dissolved hydrocarbons*** Quantitative hydrocarbon spill modelling results for dissolved hydrocarbons are shown in **Table 6-17**. The modelling indicates that locations exposed to dissolved hydrocarbons at or above the threshold concentration of 50 ppb are restricted to offshore areas up to approximately 145 km from the release site. No contact with sensitive receptor locations is predicted. ***Accumulated hydrocarbons*** Quantitative hydrocarbon spill modelling results for accumulated hydrocarbons are shown in **Table 6-17**. Accumulated hydrocarbons above threshold concentrations (>100 g/m^2) were not predicted by the modelling to occur. Floating oil at concentrations equal to or greater than 1 g/m^2 are not predicted to contact any shoreline receptors.
Summary of Potential Impacts to Environmental Values
Table 6-17 presents the full extent of the EMBA, i.e. the sensitive receptors and their locations that may be exposed to hydrocarbons (surface, entrained and dissolved) at or above the set threshold concentrations in the unlikely event of a marine diesel spill from a vessel collision during the Petroleum Activities Program. Details of these receptors are outlined in **Section 4.** The potential biological and ecological impacts of an accidental hydrocarbon release as a result of a vessel collision during the Petroleum Activities Program are presented in the following sections.

Table 6-17: Key receptor locations and sensitivities potentially contacted above impact thresholds by the vessel collision scenario with summary hydrocarbon spill contact (table cell values correspond to probability of contact [%])

Environmental setting	Location/name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions in Woodside's Risk Management Procedure																									Maximum predicted probability of hydrocarbon contact (>1% probability)				
		Physical		Biological																			Socio-economic and Cultural					Socio-cultural EMBA	Ecological EMBA			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities/Habitats*							*Protected Species*									*Other Species*									
		Open water (pristine)	*Marine sediment (pristine)*	*Coral reef*	*Seagrass beds/macroalgae*	*Mangroves*	*Spawning/nursery areas*	*Open water – productivity/ upwelling*	*Non-biogenic coral reefs*	*Offshore filter feeders and/or deepwater benthic communities*	*Nearshore filter feeders*	*Sandy shores*	*Estuaries/tributaries/creeks/ lagoons (including mudflats)*	*Rocky shores*	*Cetaceans – migratory whales*	*Cetaceans – dolphins and porpoises*	*Dugongs*	*Pinnipeds (sea lions and fur seals)*	*Marine turtles (including foraging and internesting areas and significant nesting beaches)*	*Sea snakes*	*Whale sharks*	*Sharks and rays*	*Sea birds and/or migratory shorebirds*	*Pelagic fish populations*	*Resident/demersal fish*	*Fisheries – commercial*	*Fisheries – traditional*	*Tourism and recreation*	*Protected areas/heritage – European and Indigenous/shipwrecks*	*Offshore oil and gas infrastructure (topside and subsea)*	*Surface hydrocarbon (≥1 g/m²)*	*Surface hydrocarbon (≥10 g/m²) (≥10 g/m²)*	*Entrained hydrocarbon (≥100 ppb)*	*Dissolved aromatic hydrocarbon (≥50 ppb)*	*Accumulated hydrocarbons (>100 g/m²)*
	Gascoyne AMP	✓	✓					✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1	10	3	-

N.B. The probability is based on stochastic modelling of 100 hypothetical worst-case spills under a variety of weather and metocean conditions. Hydrocarbons cannot accumulate on open ocean, submerged receptors, or receptors not fully emergent.

Summary of Potential Risk and Impacts to Environmental Values(s)
Summary of potential impacts to protected species
Marine mammals (Cetaceans and dugongs)
Marine mammals that have direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingestion of hydrocarbons (from prey, water and sediments), aspiration of oily water or droplets, and inhalation of toxic vapours (DWH Natural Resource Damage Assessment Trustees, 2016). This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts and organs, impairment of the immune system, neurological damage (Helm et al., 2015), reproductive failure, adverse health effects (e.g. lung disease, poor body condition) and potentially mortality (DWH Natural Resource Damage Assessment Trustees, 2016). In a review of cetacean observations relating to a number of large-scale hydrocarbon spills, Geraci (1988) found little evidence of mortality associated with hydrocarbon spills. However, it was concluded that exposure to oil from the DWH resulted in increased mortality to cetaceans in the Gulf of Mexico (DWH Natural Resource Damage Assessment Trustees, 2016). Geraci (1988) did identify behavioural disturbance (i.e. avoiding spilled hydrocarbons) in some instances for several species of cetacean, suggesting that cetaceans have the ability to detect and avoid surface slicks. However, observations during spills have recorded larger whales (both mysticetes and odontocetes) and smaller delphinids travelling through and feeding in oil slicks. During the DWH spill, cetaceans were routinely seen swimming in surface slicks offshore (and nearshore) (Achinger Dias et al., 2017). Impacts to cetaceans depends on the exposure pathway; with exposure to entrained oil and surface slicks not expected to result in significant impacts due to the relatively volatile, non-persistent nature of the hydrocarbons. Direct toxic effects from external exposure are not expected to occur, although mucous membranes and eyes may become irritated. Indirect toxic effects, such as hydrocarbon ingestion through accumulation in prey may occur. Baleen whales feeding within entrained hydrocarbon plumes may ingest hydrocarbons, potentially resulting in toxic effects (particularly fresh hydrocarbons near the release location). Four threatened and migratory, and six migratory cetacean species were identified by a search of the EPBC Act Protected Matters Database, as potentially occurring in the EMBA (refer to **Section 4.6.3**). No BIAs for cetacean species were identified as occurring within the Operational Area, however a pygmy blue whale migration and foraging BIA, and humpback whale migration BIA occur within the EMBA. The pygmy blue whale is the species most likely to occur within the Operational Area during their northern migration from April to August. However, the presence of all cetacean species, including the pygmy blue whale, is likely to be limited to infrequent occurrences of individuals or small groups. A loss of marine diesel from a vessel collision could result in a disruption to individual marine mammals transiting the EMBA. Such disruption could include behavioural impacts (e.g. avoidance of impacted areas), sub-lethal biological effects (e.g. skin irritation, irritation from ingestion or inhalation) and, in rare circumstances, death. However, such disruptions or impacts are not predicted to impact on the overall population viability of the species within the EMBA.
Marine reptiles (Marine turtles)
Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon slicks (NOAA, 2010). Contact with surface slicks, or entrained hydrocarbon, can therefore, result in hydrocarbon adherence to body surfaces (Gagnon and Rawson, 2010) causing irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection (NOAA, 2010). Oiling can also irritate and injure skin which is most evident on pliable areas such as the neck and flippers (Lutcavage et al., 1995). A stress response associated with this exposure pathway includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of their salt gland (Lutcavage et al., 1995). Hydrocarbons in surface waters may also impact turtles when they surface to breathe and inhale toxic vapours. Their breathing pattern, involving large 'tidal' volumes and rapid inhalation before diving, results in direct exposure to petroleum vapours which are the most toxic component of the hydrocarbon spill (Milton and Lutz, 2003). This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia and neurological impairment (NOAA, 2010). Contact with entrained hydrocarbons can result in hydrocarbon adherence to body surfaces causing irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection (Gagnon and Rawson, 2010). There are no marine turtle BIAs within the Operational Area or EMBA, however there is one habitat critical for the survival of flatback turtles that partially overlaps the EMBA (refer to **Section 4.6.2**). The nearest internesting buffer BIAs is located approximately 135 km south-east of the Operational Area. The 60 km internesting buffer for flatback turtles in the Recovery Plan for Marine Turtles in Australia (DoEE, 2017a) is considered very conservative. There is no evidence to date to indicate that flatback turtles swim out into deep offshore waters during the internesting period. Additionally, suitable areas of internesting habitat were located close to many known flatback turtle rookeries across the region (Whittock et al., 2016). Flatback turtle hatchlings do not undertake oceanic migrations offshore to deep, pelagic waters. Instead, juveniles grow to maturity in shallow coastal waters close to their natal beaches (Musick and Limpus, 1996). Due to the absence of potential nesting habitat and the offshore location, the Operational Area is unlikely to represent important habitat for marine turtles (over 200 km from suitable nesting habitat at the Montebello Islands and Barrow

Summary of Potential Risk and Impacts to Environmental Values(s)
Island). In the event of a vessel collision, a marine diesel spill may impact individual marine turtles that have direct contact with hydrocarbons within the spill affected area but the consequences to marine turtle populations are likely to be minor.
Sharks and rays
Impacts to sharks and rays may occur through direct contact with hydrocarbons and contaminate the tissues and internal organs either through direct contact or via the food chain (consumption of prey). In the offshore environment, it is probable that pelagic shark species are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the affected areas. Therefore, any impact on sharks and rays is predicted to be minor and only a temporary disruption. Hydrocarbon contact may affect whale sharks through ingestion (entrained/dissolved hydrocarbons), particularly if feeding. A foraging BIA for the whale shark is located within the EMBA (refer to **Section 4.6.1**), approximately 136 km south-east of the Operational Area, representing an area where solitary whale sharks may forage during their migration from Ningaloo (primarily between September and November). Therefore, individual whale sharks that have direct contact with hydrocarbons within the spill affected area may be impacted but the consequences to migratory whale shark populations are likely to be minor.
Seabirds and/or migratory shorebirds
As outlined in **Section 4.6.4**, 20 species of seabirds and/or migratory shorebirds were identified by the PMST as potentially occurring within the EMBA, including 10 threatened species. There are no BIAs for any bird species located within the Operational Area, however the EMBA overlaps with a wedge-tailed shearwater breeding BIA located approximately 85 km south-east of the Operational Area. Seabirds generally do not exhibit avoidance behaviour to floating hydrocarbons. Physical contact of seabirds with surface slicks is by several exposure pathways, primarily, immersion, ingestion and inhalation. Such contact with hydrocarbons may result in plumage fouling and hypothermia (loss of thermoregulation), decreased buoyancy and potential to drown, inability to fly or feed, anaemia, pneumonia and irritation of eyes, skin, nasal cavities and mouths (AMSA, 2013; IPIECA, 2004) and result in mortality due to oiling of feathers or the ingestion of hydrocarbons. Longer-term exposure effects that may potentially impact seabird populations include a loss of reproductive success (loss of breeding adults) and malformation of eggs or chick (AMSA, 2013). The extent of the EMBA for a surface slick may result in impacts on feeding habitat, however this is not expected to result in a threat to the overall population viability of seabirds or shorebirds. Accumulated hydrocarbons above threshold concentrations (>100 g/m^2) were not predicted to occur at any shorelines. Floating oil at concentrations equal to or greater than 1 g/m^2 are not predicted to contact any shoreline receptors. Therefore, no impacts are expected to important nesting habitat.
Summary of potential impacts to other habitats and communities
Benthic fauna communities
Given the deep water depths of the EMBA (>100 m) benthic fauna communities located within the EMBA will not be directly exposed or impacted by a marine diesel spill as hydrocarbons (surface, entrained and dissolved) are confined to the upper layers of the water column.
Plankton and fish communities
There is potential for plankton communities to be impacted by a marine diesel spill where entrained hydrocarbons thresholds are exceeded; however communities are expected to recover quickly (weeks/months) due to high population turnover (ITOPF, 2011). Considering the fast population turn-over of open water plankton populations, it is considered that any potential impacts will be low and temporary in nature. Fish populations in the open water offshore environment of the Operational Area and EMBA are highly mobile and can move away from a marine diesel spill. The spill-affected area will likely be confined to the upper surface layers. It is therefore unlikely that fish populations would be exposed to hydrocarbon contamination. Fish populations are likely to be distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Given the above factors and the rapid dispersion of marine diesel, it is considered that any potential impacts to fish will be negligible.
Spawning/nursery areas
Fish (and other commercially targeted taxa) in their early life stages (eggs, larvae and juveniles) are at their most vulnerable to lethal and sub-lethal impacts from exposure to hydrocarbons, particularly if a spill coincides with spawning seasons or if a spill reaches nursery areas close to the shore (e.g. seagrass and mangroves) (International Tanker Owners Pollution Federation [ITOPF], 2011a). Fish spawning (including for commercially targeted species

Summary of Potential Risk and Impacts to Environmental Values(s)
such as snapper and mackerel) mostly occurs in nearshore waters at certain times of the year and nearshore waters are also inhabited by higher numbers of juvenile fishes than offshore waters. Modelling indicated that in the unlikely event of a marine diesel spill there is potential for entrained hydrocarbons to occur in the surface water layers above threshold concentrations up to approximately 236 km from the release site, and approximately 35 km from the shoreline at the closest point off Cape Range National Park. Therefore, there is the potential for lethal and sub-lethal impacts to a certain portion of fish larvae in affected areas, depending on concentration and duration of exposure and the inherent toxicity of the hydrocarbon. Losses of fish larvae in worst affected areas are unlikely to be of major consequence to fish stocks compared with significantly larger losses through natural predation, and the likelihood that most nearshore areas would be exposed is low. This is supported by a recent study in the Gulf of Mexico which used juvenile abundance data as indices of the acute, population-level responses of young fishes to the Deepwater Horizon spill. Results indicated that there was no change to the juvenile cohorts following this spill. Additionally there were no significant post-spill shifts in community composition and structure, nor were there changes in biodiversity measures (Fodrie and Heck, 2011). Any impacts to spawning and nursery areas are expected to be slight and short term, as would flow on effects to adult fish stocks into which larvae are recruited.
Coral reef habitat
Exposure to entrained hydrocarbons has the potential to result in lethal or sub-lethal toxic effects to corals and other sensitive sessile benthos within the upper water column, including subtidal corals. Mortality in a number of coral species is possible and this would result in the reduction of coral cover and change in the composition of coral communities. Sub-lethal effects to corals may include polyp retraction, changes in feeding, bleaching (loss of zooxanthellae), increased mucous production resulting in reduced growth rates and impaired reproduction (Negri and Heyward, 2000). In the unlikely event of a marine diesel spill occurring at the time of coral spawning at potentially affected coral locations or in the general peak period of biological productivity, there is potential for a reduction in successful fertilization and coral larval survival due to the sensitivity of coral early life stages to hydrocarbons (Negri and Heyward, 2000). Such impacts are likely to result in the failure of recruitment and settlement of new population cohorts. In addition, some non-coral species may be affected via direct contact with entrained hydrocarbons, resulting in sub-lethal impacts and in some cases mortality. This is with particular reference to the early life-stages of coral reef animals (reef attached fishes and reef invertebrates), which can be relatively sensitive to hydrocarbon exposure. Coral reef fish are site attached, have small home ranges and as reef residents they are at higher risk from hydrocarbon exposure than non-resident, more wide-ranging fish species. The exact impact on resident coral communities will be entirely dependent on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities. The modelling indicates that locations exposed to entrained hydrocarbons at or above the threshold concentration of 100 ppb are restricted to offshore areas up to approximately 236 km from the release site, and dissolved hydrocarbons at or above the threshold concentration of 50 ppb are restricted to offshore areas up to approximately 145 km from the release site. The nearest coral reef habitat (Ningaloo Reef) is located over 30 km outside of the extent of the area exposed to entrained hydrocarbons, and therefore coral reef habitats will not be directly exposed or impacted by a marine diesel spill.
Key Ecological Features
KEFs potentially impacted by a marine diesel spill from a vessel collision event are: • Exmouth Plateau • Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula • Continental slope demersal fish communities These KEFs are primarily defined by seabed geomorphological features and/or indicate a potential for increased biological productivity and, therefore, ecological significance. The consequences of a marine diesel spill from a vessel collision may impact the values of the KEFs affected (for the values of each KEF see Woodside's Existing Environment (**Appendix H**). Potential impacts to the above KEFS include, impacts to demersal fish populations and reduced biodiversity. Impacts to benthic habitats are not predicted as hydrocarbons (surface, entrained and dissolved) will be limited to the upper layers of the water column. Most of the KEFs within the EMBA have relatively broad-scale distributions and are unlikely to be significantly impacted. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to the ecological values of KEFs within the EMBA, with impacts predicted to be greatest within surface water layers closest to the potential release location.
Summary of potential impacts to water quality
Water quality would be affected due to hydrocarbon contamination which is described in terms of the biological effect concentrations. These are defined by the EMBA descriptions for each of, entrained and dissolved hydrocarbon fates

Summary of Potential Risk and Impacts to Environmental Values(s)
and their predicted extent (refer to **Table 6-17**). Furthermore, water quality is predicted to have minor long-term and/or significant short-term hydrocarbon contamination above background and/or national/international quality standards.
Summary of potential impacts to marine sediment quality
Given the deep water depths of the EMBA (>100 m) marine sediment quality will not be directly impacted by a marine diesel spill as hydrocarbons (surface, entrained and dissolved) are confined to the upper layers of the water column.
Summary of potential impacts to protected areas (including AMPs)
The quantitative spill risk assessment results indicate that the open water environment protected within the Gascoyne AMP, may be affected by the released hydrocarbons (refer to **Table 6-17**). It is noted that there are no State or Territory protected areas within the EMBA. Spill modelling predicts that the Gascoyne AMP may be contacted by entrained hydrocarbons above the 100 ppb ecological impact threshold with a probability of 4%. The Gascoyne AMP contains marine fauna and biological communities, which are considered to be of important environmental value that the AMP is intended to protect. Impact on the values of the above AMPs (refer to Woodside's Existing Environment (**Appendix H)** are discussed in the relevant sections above for ecological and physical values and below for socio-economic and cultural values. Additionally, such hydrocarbon contact may alter stakeholder understanding and/or perception of the protected marine environment, given these represent areas largely unaffected by anthropogenic influences and contain biological diverse environments.
Summary of potential impacts to socio-economic and cultural values
Fisheries – commercial
Fish exposure to hydrocarbon can result in 'tainting' of their tissues. Even very low levels of hydrocarbons can impart a taint or 'off' flavour or smell in seafood. Tainting is reversible through the process of depuration which removes hydrocarbons from tissues by metabolic processes, although it is dependent upon the magnitude of the hydrocarbon contamination. Fish have a high capacity to metabolise these hydrocarbons while crustaceans (such as prawns) have a reduced ability (Yender et al., 2002). Seafood safety is a major concern associated with spill incidents. Therefore, actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (Yender et al., 2002). A spill would result in the establishment of an exclusion zone around the spill affected area. There would be a temporary prohibition on fishing activities for a period of time and subsequent potential for economic impacts to affected commercial fishing operators. A loss of marine diesel result from a vessel collision is unlikely to cause significant direct impacts on the target species of Commonwealth and WA commercial fisheries within the defined EMBA. Further details are provided below. **Commonwealth fisheries** The predicted EMBA resulting from a marine diesel spill may impact on the area fished by the Western Deepwater Trawl Fishery (refer to **Section 4.10.2**). This fishery generally targets deepwater bugs, deepwater flathead, boarfish, dory and snapper using demersal (bottom) trawl gear (DoE, 2020). Fishing takes place in waters deeper than 200 m. The temporary nature of the predicted marine diesel spill would infer that it is unlikely the hydrocarbon concentrations in the upper surface layers would lead to potential exposure of bottom dwelling target species to contamination. **WA fisheries** The predicted EMBA resulting from a marine diesel spill may impact the area fished by a number of State fisheries (refer to **Section 4.10.2**). These fisheries generally use a range of gear types and operate in shallow inshore waters to water depths up to 1,200 m, targeting demersal and pelagic finfish species, crustaceans, and a range of other benthic species. In the unlikely event of a marine diesel spill, there is potential for the targeted fish species to be exposed to entrained hydrocarbons in the water column. However, the potential for direct impact would be reduced as target species such as snapper and mackerel are likely to avoid the surface water layer underneath oil slicks. The temporary nature of the predicted marine diesel spill would infer that it is unlikely the hydrocarbon concentrations in the upper surface layers would lead to potential exposure of pelagic fish to contamination. Demersal species (such as finfish) have limited mobility and therefore, will not be able to easily move away from a spill. As such, mortality/sub-lethal effects may impact demersal fish located close to the release location. Impacts to benthic species are unlikely as hydrocarbons are confined to the upper surface water layers.
Fisheries – traditional
No designated traditional fisheries have been identified to occur within the EMBA and therefore no impacts to traditional fisheries are predicted to occur.
Tourism and recreational activities

Summary of Potential Risk and Impacts to Environmental Values(s)
No known, regular tourism or recreational activities are expected to take place in the offshore waters of the EMBA and therefore impacts to these activities are highly unlikely and would be limited to negligible.
Offshore oil and gas activities
There are no other oil and gas facilities located within 50 km of the Operational Area therefore, the risk of vessel collision with oil and gas related activities is low. There are a number of oil and gas facilities that occur within the EMBA (i.e. Pluto Platform, Ngujima Yin FPSO). Avoidance of surface hydrocarbons is a possible response by other vessels. However, such occurrences will likely be limited to close proximity to the release site and other oil and gas activities are unlikely to be impacted.
Commercial shipping
A shipping fairway intersects the north-east corner of the Operational Area (refer to **Figure 4-16**), therefore, loss of marine diesel from a vessel collision may lead to exclusion of commercial shipping near the release location, resulting in operational inconvenience as vessels may be required to deviate course from intended routes.
Cultural heritage
No listed World Heritage Places, Indigenous Sites of Significance, Commonwealth Heritage Places or National Heritage Places were identified in the EMBA. A search of the Australasian Underwater Cultural Heritage Database (**Section 4.10.1.8**), which records all known Maritime Cultural Heritage (shipwrecks, aircraft, relics and other underwater cultural heritage) in Australian waters, indicated that there are nine Underwater Cultural Heritage sites within the EMBA. These heritage sites are located on the seabed, and will not be directly impacted by a marine diesel spill as hydrocarbons (surface, entrained and dissolved) are confined to the upper layers of the water column. In addition, as described in **Section 4**, no ethnographic values are known to occur within the Operational Area or EMBA. This work did identify ethnographic sites onshore, but these are beyond the EMBA and scope of this EP. It was noted that some traditional knowledge of ethnographic values has been lost through the effects of colonisation generally, and as a result of the Flying Foam Massacre in particular. It is noted that the marine ecosystem holds both cultural and environmental value (See **Section 4.10.1**), with these types of values (cultural and environmental) intrinsically linked. Woodside has conducted extensive consultation with Traditional Custodian groups as described in Section resulting in the identification of environmental values of cultural interest specified in Section 4.10.1. Any cultural values linked to environment receptors, have been assessed above and below.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[36]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Comply with Marine Order 30 (prevention of collisions) 2016, including: • adherence to steering and sailing rules including maintaining lookouts (e.g. visual, hearing, radar, etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar) • adherence to navigation light display	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement to reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted	Yes **C 10.1**

[36] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[36]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
requirements, including visibility, light position/shape appropriate to activity • adherence to navigation noise signals as required.				
Comply with Marine Order 27 (Safety of navigation and radio equipment) 2016, including: • navigational systems and equipment mentioned in Regulations 19 and 20 of Chapter V of SOLAS for the vessel are type approved and installed on board vessels • navigational systems and equipment mentioned in Regulations 7 to 11 of Chapter IV of SOLAS are installed on board vessels • navigational systems and equipment are maintained in working order • navigational activities and incidents of importance to safety of navigation on the vessel are recorded.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement to reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted	Yes **C 10.2**
Comply with Marine Order 21 (safety and emergency arrangements) 2020, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement to reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted	Yes **C 10.3**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[36]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
order (compass/radar) • navigational systems and equipment required are those specified in Regulation 19 of Chapter V of SOLAS • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.				
Good Practice				
Notify AHO of activities and movements no less than four weeks before the scheduled activity commencement date.	F: Yes CS: Minimal cost. Standard practice.	Notification to AHO will enable them to generate navigation warnings (Maritime Safety Information Notifications (MSIN)) and NTM [including AUSCOAST warnings where relevant)]).	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.1**
Notify AMSA JRCC of activities and movements 24–48 hours before the scheduled activity commencement date.	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.2**
Engage with proponents identified as having concurrent activities within the Operational Area prior to commencing the Petroleum Activities Program and develop an operations plan including the following aspects: • communications • work programming • hazard management • emergency response.	F: Yes CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 1.4**
Establish and maintain a 3 nm radius SNA around the seismic vessel and towed array.	F: Yes CS: Minimal cost. Standard practice.	Presence of the SNA will reduce the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice.	Yes **C 2.1**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[36]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
			Control is also standard practice.	
Employ at least one support/chase vessel to assist the seismic vessel.	F: Yes CS: Minimal cost. Standard practice.	Use of a support vessel to assist the seismic vessel will reduce the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 2.2**
In the event of a spill, emergency response activities implemented in accordance with the OPEP.	F: Yes CS: Costs associated with implementing response strategies vary dependent on nature and scale of spill event. Standard practice.	Potentially reduces consequence by implementing response to reduce impacts to the marine environment,	Control based on regulatory requirement – must be adopted.	Yes **C 10.4**
Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	F: Yes CS: Moderate costs associated with exercises. Standard practice.	No change to impact or risk, however ensures the OPEP can be implemented in the event of a hydrocarbon spill thereby potentially reducing the consequence.	Control based on regulatory requirement – must be adopted.	Yes **C 10.5**
Mitigation: Oil spill response.	Refer to **Appendix D.**			
Professional Judgement – Eliminate				
Eliminate use of vessels.	F: No. The use of vessels is required to conduct the Petroleum Activities Program. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
Risk Based Analysis				
A quantitative spill risk assessment was undertaken (see detail above).				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A) Woodside considers the adopted controls appropriate to manage the impacts and risks of an unplanned loss of hydrocarbon resulting from vessel collision. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that an accidental hydrocarbon release as a result of a vessel collision represents a moderate current risk rating and may result in a minor, short-term impact (1–2 years) on ecosystems, species, habitat or physical or biological attributes. Relevant recovery plans and conservation advice have been

Demonstration of Acceptability
considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders, AMSA and AHO identified during impact assessment and stakeholder consultation. Hydrocarbon spills were raised during consultation (**Table 5.4**) and these were considered in the finalisation of the EP. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 10 No release of hydrocarbons to the marine environment due to a vessel collision during the Petroleum Activities Program.	**C 10.1** Comply with Marine Order 30 (prevention of collisions) 2016, including: • adherence to steering and sailing rules including maintaining lookouts (e.g. visual, hearing, radar, etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar) • adherence to navigation light display requirements, including visibility, light position/shape appropriate to activity • adherence to navigation noise signals as required.	**PS 10.1** Project vessels compliant with Marine Order 30 (prevention of collisions) 2016 (which requires vessels to be visible at all times).	**MC 10.1.1** Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 21, 27 and 30).
	C 10.2 Comply with Marine Order 27 (Safety of navigation and radio equipment) 2016, including: • navigational systems and equipment mentioned in Regulations 19 and 20 of Chapter V of SOLAS for the vessel are type approved and installed on board vessels • navigational systems and equipment mentioned in Regulations 7 to 11 of Chapter IV of SOLAS are installed on board vessels • navigational systems and equipment are	**PS 10.2** Project vessels compliant with Marine Order 27 (Safety of navigation and radio equipment) 2016.	

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	maintained in working order • navigational activities and incidents of importance to safety of navigation on the vessel are recorded.		
	C 10.3 Comply with Marine Order 21 (safety and emergency arrangements) 2020, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working order (compass/radar) • navigational systems and equipment required are those specified in Regulation 19 of Chapter V of SOLAS • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.	**PS 10.3** Project vessels compliant with Marine Order 21 (safety of navigation and emergency procedures) 2016.	
	C 10.4 In the event of a spill, emergency response activities implemented in accordance with the OPEP.	**PS 10.4** In the event of a spill the OPEP requirements are implemented.	**MC 10.4.1** Records of completed incident documentation.
	C 10.5 Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	**PS 10.5.1** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-7**.	**MC 10.5.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 10.5.2 Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the OPEP, are maintained.	**MC 10.5.2** Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available.
	C 1.1 **Section 6.6.1**	**PS 1.1** **Section 6.6.1**	**MC 1.1.1** **Section 6.6.1**
	C 1.2 **Section 6.6.1**	**PS 1.2** **Section 6.6.1**	**MC 1.2.1** **Section 6.6.1**
	C 1.4	**PS 1.4**	**MC 1.4.1**

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	Section 6.6.1	**Section 6.6.1**	**Section 6.6.1**
	C 2.1 **Section 6.6.1**	**PS 2.1** **Section 6.6.1**	**MC 2.1.1** **Section 6.6.1**
	C 2.2 **Section 6.6.1**	**PS 2.2** **Section 6.6.1**	**MC 2.2.1** **Section 6.6.1**
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are provided in **Appendix D.**			

6.7.3 Accidental Hydrocarbon Release: Bunkering

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-Economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Loss of hydrocarbons to the marine environment from bunkering/refuelling of seismic vessel			x		x	x	x	A	E	1	L	LCS GP	Broadly Acceptable	EPO 11

Description of Source of Risk

Credible Scenario

Bunkering of marine diesel between the support vessel(s) and the seismic vessel may occur within the Operational Area.

Two credible scenarios for the loss of containment of marine diesel during bunkering operations were identified:

- Partial or total failure of a bulk transfer hose or fittings during bunkering, due to operational stress or other integrity issues could spill marine diesel to the deck and/or into the marine environment. This would be in the order of less than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume).
- Partial or total failure of a bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shutoff fuel pumps, for a period of up to five minutes, resulting in approximately 8 m^3 marine diesel loss to the deck and/or into the marine environment.

Quantitative Spill Risk Assessment

Woodside has commissioned RPS to model several small marine diesel spills, including surface spill volumes of 8 m^3 in the offshore waters of north-west WA. The results of these models have indicated that exposure to surface hydrocarbons above the 10 g/m^2 threshold is limited to the immediate vicinity of the release site, with little potential to extend beyond 1 km. Therefore, it is considered that exposure to threshold concentrations from an 8 m^3 surface spill from bunkering activities would be well within the EMBA for the vessel collision scenario detailed in **Section 6.7.2**. Given this, the offshore location of the Operational Area, and the fact that the same hydrocarbon type is involved for both scenarios, specific modelling for an 8 m^3 marine diesel release was not performed for this Petroleum Activities Program.

Hydrocarbon Characteristics

Refer to **Section 6.7.1.1** for a description of the characteristics of marine diesel, including detail on the predicted fate and weathering of a spill to the marine environment.

Consequence Assessment

Potential Impacts to Environmental Values

Previous modelling studies for 8 m^3 marine diesel releases, spilt at the surface as result of bunkering activities, indicated that the potential for exposure to surface hydrocarbons exceeding 10 g/m^2 was confined to within the immediate vicinity (approximately 1 km) of the release sites. Therefore, it is considered that there is no potential for

Consequence Assessment
contact with sensitive receptor locations above surface (10 g/m^2), entrained (100 ppb) or dissolved (50 ppb) threshold concentrations from an 8 m^3 spill of marine diesel within the Operational Area.
Summary of Potential Risks and Impacts to Environmental Values(s)
The potential biological and ecological impacts associated with a much larger hydrocarbon spill (250 m^3) are presented in **Section 6.7.2**, further detail on impacts specific to a spill of marine diesel from a bunkering loss are provided below. The biological consequences of such a small volume spill on identified open water sensitive receptors relate to the potential for minor impacts to megafauna, plankton and fish populations (surface and water column biota) that are within the spill affected area. No impacts to commercial fisheries and/or benthic habitats are expected. Refer to **Section 6.7.2** (potential impacts of unplanned hydrocarbon release to the marine environment from vessel collision) for the detailed potential impacts; however, the extent of the EMBA associated with a marine diesel spill from loss during bunkering will be much reduced in terms of spatial and temporal scales, and hence, potential impacts from bunkering are considered slight and short-term (<1 year).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[37]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention – oil) 2014 which requires a Ship Oil Pollution Emergency Plan (SOPEP)/ Spill Monitoring Program Execution Plan (SMPEP) (as appropriate to vessel class).	F: Yes CS: Minimal cost. Standard Practice.	Reduces the likelihood of a spill entering the marine environment. Although no significant reduction in consequence could result, the overall risk is reduced.	Controls based on legislative requirements – must be adopted.	Yes **C 11.1**
Good Practice				
Bunkering equipment controls: • all hoses that have a potential environmental risk following damage or failure shall be placed on the vessel's preventative maintenance system. • all bulk transfer hoses shall be pressure rated at purchase • there shall be dry-break couplings and flotation on fuel hoses • there shall be an adequate number of appropriately	F: Yes CS: Minimal cost. Standard practice.	Reduces the likelihood of a spill occurring. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 11.2**

[37] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[37]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
stocked, located and maintained spill kits.				
Ensure Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • a completed Permit to Work and/or JSA shall be implemented for the hydrocarbon bunkering/refuelling operation • gauges, hoses, fittings and the sea surface shall be visually monitored during the operation • hoses shall be visually inspected as per vessel procedures prior to commencement • bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred • hydrocarbons shall not be transferred in marginal weather conditions.	F: Yes CS: Minimal cost. Standard practice.	Reduces the likelihood of a spill occurring. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 11.3**
Mitigation: Oil spill response.	Refer to **Appendix D.**			

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[37]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Seismic vessel brought into port to refuel.	F: No. Does not eliminate the fuel transfer risk. It is not operationally practical to transit the seismic vessel back to port for refuelling, based on the frequency of the refuelling requirements and distance from the nearest port (Port Hedland >500 km). CS: Significant due to schedule delay and vessel transit costs and day rates.	Eliminates the risk in the Operational Area; however, moves risk to another location. Therefore, no overall benefit.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified.				
Risk Based Analysis				
A quantitative spill risk assessment was undertaken (see details above).				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the impacts and risks of a bunkering spill. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement Loss of hydrocarbons to marine environment during bunkering has been evaluated as having a low current risk rating that is unlikely to result in potential impact greater than minor and temporary exceedance over national/international water quality standards and a localised, minor and temporary disruption to a small proportion of the population and no impact on critical habitat or activity of protected species. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. As demonstrated in **Section 6.8**, the residual risk of unplanned hydrocarbon release from bunkering is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 11 No unplanned loss of hydrocarbons to the marine environment from bunkering greater	**C 11.1** Marine Order 91 (marine pollution prevention – oil) 2014, requires SOPEP/SMPEP (as appropriate to vessel class).	**PS 11.1** Appropriate initial responses prearranged and drilled in case of a hydrocarbon spill, as appropriate to vessel class.	**MC 11.1.1** Marine Assurance records demonstrate compliance with Marine Order 91.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
than a consequence level E[38] during the Petroleum Activities Program.	**C 11.2** Bunkering equipment controls: • all hoses that have a potential environmental risk following damage or failure shall be placed on the vessel's preventative maintenance system • all bulk transfer hoses be pressure rated at purchase • there shall be dry-break couplings and flotation on fuel hoses • there shall be an adequate number of appropriately stocked, located and maintained spill kits.	**PS 11.2.1** Damaged equipment is replaced prior to failure.	**MC 11.2.1** Records confirm the vessel bunkering equipment is subject to systematic integrity checks as per vessels preventative maintenance schedule.
		PS 11.2.2 Minimised inventory loss in the event of a failure.	**MC 11.2.2** Records confirm presence of dry break couplings and flotation on fuel hoses and are pressure rated.
		PS 11.2.3 Ensure adequate resources are available to allow implementation of the SOPEP.	**MC 11.2.3** Records confirm presence of spill kits.
	C 11.3 Ensure Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • a completed Permit to Work and/or JSA shall be implemented for the hydrocarbon bunkering/refuelling operation • gauges, hoses, fittings and the sea surface shall be visually monitored during the operation • hoses shall be visually inspected as per vessel procedures prior to commencement • bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred • hydrocarbons shall not be transferred in	**PS 11.3** Compliance with Contractor procedures for managing bunkering/refuelling operations.	**MC 11.3.1** Records demonstrate bunkering/refuelling undertaken in accordance with contractor bunkering procedures.

[38] Defined as 'Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes'.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	marginal weather conditions.		
Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in **Appendix D.**			

6.7.4 Unplanned Discharge: Deck Spills

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-Economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Accidental discharge of hydrocarbons/ chemicals from Project vessel deck activities and equipment (e.g. cranes and winches) within the Operational Area			x			x		A	F	2	L	LCS GP	Broadly Acceptable	EPO 12

Description of Source of Risk

Deck spills can result from spills from stored hydrocarbons/chemicals or equipment. Project vessels typically store hydrocarbon/chemicals in various volumes. Storage areas are typically set up with effective primary and secondary bunding to contain any deck spills. Releases from equipment are predominantly from the failure of hydraulic hoses, which can either be located within bunded areas or outside of bunded or deck areas (e.g. over water on cranes).

Woodside's operational experience demonstrates that spills are most likely to originate from hydraulic hoses and have been less than 100 L, with an average volume <10 L.

Consequence Assessment

Potential Impacts to Environmental Value(s)

No significant impacts from the accidental discharges described are anticipated in the offshore/open water locations of the Operational Area, because of the minor quantities involved (<10 L), the limited duration of vessel activities during the Petroleum Activities Program (up to 80-days), and high level of dilution into the open water marine environment of the Operational Area. The biological consequences of such a small volume spill on identified open water sensitive receptors relate to a minor potential for toxicity impacts to plankton and fish populations (surface and water column biota) and localised reduction in water quality within a small spill affected area. No impacts are predicted to benthic habitat communities in the Operational Area.

Summary of Potential Risks and Impacts to Environmental Value(s)

Given the adopted controls, it is considered that minor hydrocarbon/harmful chemical spills to the marine environment will not result in a potential impact to water quality greater than localised contamination above background levels, quality standards or known effect concentrations, and will not result in a potential impact greater than localised and temporary disruption to a small proportion of the population with no impact on critical habitat or activity.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[39]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention—oil) 2014, requires Shipboard Oil Pollution Emergency Plan (SOPEP) (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of an unplanned release. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 11.1**
Good Practice				
Bulk chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 12.1**
Maintain and locate spill kits in close proximity to hydrocarbon storage areas and deck areas for use to contain and recover deck spills.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a deck spill from entering the marine environment. The consequence is unchanged.	Benefits outweigh cost/sacrifice.	Yes **C 12.2**
Professional Judgement – Eliminate				
None identified.				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Below-deck storage of all hydrocarbons and chemicals.	F: Not feasible. During operations there is a need to keep small volumes near activities and within equipment requiring use of hydrocarbons and chemicals and can result in increased risk of leaks from transfers via hose or smaller containers. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
A reduction in the volumes of chemicals and hydrocarbons stored onboard the vessel.	F: Yes. Increases the risks associated with transportation and lifting operations. CS: Project delays if required chemicals not on board. Increases the risks associated with transportation and lifting operations.	No reduction in likelihood or consequence since chemicals will still be required to enable activities to occur.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No

[39] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[39]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of the potential unplanned accidental deck spills described above. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The risk assessment has determined that an unplanned minor discharge of hydrocarbons/chemicals as a result of minor deck spills represents a low current risk rating that is unlikely to result in potential impact greater than localised and temporary disruption to a small proportion of the population and no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are consistent with the most relevant regulatory guidelines and good oil-field practice/industry best practice. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of minor unplanned deck spills to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 12 No unplanned spills to the marine environment from deck activities greater than a consequence level of F[40] during the Petroleum Activities Program.	**C 11.1** **Section 6.7.3**	**PS 11.1** **Section 6.7.3**	**MC 11.1.1** **Section 6.7.3**
	C 12.1 Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/ moved temporarily.	**PS 12.1** Failure of primary containment in storage areas does not result in loss to the marine environment.	**MC 12.1.1** Records confirm all bulk chemicals and fuel are stored in bunded/ secondarily contained areas when not being handled/moved temporarily.
	C 12.2 Maintain and locate spill kits in close proximity to hydrocarbon storage areas and deck areas for use to contain and recover deck spills.	**PS 12.2** Spill kits to be available for use to clean up deck spills.	**MC 12.2.1** Records confirms spill kits are present, maintained and suitably stocked.

[40] Defined as 'No lasting effect (<1 month). Localised impact not significant to environmental receptor'.

6.7.5 Unplanned Discharge: Loss of Solid Hazardous and Non-Hazardous Wastes (including Dropped Objects)

Context		
Activity Components – **Section 3.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Accidental loss of hazardous or non-hazardous wastes (including dropped objects) to the marine environment (excludes sewage, grey water, putrescible waste and bilge water).			X		X	X		A	F	1	L	LC S GP	Broadly Acceptable	EPO 13

Description of Source of Impact

The project vessels will generate a variety of solid wastes including packaging and domestic wastes such as aluminium cans, bottles, paper and cardboard. Hence, there is the potential for solid wastes to be lost overboard to the marine environment. Wastes on-board are managed in accordance with the on-board waste management plan. Some wastes may be incinerated. Based on industry experience, waste items lost overboard are typically wind-blown rubbish such as container lids, cardboard etc. Such losses typically have occurred during back loading activities, periods of adverse weather and incorrect waste storage.

Consequence Assessment

Potential Impacts to Environmental Values

The potential impacts of solid wastes accidentally discharged to the marine environment include direct pollution and contamination of the environment and secondary impacts relating to potential contact of marine fauna with wastes, resulting in entanglement or ingestion and leading to injury and death of individuals. Several migratory and threatened species were identified as occurring within the Operational Area, including cetaceans, marine turtles and sharks. However, these species are expected to be transient as there are no known key aggregation areas within the Operational Area. The temporary or permanent loss of waste materials into the marine environment is highly unlikely to have a significant environmental impact, based on the types, size and frequency of wastes that could occur during the limited time the vessels will be in the Operational Area and the transient nature of the species present. Given this, impacts will have no lasting effect on any habitat, species or water quality.

Summary of Potential Risks and Impacts to Environmental Values(s)

Given the adopted controls, it is considered that the accidental discharge of solid waste described will result in localised impacts not significant to environmental receptors, with no lasting effect.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[41]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 95 – marine pollution prevention—garbage (as appropriate to vessel class), prescribes matters necessary to give effect to Annex V of MARPOL, which prohibits the discharge of all garbage into the sea, except as provided otherwise.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduces the likelihood of an unplanned release. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 13.1**
Good Practice				
Project Vessel Waste Management Plan, which requires: • dedicated waste segregation bins • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of an unplanned release. The consequence is unchanged.	Benefit outweighs cost sacrifice.	Yes **C 13.2**
Lost waste/dropped objects will be recovered, where safe and practicable. Where safe and practicable for this activity, will consider: • risk to personnel to retrieve object • whether the location of the object is in recoverable water depths • object's proximity to subsea infrastructure • ability to recover the object (i.e. nature of object, lifting equipment and suitable weather).	F: Yes, however it may not always be practicable. Assessed on a case by case situation. CS: Minimal cost. Standard practice.	No reduction in likelihood, as this is an unplanned event. Since the equipment may be recovered, a reduction in consequence is possible.	Benefit outweighs cost sacrifice.	Yes **C 13.3**
Professional Judgement – Eliminate				
None identified.				

[41] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[41]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement				
On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of accidental discharges of waste. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement
The impact assessment has determined that, given the adopted controls, accidental discharge of solid waste represents a low current risk rating that is unlikely to result in a potential impact above localised, not significant to environmental receptors with no lasting effects. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements (Marine Order 95).
Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of these discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 13 No unplanned releases of solid hazardous or non-hazardous waste to the marine environment greater than a consequence level of F[42] during the Petroleum Activities Program.	**C 13.1** Marine Order 95 – marine pollution prevention—garbage (as appropriate to vessel class), prescribes matters necessary to give effect to Annex V of MARPOL, which prohibits the discharge of all garbage into the sea, except as provided otherwise.	**PS 13.1** Project vessels compliant with Marine Order 95.	**MC 13.1.1** Records demonstrate project vessels are compliant with Marine Order 95.
	C 13.2 Project Vessel Waste Management Plan, which requires: • dedicated waste segregation bins • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class.	**PS 13.2** Waste will be managed in accordance with the project vessel waste arrangements.	**MC 13.2.1** Records demonstrate compliance against project vessel waste arrangements.

[42] Defined as 'No lasting effect (<1 month). Localised impact not significant to environmental receptor'.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	C 13.3 Lost waste/dropped objects will be recovered, where safe and practicable. Where safe and practicable for this activity, will consider: • risk to personnel to retrieve object • whether the location of the object is known or is in recoverable water depths and feasible to do so • object's proximity to subsea infrastructure • ability to recover the object (i.e. nature of object, lifting equipment and suitable weather).	**PS 13.3** Waste dropped to the marine environment will be recovered where safe and practicable to do so.	**MC 13.3.1** Records detail the recovery attempt consideration and status of any waste lost to the marine environment.

6.7.6 Physical Presence: Vessel Collision / Entanglement with Marine Fauna

Context		
Project Vessels – **Section 3.5.5**	Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Accidental collision between project vessels and threatened and/or migratory marine fauna within the Operational Area.						x		A	E	1	L	LCS GP	Broadly Acceptable	EPO 14
Entanglement of threatened and/or migratory marine fauna with towed seismic equipment within the Operational Area.						x								

Description of Source of Risk

Project Vessels

The project vessels operating in and around the Operational Area may present a potential hazard to cetaceans and other protected marine fauna such as marine reptiles. Vessel movements can result in collisions between the vessel (hull and propellers) and marine fauna, potentially resulting in superficial injury, serious injury that may affect life functions (e.g. movement and reproduction) and mortality. The factors that contribute to the frequency and severity of impacts due to collisions vary greatly due to vessel type, vessel operation (specific activity, speed), physical environment (e.g. water depth) and the type of animal potentially present and their behaviours.

The seismic vessel will be advancing at low speeds around 4–5 knots (7–9 km) during seismic acquisition. The support vessel(s) generally travel at higher speeds.

Seismic Equipment

The seismic vessel will tow seismic geophysical and associated equipment (comprising the acoustic source, header buoys, starboard and port deflectors or baravanes, streamers and tail buoys) within the Operational Area. The seismic vessel may tow up to 14 streamers that could extend approximately 8 km behind the seismic vessel. The streamer(s) will be towed at a depth of approximately 15–25 m. The seismic source will be towed at a depth of approximately 6 to 8 m (± 1 m).

The seismic equipment has the potential to present an entrapment/entanglement risk to marine fauna (in particular marine turtles). Anecdotally, there has been no reported cases of marine fauna becoming entangled in seismic equipment in Australian waters.

Consequence Assessment

Potential Impacts to Environmental Values

Vessel disturbance is a key threat to a number of migratory and threatened species identified as occurring within Operational Area, including cetaceans and marine turtles. Relevant conservation actions outlined in these plans are listed in **Section 6.8.**

Consequence Assessment

Cetaceans

Cetaceans are naturally inquisitive marine mammals. The reaction of cetaceans to the approach of a vessel is quite variable. Some species remain motionless when close to a vessel, while others are known to be curious and often approach ships that have stopped or are slow moving, although they generally do not approach and sometimes avoid faster moving ships (Richardson et al., 1995). The Whale and Dolphin Conservation Society (WDCS, 2006) indicates that some cetacean species, such as humpback whales can detect and change course to avoid a vessel.

Collisions between vessels and marine mammals occur more frequently in areas where high vessel traffic and important habitat coincide (WDCS, 2006). In Australia, the majority of vessel strikes to known species involved humpback, southern right whale and sperm whales, in descending order (Peel et al., 2016). Van Warebeek et al. (2007) report just five blue whale ship strikes in the Southern Hemisphere. No vessel strike collisions were reported in the Northern coast of Australia (Peel et al., 2016). The behaviour exhibited by whales prior to vessel collision varies, with some reported as being asleep/unmoving prior to the collision (Peel et al., 2016) and others displaying a 'last-second flight response' (Laist et al., 2001). Individual cetaceans engaged in behaviours such as feeding, mating or nursing may also be more vulnerable to vessel collisions when distracted by these activities (DoEE, 2017b).

The likelihood of vessel/whale collision being lethal is influenced by vessel speed—the greater the speed at impact, the greater the risk of mortality (Jensen and Silber, 2004; Laist et al., 2001). Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale as a result of a vessel strike increases from about 20% at 8.6 knots to 80% at 15 knots. Project vessels within the Operational Area are likely to be travelling <8 knots, therefore, the chance of a vessel collision with protected species resulting in a lethal outcome is considered unlikely, as fauna can move away from project vessels.

The Operational Area does not overlap with any cetacean BIAs or critical habitat. Due to the proximity of a pygmy blue whale migration BIA approximately 14 km south-east of the Operational Area, and also the recorded presence of a tagged whale within the south east corner of the Operational Area (**Section** 4.6.3), it is possible the pygmy blue whale may occur within the Operational Area during their northern migration from April to July, and during their southern migration from October to January. However, the presence of all cetacean species, including the pygmy blue whale, is likely to be limited to infrequent occurrences of individuals or small groups.

According to the data of Vanderlaan and Taggart (2007), it is estimated that the risk of lethal injury to a large whale as a result of a vessel strike is less than 10% at a speed of 4 knots. Vessel-whale collisions at this speed are uncommon and based on reported data contained in the NOAA database (Jensen and Silber, 2004) there only two known instances of collisions when the vessel was travelling at less than 6 knots; both of these were from whale-watching vessels that were deliberately positioned amongst whales. Given the duration of activities within the Operational Area and the slow speeds at which project vessels operate, collisions with cetaceans such as pygmy blue whales are considered highly unlikely.

Marine Turtles

Marine turtles are at potential risk from vessel strike and entanglement with towed seismic equipment. Hazel and Gyuris (2006) reviewed vessel strike data from 1999-2002 on the Queensland east coast and found that during that period at least 65 turtles were killed annually as a result of collisions with vessels. Green turtles, followed by loggerhead turtles comprised the majority of vessel related records, and 72% of cases were adult or sub-adult turtles (Hazel and Gyuris, 2006). In Australian waters, all species of marine turtle have been involved in vessel strikes (DoEE, 2016).

The effect of vessel speed and turtle flee response can be significant. A study by Hazel et al. (2007) found that 60% of green turtles fled from vessels travelling at 2.2 knots (4 km/h) while only 4% fled from vessels travelling at 10.2 knots (19 km/h). When fleeing 75% of turtles moved away from the vessel's track, 8% swam along the vessel track and 18% crossed in front of the vessel. The study concluded that most turtles would be unlikely to avoid vessels travelling at speeds greater than around 2.2 knots (Hazel et al., 2007; DoEE, 2017a). Furthermore, the relatively small size of turtles and the significant time spent below the surface makes their observation by vessel operators extremely difficult or impossible. Green turtles observed by Hazel et al. (2009) generally only exposed the dorsal-anterior part of the head above the surface of the water and never for longer than two seconds.

There is no published literature on marine turtle entanglement with seismic equipment during seismic surveys, however Nelms et al. (2016) state that they received anecdotal reports of turtle entrapments in tail buoys and airgun strings during several offshore seismic surveys off the west coast of Africa. Additionally, there is evidence of marine turtles becoming entangled in discarded seismic cable (Duncan et al., 2017).

There are no BIAs or Habitat Critical to the survival of marine turtles within the Operational Area. Due to the absence of potential nesting habitat and location offshore, the Operational Area is unlikely to represent important habitat for marine turtles. The occurrence of all species of marine reptiles within the Operational Area is expected to be limited to infrequent occurrences of transitory individuals. Given the duration of activities within the Operational Area and the slow speeds at which project vessels operate, collisions or entanglement with transiting marine turtles are considered highly unlikely.

Consequence Assessment
Summary of Potential Risks and Impacts to Environmental Value(s)
The assessment of vessel collision with marine fauna has considered the potential risks to pygmy blue whales. If the Petroleum Activities Program overlaps with the northbound or southbound migration, individuals may deviate slightly due to the presence of vessels, but will continue on their migration unhindered. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the very slow vessel speeds and presence of MFOs. This is not inconsistent with the the BWCMP (**Table 6-21**) (Action Area 4.Given the adopted controls, it is considered that if a collision or entanglement were to occur, it will not result in a potential impact greater than slight, short-term impact on the species (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[43]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[44]: • Project vessels will not travel faster than six knots within 300 m of a cetacean (caution zone) • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bowriding). • If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots.	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a cetacean occurring. The consequence of a collision is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 14.1**
Good Practice				
Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[45]	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a whale shark occurring. The consequence of a collision is unchanged.	Benefits outweigh cost/sacrifice. Control is also standard practice	Yes **C 14.3**
Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots[45].	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a turtle occurring. The consequence of a collision is unchanged.	Benefits outweigh cost/sacrifice. Control is also standard practice	Yes **C 14.4**

[43] Qualitative measure

[44]For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[43]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Fit streamer tail buoys with appropriate turtle guards, or use a design that does not represent an entanglement risk for turtles.	F: Yes. CS: Minimal cost. Standard practice.	Implementing this control will reduce the likelihood of turtle entanglement.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 14.2**
Professional Judgement – Eliminate				
Eliminate use of vessels.	F: No. The use of vessels is required to conduct the Petroleum Activities Program. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
The use of dedicated MFOs on support vessel(s) for the duration of the Petroleum Activities Program to watch for cetaceans and marine turtles and provide direction on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes. Vessel bridge crews already maintain a constant watch during operations, and crew complete specific cetacean observation training. CS: Additional cost of MFOs considered unnecessary.	Given support vessel bridge crews already maintain a constant watch during operations, additional MFOs would not significantly further reduce the risk.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit.	No
Professional Judgement – Engineered Solution				
Manage Vessel speed to reduce likelihood of interaction with marine fauna	F: Yes. CS: Good practice	There is an established relationship between the likelihood of vessel strikes to whales and the speed of the vessel. However, the Operational Area does not overlap with any cetacean BIAs or critical habitat and the presence of marine fauna is likely to be limited to infrequent occurrences of individuals or small groups. Therefore, there is no further risk reduction from the application of this control.	Given the slow speeds at which vessels operate, the likely presence of marine fauna in the Operational Area and the controls currently in place (C14.1) the adoption of this control offers no further reduction in risk.	No
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of potential vessel collision/entanglement with protected marine fauna. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement
The impact assessment has determined that, given the adopted controls, vessel collision/entanglement with marine fauna represents a low risk rating that is unlikely to result in a potential impact to fauna greater than slight and short term, with no population-level effects. Further opportunities to reduce the impacts and risks have been investigated above. Impacts to cetaceans from vessel strikes was raised during stakeholder consultation and were considered in the finalisation of the EP to clarify potential impacts.
The adopted controls are considered good oil-field practice/industry best practice and meet the requirements of Part 8 (Division 8.1) of the EPBC Act Regulations 2000. The residual risk of vessel collision with marine fauna is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans including the BWCMP (*Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented* - refer to **Section 6.8**), based on the adopted controls. Regard has been given to relevant conservation advice during the assessment of potential risks.
Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of vessel collision with marine fauna to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 14 No vessel strikes with marine fauna (whales, whale sharks and turtles) during the Petroleum Activities Program.	**C 14.1** EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[45]: • Project vessels will not travel faster than six knots within 300 m of a cetacean (caution zone). • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bowriding). • If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots.	**PS 14.1** Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to minimise potential for vessel strike.	**MC 14.1.1** Records demonstrate no breaches of EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans.
		PS 14.1.2 All vessel strike incidents with cetaceans will be reported in the National Ship Strike Database (as outlined in the Conservation Management Plan for the Blue Whale—A Recovery Plan under the EPBC Act 1999, Commonwealth of Australia, 2015).	**MC 14.1.2** Records demonstrate reporting cetacean ship strike incidents to the National Ship Strike Database.
	C 14.3 Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[45]	**PS 14.3.1** When within 250 m of a whale shark vessels will not travel greater than 6 knots and vessels will not approach closer than 30 m to a whale shark	**MC 14.3.1** Records demonstrate no breaches of speed requirements when within 250 m of a whale shark
	C 14.4 Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately	**PS 14.4.1** When within 300 m of a turtle, vessels will not travel greater than 6 knots.	**MC 14.4.1** Records demonstrate no breaches of speed requirements when within 300 m of a turtle

[45]For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	withdraw from the caution zone at a constant speed of less than 6 knots[45].		
	C 14.2 Fit streamer tail buoys with appropriate turtle guards, or use a design that does not represent an entanglement risk for turtles.	**PS 14.2** Streamer tail-buoys to have appropriate turtle guards, or will be of a design that does not represent an entanglement risk for turtles.	**MC 14.2.1** Records confirm that turtle guards have been fitted appropriately (or are not necessary due to design of tail-buoys).

6.7.7 Physical Presence: Loss of Equipment

Context		
Activity Components – **Section 3.5**	Biological Environment – **Section 4.5** Socio-Economic Environment – **Section 4.10**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-Economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Physical loss of seismic equipment (i.e. streamers, acoustic source).					x		x	A	F	2	L	LCS GP	Broadly Acceptable	EPO 15

Description of Source of Risk

The Petroleum Activities Program will be conducted using a single purpose-built seismic vessel. The seismic vessel will tow seismic equipment (comprising the acoustic source, header buoys, starboard and port spreaders or vanes, streamers and tail buoys). The seismic vessel may tow up to 14 streamers, approximately 8000 m in length, towed approximately 500 m behind the seismic vessel and, therefore, extending approximately 8.5 km behind the vessel. The streamer(s) will be towed at a depth of approximately 15–25 m. The seismic source will be towed at a depth of approximately 6 to 8 m. The streamers will be fitted with streamer recovery devices (SRDs) that will automatically deploy inflatable air bags to raise the streamer to the service for retrieval.

Loss of this equipment has the potential to cause minor physical damage to seabed and benthic communities, and temporary disturbance to marine users (i.e. commercial fishers).

Consequence Assessment

Potential Impacts to Environmental Values

Benthic Habitat and Communities

In the unlikely event of loss of seismic equipment during the Petroleum Activities Program, potential environmental effects would be limited to physical impacts to the seabed and benthic communities. During normal operations, it is considered highly unlikely for streamers to sink and impact the seabed, given the tow depth of streamers (~15–25 m) and the application of depth control built into the design (SRDs).

The Operational Area is expected to consist primarily of fine grain, soft sediments. The seabed is likely to be inhabited by a low abundance of filter feeders (primarily echinoderms) and other epifauna and infauna. The Operational Area lies within the Exmouth Plateau KEF. This KEF is generally an area of low habitat heterogeneity, however, it is likely to be an important area of biodiversity as it provides an extended area offshore for communities adapted to depths of around 1000 m (DOEE, n.d.).

Additionally, the Operational Area overlaps entirely with the Northwest Province, which typically supports a low abundance, richness and diversity of benthic communities (Heyward et al., 2001).

Given the size of seismic equipment, only a relatively small area of the seabed would be disturbed and no lasting impacts to benthic habitats are expected.

Commercial Fisheries and Other Marine Users

In the unlikely event that equipment is lost, any commercial fisheries and/or other marine users of the Operational Area may be required to make minor diversions to avoid the equipment, until it can be retrieved (if possible). The

potential for such interactions will be limited to a short period of time while the equipment is retrieved (if possible). Should disruption occur, it is expected to affect individual users and cause a temporary disruption through avoidance of a highly localised area. Given the nature and size of the equipment to be used during the survey, lost equipment may result in a minor navigational hazard. Therefore, anticipated impacts are expected to be low.

Summary of Potential Risks and Impacts to Environmental Value(s)

Given the adopted controls, it is considered that a loss of seismic equipment (i.e. seismic streamers, acoustic source to the seabed will not result in a potential impact greater than localised disruption to a small area of the seabed, a small portion of the benthic population and no impact on critical habitat or activity.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[46]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Comply with Marine Order 21 (safety and emergency arrangements) 2016, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working order (compass/radar) • navigational systems and equipment required are those specified in Regulation 19 of Chapter V of SOLAS • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement to reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted	Yes **C 15.1**
Good Practice				
Deploy, retrieve and operate streamers as per predetermined procedures, including: • Streamers will only be deployed in suitable sea state in accordance with contractors Matrix of Permitted	F: Yes. CS: Minimal cost. Standard practice.	Implementing this control will reduce the likelihood of equipment loss. The consequence is unchanged.	Benefit outweighs cost/ sacrifice.	Yes **C 15.2**

[46] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[46]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Operations (MOPO) or similar.				
Streamers fitted with steering devices in the form of remote controlled wings/fins, and real-time monitoring equipment.	F: Yes. CS: Minimal cost. Standard practice.	Implementing this control will reduce the likelihood of equipment loss. The consequence is unchanged.	Benefit outweighs cost/ sacrifice.	Yes **C 15.3**
Activate pressure-activated SRDs within streamers in the event of loss, to bring the equipment to the surface.	F: Yes. CS: Minimal cost. Standard practice.	Implementing this control will reduce the likelihood of equipment loss. The consequence is unchanged.	Benefit outweighs cost/ sacrifice.	Yes **C 15.4**
Lost equipment will be recovered, where safe and practicable. Where safe and practicable for this activity, will consider: • risk to personnel to retrieve object • whether the location of the equipment is known or in recoverable water depths • equipment's proximity to subsea infrastructure • ability to recover the equipment (i.e. nature of equipment, lifting equipment and suitable weather).	F: Yes, however it may not always be practicable. Assessed on a case by case situation. CS: Minimal cost. Standard practice.	No reduction in likelihood, as this is an unplanned event. Since the equipment may be recovered, a reduction in consequence is possible.	Benefit outweighs cost/ sacrifice.	Yes **C 15.5**
Professional Judgement – Eliminate				
None identified.				
Professional Judgement – Substitute				
Use modified short marine towed streamer(s) (approximately 1.5 to 3 km in length).	F: No. CS: Shorter streamers result in a significant loss of data, especially in deeper waters, and would not enable the survey to image the target depth below mudline.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Engineered Solution				
None identified.				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[46]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks to benthic communities from the loss of seismic equipment to the seabed. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, potential loss of seismic equipment to the seabed represent a consequence to benthic community/habitat structure limited to no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks to marine sediment from loss of seismic equipment to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 15 No loss of seismic equipment (i.e. streamers, acoustic source) with a consequence level greater than F[47] for the duration of the Petroleum Activities Program.	**C 15.1** Comply with Marine Order 21 (safety and emergency arrangements) 2020, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working order (compass/radar) • navigational systems and equipment required are those specified in Regulation 19 of Chapter V of SOLAS • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.	**PS 15.1** Project vessels compliant with Marine Order 21 (safety of navigation and emergency procedures) 2016.	**MC 15.1.1** Records demonstrate compliance with standard maritime safety procedures (Marine Orders 21 and 30).
	C 15.2 Deploy, retrieve and operate streamers as per predetermined procedures, including: • Streamers will only be deployed in suitable sea state in accordance with	**PS 15.2** Seismic vessel compliance with predetermined procedures on deployment, retrieval and operation of streamers.	**MC 15.2.1** Records confirm that seismic vessel hold procedures for streamer deployment, retrieval and operation. **MC 15.2.2** Daily report demonstrates that streamers were deployed

[47] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors.'

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	contractors MOPO or similar.		in accordance with contractors MOPO.
	C 15.3 Streamers fitted with steering devices in the form of remote controlled wings/fins, and real-time monitoring equipment.	**PS 15.3** Ability to control streamer depth and location of streamer in relation to the seabed is known at all times.	**MC 15.3.1** Records confirm streamers are fitted with steerable wings/fins, and real-time monitoring equipment.
	C 15.4 Activate pressure-activated SRDs within streamers the event of loss, to bring the equipment to the surface.	**PS 15.4** Streamers fitted with SRDs.	**MC 15.4.1** Records confirm streamers are fitted with pressure-activated SRDs.
	C 15.5 Lost equipment will be recovered, where safe and practicable. Where safe and practicable for this activity, will consider: • risk to personnel to retrieve object • whether the location of the equipment is known or is in recoverable water depths • equipment's proximity to subsea infrastructure • ability to recover the equipment (i.e. nature of equipment, lifting equipment and suitable weather).	**PS 15.5** Lost equipment recovered where safe and practicable to do so.	**MC 15.5.1** Records detail the recovery of equipment lost to the marine environment.

6.7.8 Physical Presence: Introduction and Establishment of Invasive Marine Species

Context		
Project Vessels – **Section 3.5.5**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcomes
Introduction and establishment of invasive marine species (IMS)					X	X	X	A	D	0	L	LCS GP	Broadly Acceptable	EPO 16

Description of Source of Risk

During the Petroleum Activities Program, vessels and submersible equipment have the potential to introduce IMS to the Operational Area.

Vessels

Vessels will be transiting to and from the Operational Area, potentially including traffic mobilising from international waters. There is the potential for project vessels to transfer IMS from either international waters, Australian waters or coastal waters into the Operational Area.

All vessels are subject to some level of marine fouling. Organisms attach to the vessel hull, particularly in areas where organisms can find a good attachment surface (e.g. seams, strainers and unpainted surfaces) or where turbulence is lowest (e.g. niches, sea chests, etc.). Commercial vessels typically maintain anti-fouling coatings to reduce the build-up of fouling organisms. Organisms can also be drawn into ballast tanks during on-boarding of ballast water required to maintain safe operating conditions.

Project vessels have the potential to introduce IMS to the Operational Area through marine biofouling (containing IMS) on vessels, as well as within high-risk ballast water exchange. Cross-contamination between vessels can also occur (e.g. IMS translocated between project vessels) during times when vessels need to be alongside each other.

Submersible Equipment

Submersible equipment required for the activity (seismic array) is transported to and used within the Operational Area. There is the potential that this equipment may be used on other projects before being used on this activity. As a consequence, there is the potential for IMS translocation.

Consequence Assessment

Potential Impacts to Environmental Values

IMS are a subset of Non-Indigenous Marine Species (NIMS) that have been introduced into a region beyond their natural biogeographic range, resulting in impacts to social/cultural, human health, economic and/or environmental values. NIMS are species that have the ability to survive, reproduce and establish founder populations. However, not all NIMS introduced into an area will thrive or cause demonstrable impacts. The majority of NIMS around the world are relatively benign and few have spread widely beyond sheltered ports and harbours. NIMS are only considered IMS when they result in impacts to environmental values and/or have social/cultural, economic and/or human health impacts.

Consequence Assessment

Once introduced, IMS may prey on local species (which had previously not been subject to this kind of predation and therefore not have evolved protective measures against the attack), they may outcompete indigenous species for food, space or light and can also interbreed with local species, creating hybrids such that the endemic species is lost. These changes to the local marine environment result in changes to the natural ecosystem.

IMS have also proven economically damaging to areas where they have been introduced and established. Such impacts include direct damage to assets (fouling of vessel hulls and infrastructure) and depletion of commercially harvested marine life (e.g. shellfish stocks). IMS have proven particularly difficult to eradicate from areas once established. If the introduction is detected early, eradication may be effective but is likely to be expensive, disruptive and, depending on the method of eradication, harmful to other local marine life.

Potential IMS have historically been introduced and translocated around Australia by a variety of natural and human means, including marine fouling and ballast water. Potential IMS vary from one region to another depending on various environmental factors such as water temperature, salinity, nutrient levels and habitat type, which dictate their survival and invasive capabilities. IMS typically require hard substrate in the photic zone; therefore, requiring shallow waters to become established. Highly-disturbed, shallow-water environments such as shallow coastal waters, ports and marinas are more susceptible to IMS colonisation, whereas IMS are generally unable to successfully establish in deep-water ecosystems and open-water environments where the rate of dilution and the degree of dispersal are high (Williamson and Fitter, 1996; Paulay et al., 2002; Geiling, 2014).

Project vessels and submersible equipment required to undertake the Petroleum Activities Program have the potential to introduce IMS into the Operational Area. Due to the deep water depths (>800 m) and lack of submerged banks/shoals within the Operational Area and surrounding waters, settlement and establishment of IMS is not considered credible. Furthermore, the likelihood is considered remote, given the open-water environment of the Operational Area, distance from shorelines (>200 km) and/or critical habitat and the control measures proposed to be implemented (as outlined below).

Summary of Potential Risks and Impacts to Environmental Value(s)

In support of Woodside's assessment of the risks and consequences of IMS introduction associated with the Petroleum Activities Program, Woodside conducted a risk and impact evaluation of the different aspects of an IMS translocation. The results of this assessment are presented in **Table 6-18.**

As a result of this assessment, Woodside has assessed the potential consequence and likelihood after implementing the identified controls. This assessment concluded that the highest potential consequence is a 'D' and the likelihood is 'Remote' (0), resulting in an overall 'Low' risk.

Table 6-18: Evaluation of risks and impacts from marine pest translocation

IMS Introduction Location	Credibility of Introduction	Consequence of Introduction	Likelihood
Introduced to the Operational Area and establishment on the seafloor.	***Not Credible*** The Operational Area is in deep offshore open waters away from shorelines and/or critical habitat; therefore, they are not conducive to the settlement and establishment of IMS.		
Introduced to the Operational Area and establishment on a project vessel.	***Credible*** There is potential to transfer marine pests between project vessels within the Operational Area	***Environment – not credible*** The translocation of IMS from a colonised project vessel to another vessel via natural dispersion is not credible. This is because of the open-water environment of the Operational Area and distance from shorelines and/or critical habitat. On this basis there is no credible environmental risk. Reputation – D If IMS were on a project vessel, this could potentially impact the vessel operationally through the fouling of intakes and, potentially transfer of an IMS to other support vessels, which would likely result in the quarantine of the vessel until eradication could occur (through cleaning and treatment of	***Remote (0)*** Interactions between project vessels will be limited during the Petroleum Activities Program, with a 3 nm SNA around the seismic vessel, and interactions limited to short periods of time alongside (i.e. during bunkering activities). Spread of marine pests via ballast water in these open ocean environments is not considered credible due to the lack of suitable habitat for

Consequence Assessment			
		infected areas), which would be costly to perform. Such introduction would be expected to have minor impact to Woodside's reputation, particularly with Woodside's contractors, and would likely have a reputational impact on future proposals.	settlement and establishment.
Transferred between project vessels and from project vessels to other marine environments beyond the Operational Area (i.e. transfer IMS from seismic vessel to a support vessel and then to another environment).	***Not Credible*** The risk is considered so remote that it is not considered credible for the purposes of the activity. As described above, the transfer of IMS between project vessels was already considered remote, given the offshore open ocean environment. Project vessels will be located in an offshore, open ocean environment, where IMS survival is implausible. Furthermore, this marine pest, once transferred, would need to survive on a new vessel that has good hygiene (i.e. has been through Woodside's risk assessment process), and survive the transport back from the Operational Area to shore. If it survived this trip, it would then need conditions conducive to establishing a viable population in nearshore waters to which the infected vessel travels.		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS [48]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Project vessels will manage their ballast water using one of the approved ballast water management options, as outlined in the Australian Ballast Water Management Requirements.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of transferring marine pests between project vessels within the Operational Area. No change in consequence would occur.	Controls based on legislative requirements under the *Biosecurity Act 2015* – must be adopted.	Yes **C 16.1**
Good Practice				
Woodside's IMS risk assessment process[49] will be applied to project vessels and immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels: • vessel type • recent IMS inspection and cleaning history, including for internal niches	F: Yes. CS: Minimal cost. Good practice implemented across all Woodside Operations.	Identifies potential risks and additional controls implemented accordingly. In doing so, the likelihood of transferring marine pests between project vessels and immersible equipment within the Operational Area is reduced. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	Yes **C 16.2**

[48] Qualitative measure

[49] Woodside's IMS risk assessment process was developed with regard to the national biofouling management guidelines for the petroleum production and exploration industry and guidelines for the control and management of a ships' biofouling to minimise the transfer of invasive aquatic species (IMO Guidelines, 2011).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS [48]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
• out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation • post-retrieval maintenance regime. Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk (such as treating internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS [48]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Do not discharge ballast water during the Petroleum Activities Program.	F: No. Ballast water discharges are critical for maintain vessel stability. Given the nature of the Petroleum Activities Program, the use of ballast (including the potential discharge of ballast water) is considered to be a safety-critical requirement. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Eliminate use of vessels including the seismic vessel and support vessel(s).	F. No. Given that vessels must be used to complete the Petroleum Activities Program, there is no feasible means to eliminate the source of risk. CS. Loss of the project.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Professional Judgement – Substitute				
Source project vessels based in Australia only.	F. Potentially. Limiting activities to only use local project vessels could potentially pose a significant risk in terms of the time and duration of sourcing a vessel, as well as the ability of the local vessel to perform the tasks. While the project will attempt to source support vessels locally, it is not always possible. Availability cannot always be guaranteed. There are limited project vessels based in Australian waters and sourcing Australian-based vessels only will cause increases in cost due to pressures of vessel availability. CS: Significant cost and schedule impacts due to supply restrictions.	Sourcing vessels from within Australia will reduce the likelihood of IMS introduction from outside Australian waters; however, it does not reduce the likelihood of introducing species native to Australia but alien to the Operational Area. It also does not prevent the translocation of IMS that have established elsewhere in Australia. Therefore, the consequence is unchanged.	Disproportionate. Sourcing vessels from Australian waters may result in a slight reduction in the likelihood of introducing IMS to the Operational Area, however it does not completely eliminate the risk. Furthermore, the potential cost of implementing this control could be high, given the potential supply issues associated with only locally sourcing vessels.	No
IMS inspection of all vessels	F: Yes CS. Significant cost and schedule impacts. In addition, Woodside's IMS risk assessment process is seen to be more cost-effective as this control allows Woodside to	Inspection of all vessels for IMS would reduce the likelihood of IMS being introduced to the Operational Area. However, this reduction is unlikely to be significant, given the other control measures	Disproportionate. The cost/sacrifice outweighs the benefit gained, as other controls that are proposed to be implemented	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS [48]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	manage the introduction of IMS through biofouling, while targeting efforts and resources to the areas of greatest concern.	implemented. No change in consequence would occur.	achieve ALARP position.	
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the risks and consequences of IMS introduction. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without disproportionate sacrifice, the risks and consequences are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, introduction of IMS to the Operational Area through ballast water or biofouling on vessels or in-water equipment represents a low residual risk that has a remote likelihood of resulting in a potential impact greater than minor and short term (one to two years) to a small proportion of the benthic community. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of introducing IMS to the Operational Area to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 16 No introduction and establishment of invasive marine species into the Operational Area as a result of the Petroleum Activities Program.	**C 16.1** Project vessels will manage their ballast water using one of the approved ballast water management options, as outlined in the Australian Ballast Water Management Requirements.	**PS 16.1** Project vessels will manage ballast water in accordance with Australian Ballast Water Management Requirements.	**MC 16.1.1** Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements.
	C 16.2 Woodside's IMS risk assessment process[50] will be applied to project vessels and immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels:	**PS 16.2.1** Before entering the Operational Area project vessels and immersible equipment are determined to be low risk[51] of introducing IMS of concern, and maintain this low risk status to mobilisation.	**MC 16.2.1** Records of IMS risk assessments maintained for all project vessels and relevant immersible equipment entering the Operational Area or IMS management area to undertake the Petroleum Activities Program.

[50] Woodside's IMS risk assessment process was developed with regard to the national biofouling management guidelines for the petroleum production and exploration industry and guidelines for the control and management of a ships' biofouling to minimise the transfer of invasive aquatic species (IMO Guidelines, 2011).

[51] Low risk of introducing IMS of concern is defined as either no additional management measures required or, management measures have been applied to reduce the risk.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	• vessel type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation • post-retrieval maintenance regime. Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk (such as treating internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.	**PS 16.2.2** In accordance with Woodside's IMS risk assessment process, the IMS risk assessments will be undertaken by an authorised environment adviser who has completed relevant Woodside IMS training or by qualified and experienced IMS inspector.	**MC 16.2.2** Records confirm that the IMS risk assessments undertaken by an Environment Adviser or IMS inspector (as relevant).

6.8 EPBC Act Assessment

6.8.1 Principles of ESD

For all impacts and risks assessed in **Section 6** an assessment was conducted to determine if the Petroleum Activities Program was consistent with relevant principles of ESD, as described in **Section 2.7.2**.

This assessment determined that the activity is consistent with principles of ESD a), b), c) and d). Principle e) ('improved valuation, pricing and incentive mechanisms should be promoted') is not relevant to the activity.

6.8.2 MNES Significant Impact Guidelines

As part of the evaluation of potential impacts and risks from routine acoustic emissions from seismic survey equipment (**Section 6.7**) an assessment was undertaken to determine if any relevant significant impact criteria for EPBC Act listed Endangered or Vulnerable species were met.

The activity will not result in any population level effects on any populations of listed Endangered or Vulnerable species, nor will it "modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline". Therefore, the Petroleum Activities Program will not have a significant impact on any MNES.

6.8.3 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 2.9.3,** NOPSEMA will not accept an EP that is inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community. This section describes the assessment that Woodside has undertaken to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans. For the purposes of this assessment, the relevant Part 13 statutory instruments (recovery plans and threat abatement plans) are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (DoEE, 2017a).
- Conservation Management Plan for the Blue Whale 2015–2025 (DoE, 2015a).
- Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 (DoE, 2014).
- Sawfish and River Shark Multispecies Recovery Plan (DoE, 2015b)
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (DoEE, 2018).

Table 6-19 lists the objectives and (where relevant) the action areas of these plans, and also describes whether these objectives/action areas are applicable to government, the Titleholder, and/or the Petroleum Activities Program. For those objectives/action areas applicable to the Petroleum Activities Program, the relevant actions of each plan have been identified, and an evaluation has been conducted as to whether impacts and risks resulting from the activity are clearly inconsistent with that action or not. The results of this assessment against relevant actions are presented in **Table 6-20** to **Table 6-24.**

Table 6-19: Identification of applicability of recovery plan and threat abatement plan objectives and action areas

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	Titleholder	Petroleum Activities Program
Marine Turtle Recovery Plan			
Long-term Recovery Objective: Minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so they can be removed from the EPBC Act threatened species list	Y	Y	Y
Interim Recovery Objectives			
Current levels of legal and management protection for marine turtle species are maintained or improved, both domestically and throughout the migratory range of Australia's marine turtles	Y		
The management of marine turtles is supported	Y		
Anthropogenic threats are demonstrably minimised	Y	Y	Y
Trends in nesting numbers at index beaches and population demographics at important foraging grounds are described	Y	Y	
Action Areas			
A. Assessing and addressing threats			
A1. Maintain and improve efficacy of legal and management protection	Y		
A2. Adaptively manage turtle stocks to reduce risk and build resilience to climate change and variability	Y		
A3. Reduce the impacts of marine debris	Y	Y	Y
A4. Minimise chemical and terrestrial discharge	Y	Y	Y
A5. Address international take within and outside Australia's jurisdiction	Y		
A6. Reduce impacts from terrestrial predation	Y		
A7. Reduce international and domestic fisheries bycatch	Y		
A8. Minimise light pollution	Y	Y	Y
A9. Address the impacts of coastal development/infrastructure and dredging and trawling	Y	Y	
A10. Maintain and improve sustainable Indigenous management of marine turtles	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	Titleholder	Petroleum Activities Program
B. Enabling and measuring recovery			
B1. Determine trends in index beaches	Y	Y	Y
B2. Understand population demographics at key foraging grounds	Y		
B3. Address information gaps to better facilitate the recovery of marine turtle stocks	Y	Y	Y
Blue Whale Conservation Management Plan			
Long-term recovery objective: Minimise anthropogenic threats to allow for their conservation status to improve so that they can be removed from the EPBC Act threatened species list	Y	Y	Y
Interim Recovery Objectives			
The conservation status of blue whale populations is assessed using efficient and robust methodology	Y		
The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described	Y	Y	Y
Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place	Y		
Anthropogenic threats are demonstrably minimised	Y	Y	Y
Action Areas			
A. Assessing and addressing threats			
A.1: Maintain and improve existing legal and management protection	Y		
A.2: Assessing and addressing anthropogenic noise	Y	Y	Y
A.3: Understanding impacts of climate variability and change	Y		
A.4: Minimising vessel collisions	Y	Y	Y
B. Enabling and Measuring Recovery			
B.1: Measuring and monitoring population recovery	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	Titleholder	Petroleum Activities Program
B.2: Investigating population structure	Y		
B.3: Describing spatial and temporal distribution and defining biologically important habitat	Y	Y	Y
Grey Nurse Shark Recovery Plan			
Overarching Objective			
To assist the recovery of the grey nurse shark in the wild, throughout its range in Australian waters, with a view to: • improving the population status, leading to future removal of the grey nurse shark from the threatened species list of the EPBC Act • ensuring that anthropogenic activities do not hinder the recovery of the grey nurse shark in the near future, or impact on the conservation status of the species in the future	Y	Y	Y
Specific Objectives			
Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters	Y		
Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
Where practicable, minimise the impact of shark control activities on the grey nurse shark	Y		
Investigate and manage the impact of ecotourism on the grey nurse shark	Y		
Manage the impact of aquarium collection on the grey nurse shark	Y		
Improve understanding of the threat of pollution and disease to the grey nurse shark	Y	Y	Y
Continue to identify and protect habitat critical to the survival of the grey nurse shark and reduce the impact of threatening processes within these areas	Y	Y	
Continue to develop and implement research programs to support the conservation of the grey nurse shark	Y	Y	
Promote community education and awareness in relation to grey nurse shark conservation and management	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	Titleholder	Petroleum Activities Program
Sawfish and River Sharks Recovery Plan			
Primary Objective			
To assist the recovery of sawfish and river sharks in Australian waters with a view to: • improving the population status leading to the removal of the sawfish and river shark species from the threatened species list of the EPBC Act • ensuring that anthropogenic activities do not hinder recovery in the near future, or impact on the conservation status of the species in the future	Y	Y	Y
Specific Objectives			
Reduce and, where possible, eliminate adverse impacts of commercial fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of recreational fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of Indigenous fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate the impact of illegal, unregulated and unreported fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	Y	Y	Y
Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species noting the linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life	Y	Y	Y
Reduce and, where possible, eliminate any adverse impacts of collection for public aquaria on sawfish and river shark species	Y		
Improve the information base to allow the development of a quantitative framework to assess the recovery of, and inform management options for, sawfish and river shark species	Y		
Develop research programs to assist conservation of sawfish and river shark species	Y	Y	
Improve community understanding and awareness in relation to sawfish and river shark conservation and management	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	Titleholder	Petroleum Activities Program
Marine Debris Threat Abatement Plan			
Objectives			
Contribute to long-term prevention of the incidence of marine debris	Y	Y	
Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations	Y	Y	Y
Remove existing marine debris	Y		
Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris	Y		
Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behaviour change	Y		

Table 6-20: Assessment against relevant actions of the Marine Turtle Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Marine Turtle Recovery Plan	**Action Area A3**: Reduce the impacts from marine debris	**Action**: Support the implementation of the Marine Debris Threat Abatement Plan (TAP) Priority actions at stock level: • G-NWS – understand the threat posed to this stock by marine debris • LH-WA – determine the extent to which marine debris is impacting loggerhead turtles • F-Pil and H-WA – no relevant actions	Refer Section **6.7.5** Not inconsistent assessment: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles.	**EPO 13** **C 13.1** **PS 13.1**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
	Action Area A4: Minimise chemical and terrestrial discharge	**Action**: Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs Priority actions at stock level: • G-NWS – ensure that spill risk strategies and response programs include management for turtles and their habitats • LH-WA, F-Pil – ensure that spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to slow to recover habitats, e.g. seagrass meadows or corals • H-WA – no relevant actions	Refer **Sections 6.7.2, 6.7.3** and **6.7.4** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to marine turtles. Spill risk strategies and response program include management measures for turtles and their nesting habitats.	Refer **Section 7.11**. Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D.**
	Action Area A8: Minimise light pollution	**Action**: Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats Priority actions at stock level: • G-NWS – as above • LH-WA – no relevant actions • F-Pil and H-WA – manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and emerging/dispersing hatchlings can continue	Refer **Section 6.6.6.** **Not inconsistent assessment**: The assessment of light emissions has considered the potential impacts to marine turtles. Internesting, mating, foraging or migrating turtles are not impacted by light from offshore vessels. Vessel light emissions could cause localised and temporary behavioural disturbance to isolated transient individuals, which is unlikely to result in displacement of adult turtles from internesting or nesting habitat critical to the survival of marine turtles.	N/A
	Action Area B1: Determine trends at index beaches	**Action**: Maintain or establish long-term monitoring programs at index beaches to collect	**Not inconsistent assessment**: Woodside contributes to Action Area B1 via its support of the Ningaloo Turtle Program[52].	N/A

[52] http://www.ningalooturtles.org.au/media_reports.html

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
		standardised data critical for determining stock trends, including data on hatchling production Priority actions at stock level: • G-NWS – continue long-term monitoring of index beaches • LH-WA – continue long-term monitoring of nesting and foraging populations • F-Pil and H-WA – no relevant actions		
	Action Area B3: Address information gaps to better facilitate the recovery of marine turtle stocks	**Action**: Understand the impacts of anthropogenic noise on marine turtle behaviour and biology Priority actions at stock level: • G-NWS – given this is a relatively accessible stock that is likely to be exposed to anthropogenic noise – Investigate the impacts of anthropogenic noise on turtle behaviour and biology and extrapolate findings from the North West Shelf stock to other stocks • LH-WA, F-Pil – no relevant actions • H-WA – investigate mixed stock genetics at foraging grounds	Refer **Sections 6.6 and 6.6.2** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts marine turtles. Vessel and seismic acoustic emissions could cause localised and short-term behavioural disturbance to isolated transient individuals, which is unlikely to result in displacement of adult turtles from internesting or nesting habitat critical to the survival of marine turtles.	N/A
Assessment Summary The Marine Turtle Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-21: Assessment against relevant actions of the Blue Whale Conservation Management Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Blue Whale Conservation Management Plan	**Action Area A.2**: Assessing and addressing anthropogenic noise	**Action 2**: Assessing the effect of anthropogenic noise on blue whale behaviour **Action 3**: Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to use the area without injury, and is not displaced from a foraging area	Refer **Section 6.6.2** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to pygmy blue whales. PTS or TTS effects to pygmy blue whales are not predicted to occur from exposure to a single impulse. However, as the activity is taking place within the distribution range for pygmy blue whales there is a possibility of encountering individual whales. If this occurs, the application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and extended observation and shut-down zones (Part B.4) will minimise the likelihood of PTS or TTS effects. Further to this seismic source discharge is not planned to occur within 25 km of the pygmy blue whale migration BIA (C 4.5) to conservatively account for the ANIMAT modelling predicted maximum range at which pygmy blue whales may experience TTS of 21.73 km. Additional adaptive management measures (Part B.6) are considered conservative and appropriate to provide protection to pygmy blue whales that may be exposed to multiple pulses at extended ranges from the source (i.e. extended visual observation zone). The use of a spotter vessel with qualified MFOs ~5 km ahead of the seismic vessel and towed array during all daytime seismic activity will effectively extend the implementation of the pygmy blue whale / large unidentified whale shut down zone via sightings triggered activation of EPBC Act Policy Statement 2.1. **C 4.4** provides for an	**EPO 4** **C 4.1, PS 4.1** **C 4.4, PS 4.4** **C 4.5, PS 4.5** **C 4.6, PS 4.6**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
			adaptive management process guiding night time seismic activities linked to the number of pygmy blue whale day time mitigation events. The impact assessment has determined that seismic acquisition may be undertaken in a manner that is not inconsistent with the requirements of the Conservation Management Plan for the Blue Whale. Acoustic modelling and ANIMAT modelling have demonstrated TTS effects will not occur in the pygmy blue whale migration BIA and sound levels will not result in displacement from foraging areas.	
		The BWCMP Guidance on Key Terms states 'In areas other than those identified in the CMP or NCVA (described in points (i) and (ii) above), where it can be reasonably predicted that blue whale foraging is probable, known or whale presence is detected, adaptive management should be used during industry activities to prevent unacceptable impacts i.e., no injury or biologically significant behavioural disturbance to blue whales from underwater anthropogenic noise.'	A revisit of the available telemetry data (Thums et al., 2022) has confirmed the track for the one individual pygmy blue whale that travelled to the west of the migration BIA in the peak northbound migratory season did partially overlap the eastern edge of the Operational Area and the south-east corner of the Active Source Area. The residual risk of no potential TTS effects does not change with the confirmation of a migrating pygmy blue whale that may have been opportunistically foraging in and in proximity to the Operational Area and Active Source Area. As a precautionary approach, an additional control (under the application of the EPBC Statement Policy 2.1, Part B.3) will be implemented during all day time seismic activity comprising a spotter vessel (with two MFOs onboard) ~5 km ahead of the seismic vessel to observe for pygmy blue whales. MFOs aboard the spotter vessel will implement mitigations as per C 4.1. This is in addition to the suite of control measures including a shut-down zone to limits of visibility	**EPO 4** **C 4.1, PS 4.1** **C 4.4, PS 4.4** **C 4.5, PS 4.5** **C 4.6, PS 4.6**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
			for positively identified (certain or probable confidence level) pygmy blue whales or large unidentified whales, and 2 km for all whales, which reduces the potential for close range sound exposures where the greatest sound contribution is received. This will ensure the activity is not inconsistent with the BWCMP (Action 2&3): *Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area*	
	Action Area A.4: Minimising vessel collisions	**Action 3**: Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented	Refer **Section 6.7.6.** **Not inconsistent assessment**: The assessment of vessel collision with marine fauna has considered the potential risks to pygmy blue whales. If the Petroleum Activities Program overlaps with the northbound or southbound migration, individuals may deviate slightly from the migratory route, but will continue on their migration unhindered. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the very slow vessel speeds and presence of MFOs.	**EPO 14** **C 14.1** **PS 14.1.1**
	Action Area B.3: Describing spatial and temporal distribution and defining biologically important habitat	**Action 2**: Identify migratory pathways between breeding and feeding grounds **Action 3**: Assess timing and residency within Biologically Important Areas	**Not inconsistent assessment**: Woodside contributes to Action Area B3 via its support of targeted research initiatives (e.g. satellite tracking of pygmy blue whale migratory movements[53]).	N/A

[53] Double, M.C., Andrews-Goff, V., Jenner, K.C.S., Jenner, M.-N., Laverick, S.M., Branch, T.A., Gales, N.J., 2014. Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PloS One 9, e93578

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Assessment Summary The Blue Whale Conservation Management Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-22: Assessment against relevant actions of the Sawfish and River Shark Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Sawfish and River Shark Recovery Plan	**Objective 5**: Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	**Action 5c**: Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks	Refer **Sections 6.7.2, 6.7.3** and **6.7.4** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to sawfish and river shark.	Refer **Section 7.11**. Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**.
	Objective 6: Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species	**Action 6a**: Assess the impacts of marine debris including ghost nets, fishing gear and plastics on sawfish and river shark species	Refer **Section 6.7.5.** **Not inconsistent assessment:** The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish and river sharks.	**EPO 13** **C 13.1** **PS 13.1**
Assessment Summary				

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
The Sawfish and River Shark Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-23: Assessment against relevant actions of the Grey Nurse Shark Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Grey Nurse Shark Recovery Plan	**Objective 7:** Improve understanding of the threat of pollution and disease to the grey nurse shark	**Action 7.1:** Review and assess the potential threat of introduced species, pathogens and pollutants	Refer **Sections 6.7.5** and **6.6.5**. **Not inconsistent assessment:** This EP includes an assessment of the impacts from accidental release of solid wastes as well as planned discharges of drilling waste on marine species.	**N/A**
			Refer **Sections 6.7.2**, **6.7.3** and **6.7.4**. **Not inconsistent assessment:** The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to grey nurse sharks**.**	Refer **Section 7.11**. Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**.
Assessment Summary The Grey Nurse Shark Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-24: Assessment against relevant actions of the Marine Debris Threat Abatement Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Marine Debris TAP	**Objective 1:** Contribute to long-term prevention of marine debris.	**Action 1.02**: Limit the amount of single use plastic material lost to the environment in Australia.	Refer **Section 6.7.5**. **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to vertebrate wildlife.	**EPO 13** **C 13.1** **PS 13.1**
Assessment Summary The Marine Debris TAP has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

6.9 Cultural Features and Heritage Values Assessment

As described in **Section 4**, the identification of cultural values associated with cultural heritage as well as the social, economic and cultural features important to First Nation's people is integral to understanding the environment and any potential impacts and risks to the environment.

In line with Woodside's First Nations Communities Policy (Woodside 2022), Woodside seeks to avoid damage or disturbance to cultural heritage (including intangible heritage) and, if avoidance is not possible, minimise and mitigate the impacts, in consultation with First Nation communities and Traditional Custodians. Mitigation can include any measure or control aimed at ensuring the viability of the intangible cultural heritage and its intergenerational transmission. This can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013).

It is important to note that not all topics raised by First Nations groups / individuals through consultation are considered values for the purpose of the cultural features and heritage values impact assessment below. A number of topics were raised as a general interest in environmental management and ecosystem health, where the group/individual was seeking further information about potential impacts and risks from the Petroleum Activities Program on the receptor. As these interests relate to the maintenance of the natural environment, these are adequately addressed through impact and risk assessments described in Sections 6.6 and 6.7 respectively and not further assessed below.

Aspect	Cultural Features and Heritage Values
Description of source impact/ risk	The physical presence of the project vessels and associated movements in the Operational Area, as well as routine acoustic emissions (particularly from the acoustic source array), have the potential to impact or be a risk to cultural features and heritage values. **Project Vessels** The Petroleum Activities Program includes up to four vessels – seismic, support, chase, and spotter vessel – within the Operational Area. These vessels will move within the Operational Area while undertaking the survey. The planned duration of the survey is up to 80 days. Project vessels (seismic vessel and support vessel(s)) will be present in the Operational Area for the duration of the Petroleum Activities Program. This presence in the area will result in a navigational hazard for other marine users within the immediate area of the vessel. A volume of 250 m^3 of marine diesel is considered an appropriate worst-case hydrocarbon release (based on the largest volume of a single fuel tank on project vessels) and forms the basis of the EMBA (refer to **Sections 4.1** and **6.7.2**). **Acoustic Emissions** The Petroleum Activities Program will use a seismic source, consisting of an airgun array with a maximum capacity of up to 3150 in^3, towed at a water depth of 6–8 m (±1 m). The source will be used to generate acoustic pulses by periodically discharging compressed air into the water column, at intervals of about five to six seconds as the vessel transits along planned survey lines within the Active Source Area. These pulses are used to survey geological features below the seabed by detecting the energy reflected by geological features using an array of towed hydrophones.

Planned Activities

The potential environmental impact to species that have a cultural feature or heritage value have been summarised below to provide the context of a potential impact significance level to those species to understand any cumulative impact on the cultural feature or heritage value.

Aspect	Impact Consequence		
Environmental impact assessment to marine species	Marine mammals	Marine reptiles	Fish
6.6.2 Routine acoustic emissions: seismic survey equipment	Slight (E)	Slight (E)	Negligible (F)
6.6.3 Routine acoustic emissions: project vessels	Negligible (F)	Negligible (F)	Negligible (F)
6.6.6 Routine light emissions: external lighting on project vessels	N/A	Negligible (F)	Negligible (F)

Unplanned Activities

The potential environmental risk to species that have a cultural feature or heritage value have been summarised below to provide the context of a potential impact significance level to those species to understand any cumulative impact on the cultural feature or heritage value

Aspect	Risk Rating		
Environmental risk assessment to marine species	Marine mammals	Marine reptiles	Fish
6.7.2 Unplanned hydrocarbon release: vessel collision	Moderate	Moderate	Low
6.7.3 Unplanned hydrocarbon release: bunkering	Low	Low	Low
6.7.5 Unplanned discharge: loss of solid hazardous and non-hazardous waste	Low	Low	Low
6.7.6 Physical presence: vessel collision / entanglement with marine fauna	Low	Low	N/A

Impact and Risk Assessment

The Petroleum Activities Program has the potential to impact cultural features and heritage values through the following ways:

- Intangible cultural heritage:
  - Songlines: Songlines can become lost, fragmented, or broken when there is a loss of Country or forced removal from Country (Neale and Kelly 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. It is noted that oil and gas infrastructure exists in many areas of the North West Shelf, and that songlines are still acknowledged and recognised. It is inferred that if there were to be any impacts to surviving songlines these would be significantly more likely to be described as qualitative (i.e. “weaken” a songline) rather than binary or absolute (i.e. destroy a songline).
  - Creation/dreaming sites; sacred sites; ancestral beings: Activities that physically alter landscape features may be assumed to potentially impact values of creation/dreaming sites, sacred sites or ancestral beings.
  - Cultural obligations to care for Country: Environmental impacts may be assumed to impact rights and obligations to care for Sea Country. Exclusion of Traditional Custodians from Sea Country (e.g., by restricting access) or decision-making processes (e.g. by not conducting ongoing consultation) are other potential sources of impact.

- Knowledge of Country/customary law and transfer of knowledge: Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population. Therefore, the transmission of these skills is expected to be impacted where there are impacts at the species/population level. Limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge.
- Connection to Country: Where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge this may damage connection to Country (McDonald and Phillips, 2021).
- Access to Country: Impacts to access to Country may be classified as temporary (e.g. where exclusion zones exist around activities for safety reasons) or permanent (e.g. where infrastructure obstructs access or navigation). Impacts to access to Country can only occur in areas that were traditionally accessed by Traditional Custodians. As described in Section 4.10.1.5 this is anticipated to be focussed on areas adjacent to the coast.
- Kinship systems and totemic species: It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu 2004). It is therefore inferred that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals.
- Resource collection: Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level.

- Marine ecosystems and species:
  - Marine ecosystems may hold both cultural and environmental value (see **Section 4.10.1**), with cultural and environmental values intrinsically linked (DCCEEW 2023, MAC 2021 as cited in Woodside 2023). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural features where the impact is detectable within Sea Country—the seascape which Traditional Custodians view, interact with or hold knowledge of.

Intangible values

Songlines

Management of intangible cultural heritage can include reducing impacts and risks to tangible features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013). Impacts to marine plants, animals and other cultural features associated with songlines might impact the intergenerational transmission of knowledge of songlines when individuals can no longer witness or interact with the cultural features tied to songlines on Country. Therefore, managing songlines may require environmental controls to minimise potential impact to marine fauna at a population level, including migratory routes. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section **6.6** and **6.7** respectively.

Physical features comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. Songlines can become lost, fragmented, or broken when there is a loss of Country or impact to culturally important physical features (Neale and Kelly 2020:30). No specific details of songlines within the EMBA have been provided by relevant persons during consultation for this Activity, and no landforms typical of songlines (e.g. rocks, mountains, rivers, caves and hills (Higgins 2021:724)) are anticipated to be impacted by the Activity.

In publicly available literature, Murujuga is acknowledged a starting point for songlines, including the flying fox songline (MAC 2023a). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources, but it is stated that "the sea is a source of creation for flying foxes" (DEC 2013). Although this does not provide the specificity required to determine the location of the flying fox songline or associated sites, Murujuga is located outside of the EMBA. Ethnographic survey (**Section 4.10.1.5**) also noted that "Dreamtime narratives… that commence at Murujuga and may also arrive from the sea including the… Bat (Flying Fox)" (McDonald and Phillips 2021). Although this does not provide the specificity required to determine the location of the flying fox songline or associated sites, Murujuga is located outside of the EMBA. The ethnographic survey did not identify any sites within the EMBA related to songlines, or make recommendations that any mitigations were required to manage songlines. Consultation with MAC and other Traditional custodians has not identified the flying fox songline as overlapping the EMBA, and flying foxes do not occur within the EMBA.

In publicly available literature, Murujuga is acknowledged a starting point for songlines, including the seven sisters songline (Bainger 2021). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources, however Murujuga is located outside of the EMBA. Ethnographic survey (**Section 4.10.1.5**) also noted that "a number of Dreamtime narratives… extend from the waters around Murujuga on to country, including the *KurriKurri* (Seven Sisters)" (McDonald and Phillips 2021). The seven sisters story is associated with Whitnell [sic] Bay, Murujuga, Depuch Island and Port Hedland, all being outside of the EMBA (McDonald and Phillips 2021). The ethnographic survey did not identify any sites within the EMBA related to songlines, or make recommendations that any mitigations were required to manage songlines. Consultation with MAC and other Traditional custodians has not identified the seven sisters songline as overlapping the EMBA.

The existence of a whale songline potentially intersecting the EMBA has also been asserted by members of Save Our Songlines. Consultation with this group and associated individuals has not provided detail on the presence, features or route of this songline. It is assumed that whales as an environmental receptor are a feature of this songline; the environmental management of whale populations—including from noise—are described in **Sections 6.6** and **6.7**). The most detailed description available to Woodside is asserted in the Concise Statement and Affidavit filed by [redacted] in the context of Scarborough seismic activities. Specifically, "whales carry important songlines, the whale dreaming, and connection between land and sea." Specific details regarding the whale dreaming story are provided in Table 4-20. In summary the whale dreaming story relates to transmission of knowledge and connection between environment and people, the women's lore and connection to whales through their heart centre and obligation to care for country. It is stated that "because each animal uses songlines for migration, breeding and feeding, the disruption or distortion to the songlines causes the animals to become disoriented, confused or lost." Further, that the whale's songline creates a path for other fauna to follow.

It is therefore expected that the whale songline has the potential to be affected by the Petroleum Activities Program where there are impacts to whales at a population level, including disruption of migration routes, permanent displacement of whales and population decline, that result in discontinuation of story/transmission of knowledge, interruption of caring for Country activities, interruption of whale caretaker/midwife behaviour and interruption to performance of song/ceremony onshore. Given potential impacts to whales—including from noise impacts--are limited to behavioural disturbance to transient individuals, which are not considered to be ecologically significant at a population level, the whale songline and associated whale dreaming story is not anticipated to be affected by the Petroleum Activities Program. Note further assessment of intangible values and marine mammals are provided below.

Creation/dreaming sites; sacred sites; ancestral beings

Woodside has undertaken all reasonable steps to identify creation and dreaming sites, sacred sites, and places associated with ancestral beings within the EMBA. No such sites have been identified. A review of relevant literature has been undertaken which has identified creation, dreaming and ancestral narratives related to the sea more broadly without confirming where (if anywhere) these overlap the EMBA. These references are of a general nature, and do not identify any features or values requiring specific protection or management from the proposed activities.

Sea serpents or water serpents are common in Aboriginal creation narratives, and several references were identified in the reviewed literature. The majority of these refer to serpents residing within inland rivers or pools outside of the EMBA (Barber and Jackson 2011, Hayes v Western Australia [2008] FCA 1487, Juluwarlu 2004, Water Corporation 2019). In some versions, the serpent originates from the sea or coast and creates the rivers as it heads inland. The current coastline and past coastlines at various points along the Ancient Landscape—where the Serpent would have emerged onto the land—are all outside of the EMBA. Areas of the broader ocean where the serpent may have originally lived are not specified. Barber and Jackson (2011) also recount a story where a freshwater serpent pushes a sea serpent back into the ocean where it presumably continues to reside. This does not provide the specificity required to determine the location of sea serpents within the sea, and it is possible that the ocean as a whole (out to and beyond other continents) should be viewed generally as housing the sea serpent(s). Consultation with Traditional Custodians and ethnographic surveys have not identified activities of this Petroleum Activities Program as having an impact on sea serpents. However, by analogy to other water serpent narratives across Australia, possible impact pathways may include interruption of its path by blocking or reducing flows of water, damaging sacred sites such as thalu or rock art sites or depleting water sources.

No impacts to water flows (either tidal movement or ocean currents) or depletion of water sources are anticipated from this Petroleum Activities Program. The EMBA does not overlap the Ancient Landscape where thalu or rock art sites may exist.

Cultural obligations to care for Country

Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. Lack of access to coastally located cultural sites that carry songlines or remain ceremonially important can impact First Nations people's livelihoods and impact their ability to carry out cultural obligations on Country. The EMBA does not interact with coastal sites and no impacts to coastal sites of significance are anticipated.

No cultural activities to care for Country which are performed within the EMBA were identified.

Knowledge of Country/customary law and transfer of knowledge

Cultural knowledge about Sea Country/customary law and the intergenerational transmission of knowledge are important values identified through consultation, assessments and the literature review. Transfer of knowledge includes continuing traditional practices to pass on practical skills. No traditional practices conducted within the EMBA have been identified.

Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population—for example traditional fishing methods require the survival of traditional fish resources. Therefore, ensuring the transmission of cultural knowledge may require environmental controls protecting species and migratory pathways at a population level. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section **6.6** and **6.7** respectively.

Connection to Country

Connection to Country describes the multi-faceted relationship between First Nations people and the landscape, which is envisioned as having personhood and spirit. No impacts to connection to country are anticipated as a result of exclusion or displacement of Aboriginal communities. Access to Country is discussed below.

Access to Country

Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Access is also a value in its own right, as a continuation of traditional Sea Country access and use.

Access to areas within the Operational Area may be limited where exclusion zones are established around vessels for safety purposes. The Operational Area is located approximately 188 km from the closest landfall at North West Cape and no traditional activities within the Operational Area have been identified. Further the exclusion zones around seismic activities are temporary. Access to Country within the EMBA is also not expected to be affected in the highly unlikely event of a marine diesel spill given the closest boundary is 40 km from shore. However relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I.

Kinship systems and totemic species

Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). These relationships are understood to impose obligations on Traditional Custodians. It is understood that these obligations do not impose restrictions on other people generally, but it is considered that impacts to species at a population level may inhibit Traditional Custodians with kinship relationships' ability to perform their obligations where this results in reduced or displaced populations. It is therefore considered that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. As such, impacts to individual marine fauna is not expected to impact on the totemic or kinship cultural connection. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section **6.6** and **6.7** respectively.

Resource collection

A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these communities may be impacted where there is an impact at the species/population level. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section **6.6** and **6.7** respectively.

Further, the closest boundary of the Operational Area is approximately 188 km from the closest landfall at North West Cape, while the closest boundary of the EMBA is about 40 km from closest landfall with no shoreline contact. Impacts to potential resources within the EMBA are described and risk assessed in **Section 6.7.2**. Further relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I.

Marine Species

Marine mammals

There are increase ceremonies / rituals for species of animals and plants, important to First Nations, to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. All mentions of active ceremonial sites were confined to onshore locations, though the values may extend offshore where, for example, the thalu relates to marine species populations. As thalu ceremonies are performed to maintain and increase populations of marine species, it is considered that management applies at the species/population level and not to individuals—for example the thalu site on Murujuga which "brings in whales to beach" will continue to serve its purpose so long as whales continue to migrate through Mermaid Sound. Reviewed literature (DBCA 2020) also includes information that is marked as information that cannot be copied, reproduced or used without consent. The values described in the literature are environmental in nature and apply to marine mammal behaviours at a population level, and are managed through existing environmental controls in Section 6.6 and 6.7.

Related intangible cultural heritage may include the transmission of cultural knowledge about whales and whale behaviour, including birthing areas, whale communication and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). First Nations groups, have expressed interest about whale migratory routes and studies. Inter-generational transmission of cultural knowledge (including songlines) relating to marine mammals may be impacted where changes to population or behaviour at a population level results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

As described in the relevant environmental impact and risk assessments in **Sections 6.6** and **6.7** respectively, potential impacts to cetaceans from planned activities are restricted to temporary behavioural disturbance (avoidance) to transient individuals, with underwater noise from the acoustic source array the greatest source of impact. Thee impacts and risks are not considered to be ecologically significant at a population level, and hence not expected to impact the value of marine mammals, including the transmission of cultural knowledge. The Operational Area does not overlap any BIAs, with the closest migratory BIA for pygmy blue whales ~14 km distance away. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

Marine reptiles

Turtles and their eggs have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level.

Intangible cultural heritage may also include the transmission of cultural knowledge about marine reptiles, such as nesting areas, hunting areas and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). First Nations groups have expressed an interest regarding turtle monitoring programs and migration patterns. Activities that impact turtle populations and their marine environment may have an indirect impact on some Aboriginal communities as this can limit access to cultural sites or deplete hunting areas that would threaten local food security (Delisle et al. 2018:251). Inter-generational transmission of cultural knowledge (including Songlines) relating to marine reptiles may be impacted where changes to population or behaviour results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003).

As described in the relevant environmental impact and risk assessments in **Sections 6.6** and **6.7** respectively, potential impacts to marine reptiles are likely to be restricted to temporary behavioural changes to transient turtles, which are not considered to be ecologically significant at a population

level. The Operational Area and EMBA do not overlap any marine turtle BIAs. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

Fish

Fish have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level.

During consultation fish were identified as important agents in the management of the broader ecosystem in Mermaid Sound, which is outside of the EMBA, but is assumed to also apply general to marine environments Inter-generational transmission of cultural knowledge relating to fish may be impacted where changes to population or behaviour results in reduced sightings (e.g. through population decline). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). Intangible cultural heritage associated with fish, including inter-generational knowledge regarding fishing techniques and migratory patterns, can be managing by reducing impacts to fish in nearshore marine environments to which this cultural knowledge is intrinsically connected.

As described in the relevant environmental impact and risk assessments in **Sections 6.6** and **6.7** respectively, the potential impacts of noise emissions from the seismic source on fish, sharks and rays during the acquisition are considered to be localised and of no lasting effect, and restricted to temporary behavioural changes (avoidance) in any isolated individuals that may transit the area in close proximity to the operating seismic source. with, potential impacts not considered to be ecologically significant at a population level. The Operational Area and EMBA do not overlap any whale shark BIAs. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained.

Conclusion

The impact and risk assessment for cultural features and heritage values has determined that the planned activities are unlikely to result in an impact greater than negligible (F) and unplanned activities are assessed to have a residual risk rating of moderate (or lower).Woodside will continue to consider new heritage information as it becomes available (See C 17.1).

ALARP Demonstration	Control considered	Feasibility (F) & Cost/ Sacrifice (Cs)	Benefit in Impact/Risk Reduction	Proportionality	Adopted
	Establish and maintain a publicly available website to include both: • an interactive map which provides persons with updated information on activities being conducted as part of the Petroleum Activities Program, including location of seismic vessel and • cetaceans and marine turtle observations	F: Yes CS: Minimal	A publicly available website will allow transparency of the activity for other marine users including First Nations. The interactive map provides additional/ alternate method for marine users to obtain information on the timing of activities, thereby reducing the likelihood of interference with other marine users. The data logs of marine fauna observations will provide demonstrations of potential interactions with marine fauna, including whales and turtles.	Benefits outweigh cost/sacrifice.	Yes **C 1.6**
	Apply a 'living heritage[54]' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural knowledges across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community.	F: Yes CS: Minimal	Implementation of the 'living heritage' approach pays acknowledgement and respect to Traditional Custodian communities. It supports the transfer of cultural knowledges and is an effective strategy to manage intangible cultural values.	Benefits outweigh cost/ sacrifice.	Yes **C 18.2**
	Implement a program, which is compliant with Corporate Woodside Policies Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities Program.	F: Yes CS: Substantial costs	Implementation of this program is anticipated to allow Woodside to improve their understanding of potential cultural values and Heritage in the Operational Area and or EMBA and then develop avoidance or mitigation strategies in collaboration with Traditional Custodians if	Benefits outweigh cost/ sacrifice	Yes **C 17.1**

[54] Living heritage supports community and individual identity. Intangible cultural heritage is 'living heritage' that is inherited from ancestors and passed on to their descendants. It is comprised of many influences, including oral traditions, art, social practices, rituals and ceremonies, cultural knowledge and practices. It is transmitted from generation to generation, and evolves in response to the environment. Woodside applies a 'living heritage' approach to its cultural heritage management. This includes ensuring that Traditional Custodians are given voice to identify interests, transmit information and express concerns. Woodside works with Traditional Custodians to support and follow appropriate cultural protocols, including calling to Country, conducting smoking ceremonies (in areas where this custom is appropriate) and undertaking cultural awareness.

			impacts to cultural values are identified.		
	The environmental impacts and risks of the activity will continue to be managed to as low as reasonably practicable and an acceptable level for cultural features and heritage values.	F: Yes CS: Substantial costs	Implementation of activities and associated controls to ALARP and acceptable levels supports the maintenance of cultural features and heritage values	Benefits outweigh cost/ sacrifice	Yes **C 18.1**
	Use of cultural heritage monitors on vessels to oversee implementation of controls protecting cultural values	F: No CS: Not *feasible	Cultural heritage monitors are used in some contexts to observe tangible heritage as it is disturbed. On vessel cultural heritage monitors would have access to areas normally subject to exclusion zones and can shape the management of cultural features and heritage values in real time. The nature of the activity is such that cultural heritage monitors would not be able to inspect tangible heritage as no material is brought to the water surface and there is no planned disturbance to the seabed. Additionally, the Operational Area is located beyond the Ancient Landscape and, as a result, no tangible First Nations heritage is expected to exist in the Operational Area. Within the Operational Area given the distance offshore it is likely not possible to reach agreement on which First Nations groups should be represented on vessels.	Not considered – control not feasible.	No
	Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural	F: Yes CS: Minimal	Ensures workforce as suitably aware of cultural features and heritage values in the area they are operating.	Benefits outweigh cost/ sacrifice.	Yes **C 19.1**

	features and heritage values, including tangible and intangible cultural heritage.				
	Application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and Part B.4 to whales, as outlined below: • observation zone: - 3 km+ to the limits of visibility for large unidentified whales - 2 km to 3 km for all other whales • shut-down zone: - to limits of visibility for positively identified (certain or probable confidence level) pygmy blue whales / humpback whale or large unidentified whales; - 2 km for all whales • observation and compliance reporting: - Use of vessel crew to supplement dedicated MFOs in marine fauna observations and monitoring compliance to Policy Statement 2.1. - Records kept of marine fauna observations during all surveys. • pre start-up visual observation (30 minutes) • soft start procedure (30 minutes) • start-up delay procedure (if sighting occurs) • operations procedure • stop work procedure • night-time and low visibility procedure.	F: Yes. CS: Extending the shut-down zones may result in additional shut-downs potentially resulting in extending the survey and additional costs	Reduces the likelihood of individual whales being within proximity of the acoustic source where TTS could occur and eliminates the potential for PTS. As the activity is taking place within the distribution range for pygmy blue whales where there is a lower possibility of encountering individual whales as compared to the migration BIA (Thums et al., 2022). If this occurs, the application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and extended observation and shutdown zones (Part B.4) will minimise the likelihood of TTS effects. The extension of the shutdown zone to the limits of visibility for humpback whales is not considered necessary to reduce impacts and risks to ALARP and Acceptable levels. However, Woodside has adopted this control as a further precautionary measure. Therefore, the implementation of this control can potentially reduce the underwater noise and reduces the likelihood of impact or influence on whale activity. Where this control prevents impacts to whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained).	Benefits outweigh cost/ sacrifice.	**C 4.1**

	Record sightings of marine turtles during the activities	F: Yes CS: Minimal	Collecting data on marine turtle presence may assist in increasing understanding of their activity in the Operational Area and supports the implementation of C 1.6.	Benefits outweigh cost/sacrifice.	Yes C 19.2
	Application of a 500 m observation zone and a 100 m shutdown zone for turtles.	F: Yes CS: Increased costs of the survey during no seismic operations, prolonging the survey duration. Any delays to the seismic program could result in significant cost and operational implications.	The implementation of this control can reduce the likelihood of impact or influence on turtle activity. Where this control prevents impacts to turtles at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained).	Benefits outweigh cost/sacrifice.	Yes C19.3
	EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[55]: • Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean shows signs of being disturbed,	F: Yes CS: Minimal	Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater noise footprint of a vessel and reduces the likelihood of impact or influence on whale activity. Where this control prevents impacts to whales at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained).	Benefits outweigh cost/sacrifice.	Yes C14.1

[55] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

	project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots.				
	Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[56]	F: Yes CS: Minimal	Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater noise footprint of a vessel and reduces the likelihood of impact or influence on whale shark activity. Where this control prevents impacts to whale sharks at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained).	Benefits outweigh cost/sacrifice.	Yes C 3.5
	Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots.	F: Yes CS: Minimal	Implementation of controls for reduced vessel speed around marine fauna can potentially reduce the underwater noise footprint of a vessel and reduces the likelihood of impact or influence on turtle activity. Where this control prevents impacts to turtles at a population level, it maintains a culturally significant resource to a level that results in no observable change to coastal communities (migratory pathways maintained).	Benefits outweigh cost/sacrifice.	Yes C 3.6
	Should it be identified that relevant cultural authorities may be affected in the unlikely event of a spill, Woodside will engage with those parties as appropriate and in alignment with the OSPRMA.	F: Yes CS: Minimal	Engaging with relevant cultural authorities that may be impacted by a spill will allow the Traditional Custodians to identify areas of concern.	Benefits outweigh cost/sacrifice	Yes Adopted, see Appendix I

[56] For safety reasons, the distance requirements are not applied for a vessel holding station or with limited manoeuvrability e.g. lifting, loading, back-loading, bunkering, close standby cover for overside working and emergency situations

As marine ecosystems may hold both cultural and environmental value (see Section 4.9.1), with cultural and environmental values intrinsically linked, in addition to the above controls, the controls in section 6.7 and 6.8 will reduce impacts to cultural features and heritage values.

ALARP Statement	On the basis of the impact and risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, Section 2.3.3), Woodside considers the adopted controls appropriate to manage the potential impacts and risks to cultural features and heritage values. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP.
Acceptability Statement	The impact and risk assessment has determined that, given the adopted controls, planned activities are unlikely to result in an impact greater than negligible (F)[57] and unplanned activities are assessed to have a residual risk rating of moderate (or lower). The Petroleum Activities Program and the EMBA do not overlap the Ancient Landscape and they do not have a significant impact on MNES including marine fauna with a First Nations connection with, or traditional use in nearshore areas as defined in Section 4.10.1. Woodside has engaged with Traditional Custodians adjacent to the EMBA to understand the cultural features and heritage values that may occur and potential impacts from the activity. Additional controls considered and adopted, to minimise impacts to whales and associated songlines and turtles (C 4.1 and C 19.3) have been discussed with the relevant persons who have raised the value. The Program of Ongoing Engagement with Traditional Custodians (EPO 17 and C 17.1) and 'living heritage' management approach (C 18.2) have been developed to enable Woodside to manage cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians. Further opportunities to reduce the impacts have been investigated above. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks to cultural features and heritage values to a level that is acceptable if ALARP.

Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[58]			
EPO	***Adopted Control(s)***	***EPS***	***MC***
EPO 17 Woodside will actively support Traditional Custodians' capacity for ongoing engagement and consultation on environment plans for the purpose of avoiding impacts to cultural heritage values **EPO 18** New cultural values identified through the	**C 1.6** Establish and maintain a publicly available website to include both: • an interactive map which provides persons with updated information on activities being conducted as part of the Petroleum Activities Program, including location of seismic vessel and • cetaceans and marine turtle observations	**PS 1.6a** Refer to **Section 6.6.1**	**MC 1.6.1** Refer to **Section 6.6.1**
		PS 1.6b Refer to **Section 6.6.1**	**MC 1.6.2** Refer to **Section 6.6.1**

[57] Noting that as the receptor sensitivity is high the impact significance level is Slight (E).

[58] As marine ecosystems may hold both cultural and environmental value (see **Section 4.10.1**), with cultural and environmental values intrinsically linked, in addition to the specific controls for cultural features and heritage values, the controls and performance standards in section 6.7 and 6.8 will reduce impacts to cultural features and heritage values.

Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[58]			
EPO	***Adopted Control(s)***	***EPS***	***MC***
Program and supporting studies (**EPO 17**) will be managed to ALARP and an Acceptable level of impact. **EPO 19** No impact to cultural features and heritage values, as stated in Table 4-21, greater than a consequence level of F[59] from the Petroleum Activities Program. **EPO 4** Undertake seismic acquisition in a manner that prevents injury to whales, and minimises the potential for biologically significant behavioural disturbance **EPO 5** Limit underwater sound production from the seismic source to the area defined and assessed in this EP. **EPO 6** Undertake seismic acquisition in a manner that reduces potential cumulative impacts resulting from the Petroleum Activities Programme and other seismic survey operations as far as reasonably practicable. **EPO 14** No vessel strikes with marine fauna (whales, whale sharks and turtles) during the	**C 17.1** Implement a program, which is compliant with Corporate Woodside Policies Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities Program.	**PS 17.1.1** Implement a program, which is compliant with Corporate Woodside Policies, Strategies and procedures, to undertake ongoing consultation with Traditional Custodians whose functions, interests and activities may be affected by the Petroleum Activities program. The Program may include, as agreed with relevant Traditional Custodians: • Social investment to support First Nations ranger programs • Support for First Nations oil spill response capabilities • Support for recording Sea Country values • Support to Traditional Custodian groups to build capabilities and capacity with respect to ability to engage with Woodside and the broader O&G industry on activities • Development of ongoing relationships with Traditional Custodian groups • Any other initiatives proposed for the purpose of protecting Country including cultural values	**MC 17.1.1** Records demonstrate discussions with relevant Traditional Custodian Groups on proposed partnerships and/ or initiatives initiated by Woodside, and responses to feedback provided by Woodside within 4 weeks. **MC 17.1.2** Progress on the Program will be reported in line with annual sustainability reporting via the Woodside website.
		PS 17.2.1 Undertake an annual review of the program to determine its effectiveness and adapt the program accordingly. The annual review will also include an assessment of appropriateness of the methods used to undertake ongoing	**MC 17.2.1** Records demonstrate an annual review of the program has been undertaken.

[59] Defined as F – Negligible, no lasting effect (< 1 month) Localised impact not significant to areas /items of cultural significance

Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[58]			
EPO	***Adopted Control(s)***	***EPS***	***MC***
Petroleum Activities Program.		consultation with Traditional Custodians.	
	C 18.1 The environmental impacts and risks of the activity will continue to be managed to as low as reasonably practicable and an acceptable level for cultural values or features.	**PS 18.1.1** Consideration of cultural values / new information, through the life of the EP, and the development of avoidance or mitigation strategies in collaboration with Traditional Custodians if impacts to cultural values are identified. Where avoidance is not possible, impact minimisation will be prioritised and demonstrated through a written options analysis / ALARP to ensure an acceptable level of impact. This will be documented through Woodside's Management of Change and Management of Knowledge processes.	**MC 18.1.1** Records demonstrate Change Management and Management of Knowledge processes have been followed where new controls or management measures identified
	C 18.2 Apply a 'living heritage' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural knowledges across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community.	**PS 18.2.1** Woodside will continue to give voice to Traditional Custodians to identify interests, transmit information and express concern through Woodside's program as per PS 17.1.1.	**MC 17.1.1** Refer above
		PS 18.2.2 Woodside will assess and where deemed practicable will implement appropriate cultural protocols where requested by Traditional Custodians	**MC 18.2.2** Records demonstrate Woodside implemented cultural protocols as requested through PS 4.9.1.

	C 4.1
	Application of EPBC Policy Statement 2.1 Part A Standard Management Procedures and Part B.4 to whales, as outlined below:
	• observation zone:
	  - 3 km+ to the limits of visibility for large unidentified whales
	  - 2 km to 3 km for all other whales
	• shut-down zone:
		PS 4.1
		Refer to **Section 6.6.2**
			MC 4.1.1
			Refer to **Section 6.6.2**

Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[58]			
EPO	***Adopted Control(s)***	***EPS***	***MC***
	- to limits of visibility for positively identified (certain or probable confidence level) pygmy blue whales, humpback or large unidentified whales; - 2 km for all whales • observation and compliance reporting: - Use of vessel crew to supplement dedicated MFOs in marine fauna observations and monitoring compliance to Policy Statement 2.1. - Records kept of marine fauna observations during all surveys. • pre start-up visual observation (30 minutes) • soft start procedure (30 minutes) • start-up delay procedure (if sighting occurs) • operations procedure • stop work procedure • night-time and low visibility procedure.		
	C 19.1 Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural features and heritage values, including tangible and intangible cultural heritage.	**PS 19.1.1** All relevant marine crew have completed Project inductions that include information on cultural values, including tangible and intangible cultural heritage for awareness**.**	**MC 19.1.1** Records demonstrate all relevant marine crew have completed inductions that include cultural material
	C 19.2 Record sightings of marine turtles during the activities	**EPS 19.2.1** All sightings of marine turtles will be recorded**.**	**MC 19.2.1** Marine fauna logs demonstrate marine turtle sightings logged.
	C 19.3 Application of a 500 m observation zone and a 100 m shutdown zone for turtles.	**EPS 19.3.1** Implement a 500 m observation zone and a 100 m shutdown zone for turtles	**MC 19.3.1** Records demonstrate compliance with application of 500 m observation zone and

Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[58]			
EPO	***Adopted Control(s)***	***EPS***	***MC***
			100 m shutdown zone for turtles.
	C 14.1 EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[60]: • Project vessels will not travel greater than 6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots.	**PS 14.1.1** Refer to **Section 6.7.6**	**MC 14.1.1** Refer to Section **6.7.6**
		PS 14.1.2 Refer to Section **6.7.6**	**MC 14.1.2** Refer to Section **6.7.6**
	C 14.3 Project vessels will not travel greater than 6 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark[60]	**PS** Refer to Section **6.7.6**	**MC** Refer to Section **6.7.6**
	C 14.4 Vessels will not travel greater than 6 knots within 300m of a turtle (caution zone). If the turtle shows signs of being disturbed, vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. [60]	**PS** Refer to Section **6.7.6**	**MC** Refer to Section **6.7.6**

[60] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability including but not limited to seismic vessel towing equipment and acquiring data, and in the event of an emergency e.g. loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

7 IMPLEMENTATION STRATEGY

7.1 Overview

Regulation 14 of the Environment Regulations requires an EP to contain an implementation strategy for the activity. The implementation strategy for the Petroleum Activities Program confirms fit-for-purpose systems, practices and procedures are in place to direct, review and manage the activities so that environmental risks and impacts are continually being reduced to ALARP and are acceptable, and that EPOs and EPSs outlined in this EP are achieved.

Woodside, as Operator, is responsible for ensuring that the Petroleum Activities Program is managed in accordance with this implementation strategy and the WMS (see **Section 1.7.4**).

7.2 Systems, Practice and Procedures

All operational activities are planned and carried out in accordance with relevant legislation and internal environment standards and procedures identified in this EP (**Section 2.4**).

Processes are implemented to verify controls to manage environmental impacts and risks to:

- a level that is ALARP and acceptable
- meet EPOs
- comply with EPSs defined in this EP.

The systems, practices and procedures that will be implemented are listed in the EPSs contained in this EP. Document names and reference numbers may be subject to change during the statutory duration of this EP; this is managed through a change register and management of change process.

7.3 Roles and Responsibilities

Key roles and responsibilities for Woodside and contractor personnel relating to implementing, managing and reviewing this EP are described in **Table 7-1**. Roles and responsibilities for oil spill preparation and response are outlined in **Appendix D** and the *Woodside Oil Pollution Emergency Arrangements (Australia)*.

It is the responsibility of all Woodside employees and contractors to implement the Woodside Corporate Environment and Biodiversity Policy (refer to **Appendix A**) in their areas of responsibility and that the personnel are suitably trained and competent in their respective roles.

Table 7-1: Roles and Responsibilities

Title (role)	Environmental Responsibilities
Office-based Personnel	
Woodside Survey Operations Project Manager	• Verify relevant Environmental Approvals for the activities exist before commencing activity. • Monitor and manage the activity so it is performed as per the relevant standards and commitments in this EP. • Notify the Woodside Environment Adviser in a timely manner of any scope changes. • Liaise with regulatory authorities as required. • Review this EP as necessary and manage change requests. • Ensure all project and support vessel crew members complete a Project (Including HSE) induction. • Verify that contractors meet environmental related contractual obligations. • Liaise with contractors to ensure communication and understanding of environment requirements as outlined in this EP. • Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's HSE Reporting and Investigation Procedure. • Monitor and close out corrective actions identified during environmental monitoring or audits. • Track compliance with performance outcomes and performance standards as per the requirements of this EP.
Woodside Environmental Adviser	• Prepare environmental component of relevant Induction Package. • Review compliance with performance outcomes and performance standards as per the requirements of this EP. • Ensure relevant Environmental Approvals for the activities exist before commencing activity. • Input to environmental component of relevant Induction Package. • Assist with the review, investigation and reporting of environmental incidents as required. • Assist environmental monitoring and inspections/audits are performed as per the requirements of this EP as required. • Liaise with relevant regulatory authorities as required. • Assist in preparing required external regulatory reports, in line with environmental approval requirements and Woodside incident reporting procedures. • Provide advice to relevant Woodside personnel and contractors to help them understand their environment responsibilities. • Support the Survey Operations Project Manager in ensuring communications and understanding of environment requirements as outlined in this EP. • Provide environmental support for activities through regular engagement with WSR.

Title (role)	Environmental Responsibilities
Woodside Corporate Affairs Adviser	• Prepare and implement the Stakeholder Consultation Plan for the Petroleum Activities Program. • Report on stakeholder consultation. • Continuously liaise and provide notification as required as outlined in the EP.
Woodside Marine Assurance Superintendent	• Source and conduct relevant audit and inspection to confirm vessels comply with relevant Marine Orders and Woodside Marine Charters Instructions requirements.
Woodside Corporate Incident Coordination Centre (CICC) Duty Manager	On receiving notification of an incident, the Woodside CICC Duty Manager shall: • Establish and take control of the Incident Management Team and establish an appropriate command structure for the incident. • Assess the situation, identify risks and actions to minimise the risk. • Communicate impact, risk and progress to the Crisis Management Team and stakeholders. • Develop the Incident Action Plan (IAP) including objectives for action. • Approve, implement and manage the IAP. • Communicate within and beyond the incident management structure. • Manage and review safety of responders. • Address the broader public safety considerations. • Conclude and review activities.
Vessel-based Personnel	
Vessels Master	• Ensure the vessel management system and procedures are implemented. • Ensure personnel commencing work on the vessel receive an environmental induction that meets the relevant requirements specified in this EP. • Ensure personnel are competent to perform the work they have been assigned. • Verify SOPEP drills are conducted as per the vessel's schedule. • Ensure the vessel Emergency Response Team has been given sufficient training to implement the SOPEP. • Ensure any environmental incidents or breaches of relevant EPOs or PSs detailed in this EP, are reported immediately to the Party Chief and Woodside Site Representative. • Ensure corrective actions for incidents or breaches are developed, communicated to the Woodside Site Representative, and tracked to closeout in a timely manner. Ensure closeout of actions is communicated to the Woodside Site Representative.

Title (role)	Environmental Responsibilities
Party Chief / Manager	• Understand and manage environmental aspects of the seismic operations per this EP and approval conditions. • Provide copies of documents, records, reports and certifications (as requested by Woodside) in a timely manner to assist in compliance reporting. • Ensure any environmental incidents or breaches of EPOs or PSs detailed in this EP, are reported immediately to the Woodside Site Representative and Woodside Survey Operations Project Manager.
Woodside Site Representative	• Ensure project personnel adhere to the requirements of this EP so the EPOs are met, and the PSs detailed in this EP are implemented during seismic operations. • Ensure environmental incidents or breaches of outcomes or standards are reported as per the Woodside event notification requirements. Corrective actions for incidents and breaches must be developed, tracked and closed out in a timely manner. • Ensure periodic environmental inspections are completed. Monitor and close out corrective actions (eCAR) identified during environmental monitoring or audits/inspections. • Ensure any environmental incidents or breaches of EPOs or PSs detailed in this EP, are reported immediately to the Woodside Survey Operations Project Manager. • Review Contractors' procedures, input into Toolbox talks and JSAs. • Provide environmental support for activities through regular engagement with Woodside Environmental Adviser.
Marine Fauna Observer	• Provide training through induction/briefing to all vessel crew likely to assist with marine fauna observations. • Record observations of marine fauna and monitor and report on compliance with acoustic operating requirements.

7.4 Thalanyji Sea Country Management Process

During consultation, BTAC, on behalf of the Thalanyji People, advised it has a cultural obligation to care for the environmental values of Sea Country (refer to Appendix F, Table 1)

In correspondence from 20 February 2023 (refer to Appendix F, Table 1) BTAC advised that:

- BTAC seeks support from Woodside to enable BTAC to define and articulate its values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community. This would enable BTAC and Woodside to collaborate to develop effective management plans that can provide adequate protection to Sea Country values; and
- BTAC seeks support from Woodside to obtain technical support to review the information and provide BTAC and its members with feedback on the project risks to Sea Country and help BTAC contemplate the potential management controls that could be developed to protects its values and interests.

Woodside's offer of technical support is detailed in Appendix F, Table 1 but this has not yet been accepted.

BTAC has not provided further detail regarding heritage value of places or cultural features of the Operational Area or the EMBA but did note that this Sea Country extends "out to the vast islands off the coast of the Pilbara, including the Monte Bello Islands, Barrow Island, and the Mackerel Islands."

Woodside recognises that identification of these cultural features/values can only be meaningfully achieved with the participation of BTAC. Woodside will implement the process in Table 7-2 to ensure all reasonable steps have been taken to identify sea country values relative to BTAC.

Any relevant controls resulting from this consultation will be implemented to ensure the proper management of the activity.

Table 7-2: BTAC Ongoing Consultation

Activity		Timing
Woodside contacted BTAC to discuss the best way forward to consult with BTAC		Completed January 2023
Woodside and BTAC commenced correspondence regarding a consultation or engagement framework, including financial resourcing for BTAC		Ongoing since February 2023
BTAC confirmed that subject to formalising arrangements – for example under a collaboration agreement - BTAC agrees in principle for Woodside to include the statements described in the letter from Woodside dated 17 March.		Completed 18 April 2023
BTAC requested Woodside provide a draft presentation for BTAC's board regarding Woodside's activities on Thalanyji country, and draft key terms / key principles regarding a Collaboration Agreement		Completed 4 May 2023
Woodside provided to BTAC a draft of principles for a consultation framework, targeting having the framework agreed and in place by 31 July 2023		Completed 14 June 2023
Woodside wrote to BTAC inviting BTAC to submit a cost estimate to continue consultations and address items in the draft framework principles, in the interim whilst the framework is being agreed		Completed 14 July 2023
BTAC wrote to Woodside regarding the draft framework principles and proposed to forward Woodside a Costs Acceptance Letter to address resourcing for ongoing consultation		Completed 19 July 2023
Woodside provided BTAC with a draft presentation for BTAC's board, including a map showing a consolidated EMBA - a consolidation of all single activity EMBAs that have been notified to BTAC to date		Completed 20 July 2023
1	Request an ethnographic assessment to be undertaken by BTAC, including:	July 2023

Activity		Timing
	• That the scope of works identifies the values of sea-country generally sufficient to inform all Woodside EPs; • That Woodside will cover all reasonable costs of this assessment, to be agreed upon receipt of a cost estimate from BTAC; • That, in order to ensure the independence of any assessment and confidence in the process and consultants, Woodside's preference is for BTAC to manage the assessment, including selection of any consultant, but acknowledging the constraints on BTAC's time and resources that where directed Woodside (or a consultant) is willing to provide in-kind support for the assessment, including some or all tasks required to coordinate the assessment; • That any resulting report or other materials will remain the intellectual property of BTAC, but that Woodside will retain a perpetual right to use the content of any non-culturally sensitive report or other materials produced for the purposes of project approvals and planning, including providing these in-full to regulators and government authorities as needed, and that where culturally sensitive reports or other materials are produced a non-culturally sensitive (redacted or edited) version will pe provided subject to the same perpetual right above; and • To minimise the burden of duplication on BTAC and allow prioritisation of this assessment any results of this assessment may be shared by BTAC with other proponents, and where other proponents require ethnographic assessment outside of the proposed scope but aligned with the assessment timeframes, the engaged consultants may perform the required additional work (including additional days of research, fieldwork etc.) as an extension of this assessment at the cost of those proponents (thus avoiding duplication of time and costs relating to logistics, administration etc.) • Reiterate commitment to undertaking ethnographic assessments with BTAC, at BTAC's earliest availability.	Follow up after 2 weeks and once monthly in September and October.
2	Woodside will continue to implement its Management of Change and Management of Knowledge processes where new information is communicated from BTAC at any time. • Consult with BTAC to ensure Condition 6 can be met within 14 days.	Within 14 days of new cultural values being communicated from BTAC
3	Ongoing consultation as per Ongoing Program of Traditional Owner Consultation	Per Ongoing Program
4	Building capacity for the ongoing protection of country, including initiatives agreed with BTAC for the articulation of values on Sea Country in a manner that could be more clearly understood by the offshore sector, government, and the community.	Per Ongoing Program

Where the process in Table 7-2

has been complied with, Woodside considers that it will have taken all reasonable steps to identify cultural features and heritage values of Thalanyji people in the activity area.

7.5 Training and Competency

Woodside as part of its contracting process assesses a proposed Contractor's environmental management system to determine the level of consistency with the standard AS/NZ ISO 14001. This assessment is conducted for the Petroleum Activities Program as part of the tendering / vendor selection process. The assessment determines whether there is an organisational structure that clearly defines the roles and responsibilities for key positions. The assessment also determines whether there is an up-to-date training matrix that defines any corporate and site/activity-specific environmental training and competency requirements.

All crew will be aware of their roles and responsibilities regarding environmental risks throughout the Petroleum Activities Program. As a minimum, environmental awareness training is required for all

personnel, detailing awareness and compliance with the Contractor's environmental policy and environmental management system.

7.5.1 Inductions

Inductions are provided to all relevant personnel (e.g. Contractors and Company representatives) before mobilising to or on arrival at the activity location. The induction covers the HSE requirements and environmental information specific to the activity location. Attendance records are maintained.

The Petroleum Activities Program induction may cover information about:

- description of the activity
- ecological and socio-economic values of the activity location
- regulations relevant to the activity
- Woodside's Environmental Management System – Environment and Biodiversity Policy
- EP importance/structure/implementation/roles and responsibilities
- main environmental aspects/hazards and potential environmental impacts and related performance outcomes
- oil spill preparedness and response
- monitoring and reporting on performance outcomes and standards using measurement criteria
- incident reporting.
- In addition, as recreational fishing is prohibited from seismic vessels, this requirement will be covered in the induction.

7.5.2 Petroleum Activity Specific Environmental Awareness

Before the Petroleum Activities Program begins, a Woodside Project Manager will hold a pre-activity meeting with all relevant personnel. The pre-activity meeting provides an opportunity to reiterate specific environmental sensitivities or commitments associated with the activity. Attendance lists are recorded and retained.

During operations, regular HSE meetings will be held on the seismic vessel and support vessel(s). During these meetings, environmental incidents are reviewed and awareness material presented. Attendance lists are recorded and retained.

Additional materials are to be provided to project personnel as required to facilitate/support compliance with performance standards and collection of data related to measurement criteria.

7.5.3 Management of Training Requirements

All personnel on the vessels are required to be competent to perform their assigned positions. This may be in the form of external or 'on the job' training. The vessel Safety Training Coordinator (or equivalent) is responsible for identifying training needs, keeping records of training undertaken, and identifying minimum training requirements.

7.6 Monitoring, Auditing, Management of Non-conformance and Review

7.6.1 Monitoring

Woodside and its Contractors will conduct a program of periodic monitoring during the Petroleum Activities Program – starting at mobilisation and continuing through the duration of the activity to activity completion. This information will be collected using the tools and systems outlined below,

developed based on the environmental performance outcomes, controls, standards and measurement criteria in this EP. The tools and systems will collect, as a minimum, the data (evidence) referred to in the measurement criteria in **Sections 6.6** and **6.7** and **Appendix D.**

The collection of this data (against the measurement criteria) will form part of the permanent record of compliance maintained by Woodside. It will form the basis for demonstrating that the environmental performance outcomes and standards are met, which will be summarised in a series of routine reporting documents.

7.6.1.1 Source-Based Impacts and Risks

The tools and systems to monitor environmental performance, where relevant, will include:

- daily reports, which include leading indicator compliance
- periodic review of waste management and recycling records
- use of Contractor's risk identification program that requires personnel to record and submit safety and environment risk observation cards on a routine basis (frequency varies with contractor)
- collection of evidence of compliance with the controls detailed in the EP relevant to offshore activities by the Woodside Site Representative (other compliance evidence is collected onshore)
- environmental discharge reports that record volumes of planned and unplanned discharges to ocean and atmosphere
- monitoring of progress against key performance indicators
- internal auditing and assurance program as described in Section 7.6.2
- Throughout this activity, Woodside will continuously identify new source-based risks and impacts through the Monitoring and Auditing systems and tools described above and in **Section 7.6.1.1.**

7.6.1.2 Management of Knowledge

Review of knowledge relevant to the existing environment is undertaken in order to identify changes relating to the understanding of the environment or legislation that supports the risk and impact assessments for EPs (in-force and in-preparation). Relevant knowledge is defined as:

- Environmental science supporting the description of the existing environment
- Socio-economic environment and consultation feedback
- Environmental legislation.

The frequency and documentation of reviews, communication of relevant new knowledge and consideration of management of change are documented in the WMS Environment Plan Guideline.

In addition, in line with Condition 7.2 of Ministerial Statement No. 1172, the Scarborough Project will implement the Cultural Heritage Management Plan (CHMP), which has been developed in consultation with MAC. The CHMP will detail the process for a Heritage Management Committee to assess new information. Any relevant new information on cultural values will be assessed using the EP Management of Change Process (refer to **Section 7.7**).

Under the Oil Spill Scientific Monitoring Program preparedness, an annual review and update to the environmental baseline studies database is completed and documented. Periodic location-focused environmental studies and baseline data gap analyses are completed and documented. Any

subsequent studies scoped and executed as a result of such gap analysis are managed by the Environment Science Team and tracked via the Corporate Environment Baseline Database.

7.6.1.3 Management of Newly Identified Impacts and Risks

New sources of receptor based impacts and risks identified through monitoring and auditing systems and tools and the Woodside Environment Knowledge Management System will be assessed using the Change Management Process (refer to **Section 7.7**).

7.6.2 Auditing

Environmental performance auditing will be performed to:

- Identify potential new, or changes to existing environmental impacts and risk, and methods for reducing those to ALARP.
- Confirm that mitigation measures detailed in this EP are effectively reducing environmental impacts and risk, that mitigation measures proposed are practicable and provide appropriate information to verify compliance.
- Confirm compliance with the environmental performance outcomes and performance standards detailed in this EP.

The internal audits/inspections and reviews, combined with the ongoing monitoring described in **Section 7.6.1**, and collection of evidence for measurement criteria are used to assess environmental performance outcomes and standards.

As part of Woodside's EMS and/or assurances processes, activities are periodically selected for environmental audits as per Woodside's internal auditing process. Audit, inspection and review findings relevant to continuous improvement of environmental performance are tracked through the Environmental Commitments and Actions Register (ECAR). This ECAR is used to track compliance with EP commitments, including any findings and corrective actions.

Non-conformances identified will be reported and/or tracked in accordance with **Section 7.6.3**.

7.6.2.1 Marine Assurance

Marine assurance is undertaken in accordance with the Marine Offshore Vessel Assurance Procedure (Woodside Doc No: W0000PV1400355151). The marine assurance process is managed by the Marine Assurance Team of the Marine Services.

The processes and procedures used are based on industry standards and consideration of guidelines and recommendations from recognised industry organisations such as Oil Companies International Marine Forum and International Maritime Contractors Association.

The Marine Offshore Vessel Assurance Procedure defines the marine offshore assurance activities applicable for all vessels chartered directly by or on behalf of Woodside. The procedure is mandatory for all vessels hired for Woodside operations, including for short-term hires (less than three months in duration).

The Marine Offshore Vessel Assurance Procedure ensures all vessel operators and vessels chartered only operate seaworthy vessels that meet the requirements for a defined scope of work, and are managed with a robust safety management system. The marine offshore vessel assurance process is multi-faceted and encompasses:

- offshore vessel safety management system assessment (OVMSA)
- offshore vessel inspection database (OVID) inspection or similar
- project support for tender review and evaluation, pre/post contract award.

OVID inspections are objective in nature and reflect what was observed while conducting the inspection. The inspection provides observations as opposed to non-conformances. Woodside will maintain records of the marine assurance review.

Where an OVID inspection and/or OVMSA verification review is not available, and all reasonable efforts based on time and resource availability to complete an OVID inspection and/or OVMSA verification review are undertaken (i.e. short-term vessel hire), the Marine Assurance Specialist Offshore may approve using an alternate means of inspection as defined in the Marine Offshore Vessel Assurance Procedure, known as a risk assessment.

7.6.2.2 Risk Assessment

Woodside conducts a risk assessment of vessels where either an OVMSA Verification Review and/or an OVID inspection cannot be completed (i.e. short term vessel hire). This is not a regular occurrence and is typically used when the requirements of the assurance process are unable to be met or the processes detailed are not applicable to a proposed vessel(s). The Marine Vessel Risk Assessment will be conducted by the Marine Assurance Superintendent, or the nominated deputy, where the vessel meets the short term hire prerequisites.

The risk assessment is a semi-quantitative method of determining what further assurance process activity, if any, is required to assure a vessel for a particular task or role. The process compares the level of management control a vessel is subject to against the risk factors associated with the activity or role.

Several factors are assessed as part of a vessel risk assessment, including:

- Management control factors:
  - company audit score (i.e. management system)
  - vessel HSE incidents
  - vessel Port State Control deficiencies
  - instances of Port State Control vessel detainment
  - years since previous satisfactory vessel inspection
  - age of vessel
  - contractors' prior experience operating for Woodside.
- Activity risk factors:
  - people health and safety risks (a function of the nature of the work and the area of operation)
  - environmental risks (a function of environmental sensitivity, activity type and magnitude of potential environment damage (e.g. largest credible oil spill scenario))
  - value risk (likely time and cost consequence to Woodside if the vessel becomes unusable)
  - reputation risk
  - exposure (i.e. exposure to risk based on duration of project)
  - industrial relations risk.

The acceptability of the vessel or requirement for further vessel inspections or audits is based on the ratio of vessel score to activity risk. If the vessel management control is not deemed to appropriately manage activity risk, a satisfactory company audit and/or vessel inspection may be required before awarding work.

The risk assessment is valid for the period a vessel is on hire and for the defined scope of work.

7.6.3 Management of Non-conformance

Woodside classifies non-conformances with environmental performance outcomes and standards in this EP as environmental incidents. Woodside employees and contractors are required to report all environmental incidents, and these are managed as per Woodside's Health, Safety and Environment Event Reporting and Investigation Procedure (Woodside Doc No. WM0000PG9905421).

An internal computerised database called First Priority is used to record and report these incidents. Details of the event, immediate action taken to control the situation, investigation outcomes and corrective actions to prevent reoccurrence are all recorded. Corrective actions are monitored using First Priority and closed out in a timely manner.

Woodside uses a consequence matrix for classification of environmental incidents, with the significant categories being A, B and C (as detailed in **Section 2.6.1**). Detailed investigations are completed for all categories A, B, C and high potential environmental incidents.

7.6.4 Review

7.6.4.1 Management Review

Within the Environment function, senior management regularly monitors and reviews environmental performance and the effectiveness of managing environmental risks and performance. Within each Function and Business Unit Leadership Team, managers regularly review environmental performance, including through HSE Review meetings.

Risks are also reviewed before the activity commences, including operational, safety and environmental risks of the Petroleum Activities Program, to support continuous improvement as outlined in the Woodside Risk Management Framework (refer to **Section 2.6.1**).

7.6.4.2 Learning and Knowledge Sharing

Learning and knowledge sharing occurs via a number of different methods including:

- HSE meetings
- event investigations
- event bulletins
- post-activity review, including the review of environmental incidents as relevant
- ongoing communication with seismic vessel operators
- formal and informal industry benchmarking
- cross-asset learnings.

7.7 EP Management of Change and Revision

Management of changes are managed in accordance with Woodside's Environmental Approval Requirements Australia Commonwealth Guideline. Management of changes relevant to this EP, concerning the scope of the activity description (**Section 3**) including: review of advances in technology at stages where new equipment may be selected such as vessel contracting; changes in understanding of the environment, DCCEEW EPBC Act listed threatened and migratory species status, Part 13 statutory instruments (recovery plans, threat abatement plans, conservation advice, wildlife conservation plans) and current requirements for AMPs; and potential new advice from

external stakeholders (**Section 5**), will be managed in accordance with Regulation 17 of the Environment Regulations.

Risk will be assessed in accordance with the environmental risk management methodology (**Section 2.4**) to determine the significance of any potential new environmental impacts or risks not provided for in this EP. Risk assessment outcomes are reviewed in compliance with Regulation 17 of the Environment Regulations.

Minor changes where a review of the activity and the environmental risks and impacts of the activity do not trigger a requirement for a formal revision under Regulation 17 of the Environment Regulations, will be considered a 'minor revision'. Minor administrative changes to this EP, where an assessment of the environmental risks and impacts is not required (e.g. document references, phone numbers, etc.), will also be considered a 'minor revision'. Minor revisions as defined above will be made to this EP using Woodside's document control process. Minor revisions will be tracked in an MOC Register to ensure visibility of cumulative risk changes, as well as enable internal EP updates/reissuing as required. This document will be made available to NOPSEMA during regulator environment inspections.

7.8 OPEP Management of Change and Revision

Relevant documents from the OPEP (**Section 7.11** and **Table 7-6)** will be reviewed in the following circumstances:

- implementation of improved preparedness measures
- a change in the availability of equipment stockpiles
- a change in the availability of personnel that reduces or improves preparedness and the capacity to respond
- the introduction of a new or improved technology that may be considered in a response for this activity
- to incorporate, where relevant, lessons learned from exercises or events
- if national or state response frameworks and Woodside's integration with these frameworks changes.

Where changes are required to the OPEP, based on the outcomes of the reviews described above, they will be assessed against Regulation 17 to determine if resubmission of the EP, including the OPEP, is required (see **Section 7.7**).

Changes with potential to influence minor or technical changes to the OPEP are tracked in management of change records, project records and incorporated during internal updates of the OPEP or the five-yearly revision.

Woodside will maintain the following records:

- Woodside's HSPU Testing of Arrangements Register.
- Woodside Internal Equipment Maintenance Register.
- OPEP current and available.

Activity OPEPs will be revised at a minimum every five years in accordance with the Woodside Hydrocarbon Spill Preparedness and Response Procedure.

7.9 Record Keeping

Compliance records (outlined in Measurement Criteria in **Sections 6.6** and **6.7**) will be maintained. Record keeping will be in accordance with Regulation 15(7) that addresses maintaining records of emissions and discharge volumes. The records are maintained in the daily seismic reports.

7.10 Reporting

To meet the environmental performance outcomes and standards outlined in this EP, Woodside reports at a number of levels. These reporting arrangements are outlined below.

7.10.1 Routine Reporting (Internal)

7.10.1.1 Daily Progress Reports and Meetings

Daily reports for seismic activities are prepared and issued to key Company support personnel by relevant managers responsible for the activity. The report provides performance information about seismic activities, heath, safety and environment, and current and planned work activities.

Meetings between key personnel are used to transfer information, discuss incidents, agree plans for future activities and develop plans and accountabilities for resolving issues.

7.10.1.2 Regular HSE Meetings

Regular HSE meetings are held with the offshore and Perth-based Project Manager and advisers (as required) to address HSE incidents and initiatives. Minutes of these meetings are produced and distributed as appropriate.

7.10.1.3 Performance Reporting

Daily, weekly and monthly performance reports are developed. These reports cover a number of subject matters, including:

- HSE incidents (including high potential incidents and those related to this EP) and recent activities
- corporate Key Performance Indicator targets, which include environmental metrics
- outstanding actions as a result of audits or incident investigations
- technical high and low lights.

7.10.2 Routine Reporting (External)

7.10.2.1 Ongoing Consultation

In accordance with Regulation 14 (9) of the Environment Regulations, the implementation strategy must provide for appropriate consultation with relevant authorities of the Commonwealth, a State or Territory and other relevant interested persons or organisations.

Woodside's approach to ongoing consultation is that feedback and comments received from relevant persons and additional persons continue to be assessed and responded to, as required, through the life of an EP, including during EP assessment and throughout the duration of the accepted EP, in accordance with the intended outcome of consultation (as set out in **Section 5.2**).

Woodside proposes to undertake the engagements with directly impacted relevant persons and additional persons listed **in Table 7-3.** Relevant new information identified during ongoing consultation will be assessed using the EP Management of Knowledge (refer to **Section 7.6.1.2** and Management of Change Process (refer to **Section 7.7**).

Woodside has developed a Program of Ongoing Engagement with Traditional Custodians (Appendix J), directly informed by feedback from Traditional Custodians. It provides a mechanism for ongoing dialogue so that Traditional Custodians can, on an ongoing basis, provide Woodside with feedback relating to the possible consequences of an activity to be carried out under an Environment Plan on their functions, interests and activities as they relate to cultural values. The program enables Woodside to manage uncertainty on the impacts and risks to cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians.

Woodside hosts community forums at which members are provided updates on Woodside activities on a regular basis (for example community reference group meetings). Representatives who present at those meetings are from community and industry and include Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, industry representative bodies, Community and industry organisations.

Relevant persons, additional persons and those who are merely interested in the activities, can otherwise remain up to date on this activity through subscribing to the Woodside website, or by reading the publicly available version of the EP on NOPSEMA's website, where available.

Should consultation feedback be received following EP acceptance that identifies a measure or control that requires implementation or update to meet the intended outcome of consultation (see **Section 5.2**), Woodside will apply its EP Management of Knowledge process (refer to **Section 7.6.1.2**) and Management of Change process (refer to **Section 7.7**), as appropriate.

Woodside has established and maintains a publicly available, up to date and interactive map to provide stakeholders with updated information on activities being conducted as part of the Petroleum Activities Program particularly during SIMOPS. The interactive map is available on Woodside's website (**Section 6.6.1**, **PS 1.6**).

The ongoing consultation engagements that Woodside intends to progress for this EP are set out in the table below.

Table 7-3: Ongoing consultation engagements

Report/ Information	Recipient	Purpose	Frequency	Content
Program of Ongoing Engagement with	Relevant cultural authorities	Identification, assessment and consideration of cultural values relevant to	Ongoing	Assessment of cultural values Any relevant new information on cultural

Report/ Information	Recipient	Purpose	Frequency	Content
Traditional Custodians (Appendix J)		the Operational Area and Consultation Area		values will be assessed using the EP Management of Knowledge (ref to **Section 7.5**) and Management of Change Process (refer to **Section 7.7**).
Notification (email)	AHO	As requested by AMSA during consultation.	No less than 4 weeks prior to commencement.	**PS 1.1** (**Section 6.6.1**) Date of activity start.
Updates (email)			As required.	Changes to planned activities
Notification (email)	AMSA	As requested by AMSA during consultation	At least 24–48 hours before operations commence	**PS 1.2** (**Section 6.6.1**) Date of activity start.
Update (email)			Provide updates to the AHO and JRCC should there be changes to the activity.	Changes to planned activities
Notification (email)	DoD Air Services Australia	As requested by DoD during consultation If Notice to Airmen notification is required for activities in Restricted Airspace.	Five weeks prior to commencement of activities.	**PS 1.5** (**Section 6.6.1**) Date of activity start.
Notification (email)	DMIRS	Good practice	At least 10 days prior to commencement.	Activity start date
Notification (email)	AFMA WAFIC CFA DPIRD Recfishwest DAFF – Fisheries Individual fishery licence holders that have the potential to be directly impacted by planned activities in the Operational Area (no relevant fisheries identified at time of EP submission) Eni	Good practice or as requested during consultation	At least 10 prior to commencement and following completion of activities.	**PS 1.3** (**Section 6.6.1**) Date of activity start and end.
Notification (email)	All Relevant Persons for the Proposed Activity	Notification of significant change	As appropriate	Notification of significant change. Any relevant new information will be assessed using the EP

Report/ Information	Recipient	Purpose	Frequency	Content
				Management of Knowledge (ref to **Section 7.5.**) and Management of Change Process (refer to **Section 7.6**).
Emails / Meetings	Persons or organisations who provide feedback to Woodside post EP submission	Identification, assessment and consideration of feedback, claims and / or objections	As appropriate	Assessment of claims and / or objections. Relevant new information will be assessed using the EP Management of Knowledge (ref to **Section 7.5**) and Management of Change Process (refer to **Section 7.6**).

7.10.3 Start and End Notifications of the Petroleum Activities Program

In accordance with Regulation 29, Woodside will notify NOPSEMA of the commencement of the Petroleum Activities Program at least ten days before the activity commences and will notify NOPSEMA within ten days of completing the activity.

7.10.4 Environmental Performance Review and Reporting

In accordance with applicable environmental legislation for the activity, Woodside is required to report information on environmental performance to the appropriate regulator. Regulatory reporting requirements are summarised in **Table 7-4**.

Table 7-4: Routine external reporting requirements

Report	Recipient	Frequency	Content
Monthly Recordable Incident Report (**Appendix E)**	NOPSEMA	Monthly, by the 15th of each month.	Details of recordable incidents that have occurred during the Petroleum Activities Program for the previous month (if applicable).
Environmental Performance Report	NOPSEMA	After completion all activity close-out actions and documentation. Within three months of completing the activity.	In accordance with the Environment Regulations, the report will address compliance with environmental performance outcomes and performance standards outlined in this EP.

7.10.5 End of the Environmental Plan

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended and all the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 25A of the Environment Regulations.

7.10.6 Incident Reporting (Internal)

It is the responsibility of the Woodside Project Manager to ensure reporting of environmental incidents meets Woodside and regulatory reporting requirements as detailed in the Woodside Health, Safety and Environment Event Reporting and Investigation Procedure and this section of this EP.

7.10.7 Incident Reporting (External) – Reportable and Recordable

7.10.7.1 Reportable Incidents

Definition

A reportable incident is defined under Regulation 4 of the Environment Regulations as '*an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage*'.

A reportable incident for the Petroleum Activities Program is:

- an incident that has caused environmental damage with a Consequence Level of Moderate (C) or above (as defined under Woodside's Risk Table; refer to **Table 2-3**)
- an incident that has the potential to cause environmental damage with a Consequence Level of Moderate (C) or above (as defined under Woodside's Risk Table – refer to **Table 2-3**).

The environmental risk assessment (**Section 6**) for the Petroleum Activities Program has not identified any risks with a potential consequence level of C+ for environment. All incidents with actual or potential environmental consequences will be investigated. Where an actual or potential environment consequence of C+ is identified this incident will still be classified as a reportable incident and appropriate notifications completed.

Any such incidents represent potential events which would be reportable incidents. Incident reporting is performed with consideration of NOPSEMA (2014) guidance stating, 'if in doubt, notify NOPSEMA', and assessed on a case-by-case basis to determine if they trigger a reportable incident as defined in this EP and by the Regulations.

Notification

NOPSEMA will be notified of all reportable incidents, according to the requirements of Regulations 26, 26A and 26AA of the Environment Regulations. Woodside will:

- Report all reportable incidents to the regulator (orally) ASAP, but within two hours of the incident or of its detection by Woodside.
- Provide a written record of the reported incident to NOPSEMA, the National Offshore Petroleum Titles Administrator (NOPTA) and the Department of the responsible Territory Minister (DITT) ASAP after orally reporting the incident.
- Complete a written report for all reportable incidents using a format consistent with the NOPSEMA Form FM0831 – Reportable Environmental Incident (**Appendix E**) which must be submitted to NOPSEMA ASAP, but within three days of the incident or of its detection by Woodside.
- Provide a copy of the written report to the NOPTA and DITT, within seven days of the written report being provided to NOPSEMA.
- AMSA will be notified of oil spill incidents ASAP after their occurrence, and DCCEEW notified if MNES are to be affected by the oil spill incident.

7.10.7.2 Recordable Incidents

Definition

A recordable incident is defined under Regulation 4 of the Environment Regulations as an incident arising from the activity that *'breaches an environmental performance outcome or environmental performance standard, in the EP for the petroleum activity, and is not a reportable incident'*.

Any breach of the environmental performance outcomes or standards (presented within **Sections 6.6** and **6.7**) will be raised as an incident and managed as per the notification and reporting requirements outlined below and the Woodside Health, Safety and Environment Event Reporting and Investigation Procedure.

Notification

NOPSEMA will be notified of all recordable incidents, according to the requirements of Regulation 26B(4), no later than 15 days after the end of the calendar month using the NOPSEMA Form – Recordable Environmental Incident Monthly Summary Report detailing:

- All recordable incidents that occurred during the calendar month.
- All material facts and circumstances concerning the recordable incidents that the operator knows or is able, by reasonable search or enquiry, to find out.
- Any action taken to avoid or mitigate any adverse environment impacts of the recordable incidents.
- The corrective action that has been taken, or is proposed to be taken, to prevent similar recordable incidents.
- The action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.

7.10.8 Other External Incident Reporting Requirements

In addition to notifying of and reporting environmental incidents defined under the Environment Regulations and Woodside requirements, **Table 7-5** describes the incident reporting requirements that also apply in the Operational Area.

For oil spill incidents, other agencies and organisations will be notified as appropriate to the nature and scale of the incident, as per procedures and contact lists in the Woodside Oil Pollution Emergency Arrangements (Australia) and Oil Pollution First Strike Plan (refer to **Appendix I**).

Woodside prioritises engagement with those persons who may be directly affected, either by the incident itself or in relation to the regulatory or decision-making capacity with respect to incident response. At the time of an oil spill incident, should it be identified that additional persons such as, but not limited to, commercial fishers, tourism operators or relevant cultural authorities who may be affected within the EMBA, Woodside would, at the relevant time, engage with these parties as appropriate

Table 7-5: External Incident Reporting Requirements

Event	Responsibility	Notifiable party	Notification requirements	Contact	Contact detail
Any marine incidents during Petroleum Activities Program	Vessel Master	AMSA	Incident Alert Form 18 as soon as reasonably practicable* Within 72 hours after becoming aware of the incident, submit Incident Report Form 19	AMSA	reports@amsa.gov.au
Oil pollution incidents in Commonwealth waters	Vessel Master	AMSA RCC	Without delay as per *Protection of the Sea Act*, part II, section 11(1), AMSA RCC notified verbally via the national emergency 24hour notification contact of the hydrocarbon spill; follow up with a written Pollution Report ASAP after verbal notification	AMSA RCC	Phone: 1800 641 792 or +61 2 6230 6811 AFTN: YSARYCYX
Any oil pollution incident which has the potential to enter a National Park or requires oil spill response activities to be conducted within a National Park	Woodside	DCCEEW	Reported verbally, ASAP	Director of National Parks	Phone: 02 6274 2220
Activity causes unintentional death of or injury to fauna species listed as Threatened or Migratory under the EPBC Act	Woodside	DCCEEW	Within seven days of becoming aware	Secretary of the DAWE	Phone: 1800 803 772 Email: protected.species@environment.gov.au

The pollution activities should also be reported to AMSA via RCC Australia by the Vessel Master are:

- Any loss of significant plastic material (e.g. streamers).
- Garbage disposed of in the sea within 12 nm of land (garbage includes food, paper, bottles, etc.).
- Any loss of hazardous materials.

For oil spill incidents, other agencies and organisations will be notified as appropriate to the nature and scale of the incident as per procedures and contact lists in the Oil Pollution Emergency Arrangements (Australia) and the Scarborough 4D B1 MSS Oil Pollution First Strike Plan (refer to **Appendix I**).

External incident reporting requirements under the OPGGS (Safety) Regulations, including under sub-regulation 2.42, notices and reports of dangerous occurrences will be reported to NOPSEMA under the approved activity safety cases.

7.11 Emergency Preparedness and Response

7.11.1 Overview

Under Regulation 14(8), the implementation strategy must contain an Oil Pollution Emergency Plan (OPEP) and provide for updating the OPEP. Regulation 14(8AA) outlines the requirements for the OPEP which must include adequate arrangements for responding to and monitoring oil pollution.

A summary of how this EP and supporting documents address the various requirements of Environment Regulations relating to oil pollution response arrangements is shown in **Table 7-6**.

Table 7-6: Oil pollution and preparedness and response overview

Content	Environment Regulations Reference	Document/Section Reference
Details of (oil pollution response) control measures that will be used to reduce the impacts and risks of the activity to ALARP and an acceptable level	Regulation 13(5), (6), 14(3)	Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D)**
Describes the OPEP	Regulation 14(8)	EP: Woodside's oil pollution emergency plan has the following components: Woodside Oil Pollution Emergency Arrangements (Australia) Oil Pollution First Strike Plan (**Appendix I**) Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**) In accordance with Regulation 31 of the Environmental Regulations the Woodside Oil Pollution Emergency Arrangements (Australia) was provided with the Julimar Phase 2 Drilling and Subsea Installation EP, accepted by NOPSEMA on 8 November 2019.
Details the arrangements for responding to and monitoring oil pollution (to inform response activities), including control measures	Regulation 14(8AA)	Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**) Oil Pollution First Strike Plan (**Appendix I**)

Content	Environment Regulations Reference	Document/Section Reference
Details the arrangements for updating and testing the oil pollution response arrangements	Regulation 14(8), (8A), (8B), (8C)	EP: **Section 7.12** Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**)
Details of provisions for monitoring impacts to the environment from oil pollution and response activities	Regulation 14(8D)	Oil Spill Preparedness and Response Mitigation Assessment **(Appendix D)**
Demonstrates that the oil pollution response arrangements are consistent with the national system for oil pollution preparedness and control	Regulation 14(8E)	Oil Pollution Emergency Arrangements (Australia)

7.11.2 Emergency Response Training

Regulation 14(5) requires that the implementation strategy includes measures to ensure that employees and contractors have the appropriate competencies and training (**Table 7-7**). Woodside has conducted a risk-based training needs analysis on positions required for effective oil spill response. Following the mapping of training to Woodside identified competencies, training was then mapped to positions based on their required competencies.

Table 7-7: Minimum levels of competency for key IMT positions

IMT Position	Minimum Competency
Corporate Incident Coordinate Centre (CICC) Leader	• Incident and Crisis Leadership Development Program (ICLDP) • Oil Spill Response Skills Enhancement Course (OSREC – internal course) • Participation in L2 oil spill exercise (initial) • Participation in L2 oil spill exercise (refresher)
Security & Emergency Manager Duty Manager	• ICLDP • OSREC • IMO2 or equivalent spill response specialist level with an oil spill response organisation (OSRO) • Participation in L2 oil spill exercise (initial) • Participation in L2 oil spill exercise (refresher)
Operations, Planning, Logistics, Safety	• OSREC • ICC Fundamentals Course (internal course) • Participation in L2 oil spill exercise (initial) • Participation in L2 oil spill exercise (refresher)
Environment Coordinator	• ICC Fundamentals • OSREC • IMO2 or equivalent spill response specialist level with an OSRO • Participation in L2 oil spill exercise (initial) • Participation in L2 oil spill exercise (refresh

Note on competency/equivalency
In 2018 Woodside undertook a review of incident and crisis systems, processes and tools to assess whether these were fit-for purpose and has rolled out a change to the Incident and Crisis Management training and the oil spill response training requirements for both ICC and field-based roles.

Note on competency/equivalency
The revised ICC Fundamentals training Program and Incident and Crisis Leaders Development Program (ICLDP) align with the performance requirements of the *PMAOMIR320 – Manage Incident Response Information* and *PMAOM0R418 - Coordinate Incident Response.* Regarding training specific equivalency: • ICLDP is mapped to *PMAOM0R418* (and which is equivalent to IMOIII when combined with Woodside's OSREC course) and ensures broader incident management principles aligned with Australasian Inter-service Incident Management System (AIIMS). • The revised ICC Fundamentals Course is mapped to *PMAOMIR320* (and which is equivalent to IMOII). The blended learning program offers modules aligned to IMOIII, IMOII, IMOI and AMOSC Core Group Training Oil Spill Response Organisation Specialist Level training. • OSREC involves the completion of two (2) online AMSA Modules (Introduction to National Plan and Incident management; and Introduction to oil spills) as well as elements of IMOI and IMOII tailored to Woodside specific OSR capabilities. • Woodside Learning Services (WLS) are responsible for collating and maintaining personnel training records. The HSP Dashboard reflects the competencies required for each oil spill role (IMT/operational).

7.11.3 Emergency Response Preparation

The Corporate Incident Coordination Centre (CICC), based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CICC is staffed by an appropriately skilled team available on call 24-hours a day. The purpose of the team is to coordinate rescues, minimise damage to the environment and facilities, and to liaise with external agencies. A description of Woodside's Incident Command Structure and arrangements is further detailed in the Woodside OPEA (Australia). Roles and responsibilities for facility emergency response are outlined in the Woodside Oil Pollution Emergency Arrangements (Australia).

Woodside will have an Emergency Response Plan (ERP) in place relevant to the Petroleum Activities Program. The ERP provides procedural guidance specific to the asset and location of operations to control, coordinate and respond to an emergency or incident. The ERP will contain instructions for vessel emergency, medical emergency, search and rescue, reportable incidents, incident notification, contact information and activation of the contractor's emergency centre and Woodside Communication Centre (WCC).

In an emergency of any type, the Vessel Master will assume overall onsite command and act as the Incident Controller (IC). All persons aboard the vessel will be required to act under the IC's directions. The vessel will maintain communications with the onshore Project Manager and/or other emergency services. Emergency response support can be provided by the Contractor's emergency centre or WCC if requested by the IC.

The seismic vessel will have on-board equipment for responding to emergencies including medical, firefighting and hydrocarbon spill response equipment.

7.11.4 Oil and Other Hazardous Materials Spill

A significant hydrocarbon spill during the Petroleum Activities Program is unlikely, but should such an event occur, it has the potential to cause serious environmental and reputational damage if not managed properly. The Woodside Oil Pollution Emergency Arrangements (Australia) document, supported by the Oil Pollution First Strike Plan (**Appendix I**) which provides tactical response guidance to the activity/area. Spill response for this Petroleum Activities Program is described further in **Appendix D.**

The Security and Emergency Management Function is responsible for the management of Woodside's hydrocarbon spill response equipment, and for the maintenance of hydrocarbon spill preparedness and response documentation. In the event of a major spill, Woodside will request that AMSA (administrator of the National Plan) supports Woodside through advice and access to

equipment, people and liaison. The interface and responsibilities, as defined under the National Plan, are described in the Woodside Oil Pollution Emergency Arrangements (Australia) document. AMSA and Woodside have a Memorandum of Understanding (MOU) in place to support Woodside in the event of an oil spill.

The seismic vessel and support vessel(s) will have a SOPEP in accordance with the requirements of MARPOL 73/78 Annex I. These plans outline responsibilities, specify procedures and identify resources available in a hydrocarbon or chemical spill from vessel activities. The Oil Pollution First Strike Plan is intended to work in conjunction with the SOPEPs and provides immediate actions required to commence a response if hydrocarbons are released to the marine environment.

Woodside has established environmental performance outcomes, performance standards and measurement criteria to be used for oil spill response during the Petroleum Activities Program, as detailed in **Appendix D**.

7.12 Emergency and Spill Response

Woodside categorises incidents in relation to response requirements as follows:

- **Level 1 Incident** – A Level 1 incident can be resolved through the use of existing resources, equipment and personnel. A Level 1 incident is contained, controlled and resolved by site/regionally based teams using existing resources and functional support services.
- **Level 2 Incident** – A Level 2 incident is characterised by a response that requires external operational support to manage the incident. It is triggered in the event the capabilities of the tactical level response are exceeded. This support is provided to the activity via the activation of all, or part of, the responsible ICC.
- **Level 3 Incident** – A Level 3 incident or crisis is identified as a critical event that seriously threatens the organisation's People, the Environment, company Assets, Reputation, Livelihood or essential Services. At Woodside, the Crisis Management Team (CMT) manages the strategic impacts in order to respond to and recover from the threat to the company (material impacts, litigation, legal and commercial, reputation, etc.). The CICC may also be activated as required to manage the operational response to the Level 3 Incident.

7.12.1 Emergency and Spill Response Drills and Exercises

Personnel holding responsibilities in a response will test the arrangements supporting the activities OPEP to ensure they are effective and communicated. Testing of Woodside's capability to respond to incidents will be conducted in alignment with the Emergency and Crisis Management Procedure. The scope, frequency and objective of these tests is described in **Table 7-8**. These arrangements are conducted in accordance with Regulation 14 (8B) of the OPGGS (Environment) Regulations 2009.

The company emergency response testing regime is aligned to existing or developing risks associated with Woodside's operations and activities. Corporate hazards/risks outlined in the corporate risk register, respective Safety Cases or project Risk Registers, are the key reference point for emergency management and crisis management exercising schedule development. External participants may be invited to attend crisis exercises and may include government agencies, specialist service providers, hydrocarbon spill response organisations or industry members with which Woodside has mutual aid arrangements.

The objective is to exercise procedures, skills and teamwork of the Emergency Response and Command Teams in their ability to respond to emergency situations. After each exercise, the team holds a debrief session, during which the exercise is reviewed and reported. Any lessons learnt or areas for improvement are identified and incorporated into emergency procedures where appropriate.

Spill response exercise reports and key participants will be maintained in the Woodside IMS system.

Table 7-8: Testing of response capability

Response Category	Scope	Response Testing Frequency	Response Testing Objective
Level 1 Response	Exercises are project-/ activity-specific	One Level 1 'First Strike' drill conducted within two weeks of activity commencement.	Comprehensive exercises test elements of the Oil Pollution First Strike Plan (**Appendix I**). Emergency drills are scheduled to test other aspects of the Emergency Response Plan.
Level 2 Response	Exercises are vessel specific	A minimum of one Emergency Management exercise per campaign.	Testing both the facility IMT response and/or that of the CICC following handover of incident control.
Level 3 Response	Exercises are relevant to all Woodside assets	The number of CMT exercises conducted each year is determined by the Chief Executive Officer, in consultation with the Vice President of Security and Emergency Management.	Test Woodside's ability to respond to and manage a crisis level incident.

7.12.2 Hydrocarbon Spill Response Testing of Arrangements

Woodside is required to test hydrocarbon spill response arrangements as per regulations 8B and 8C of the Environment Regulations. Woodside's arrangements for spill response are common across its Australian operating assets and activities to ensure the controls are consistent. The overall objective of testing these arrangements is to ensure that Woodside maintains an ability to respond to a hydrocarbon spill, specifically to:

- ensure relevant responders, contractors and key personnel understand and practise their assigned roles and responsibilities
- test response arrangements and actions to validate response plans
- ensure lessons learned are incorporated into Woodside's processes and procedures and improvements are made where required.

If new response arrangements are introduced, or existing arrangements significantly amended, additional testing is undertaken accordingly. Additional activities or activity locations are not anticipated to occur; however, if they do, testing of relevant response arrangements will be undertaken as soon as practicable.

In addition to the testing of response capability described in **Table 7-8**, up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment.

7.12.2.1 Testing of Arrangements Schedule

Woodside's Testing of Arrangements Schedule (**Figure 7-1**) aligns with international good practice for spill preparedness and response management; the testing is compatible with the IPIECA Good Practice Guide and the Australian Emergency Management Institute Handbook. If a spill occurs, enacting these arrangements will underpin Woodside's ability to implement a response across its petroleum activities. **Figure 7-1** shows a condensed snapshot of Woodside's 5-year rolling Testing of Arrangements Schedule.

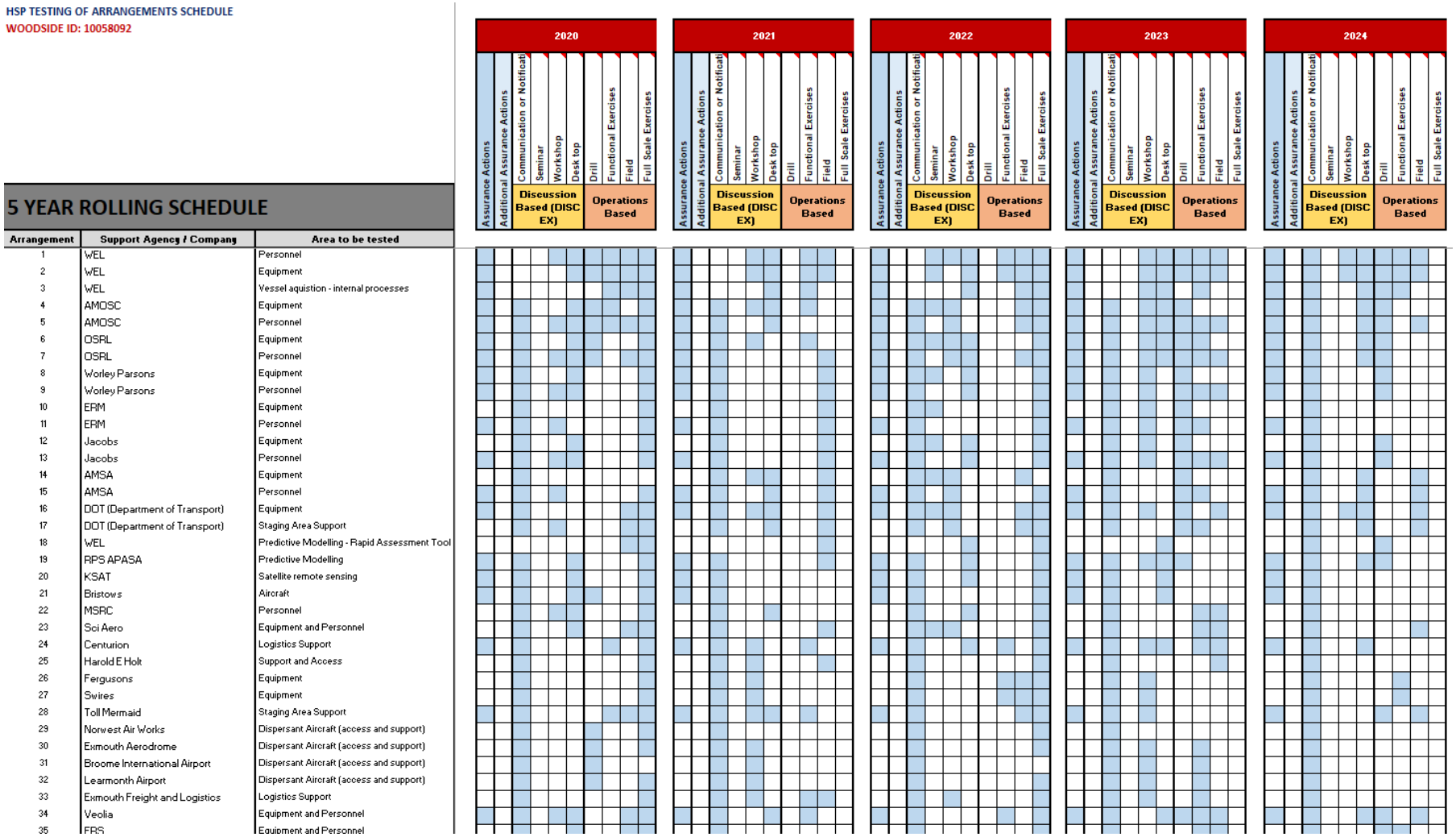

Figure 7-1: Indicative 5-yearly testing of arrangements schedule

(Snapshot of a selection of oil spill response arrangements tested annually; Note: schedule is subject to change, additional detail is included in the live document)

Numbered hydrocarbon spill arrangements listed in the rows of the schedule are taken from the support plans and operational plans described in Section 1.4 of **Appendix D**. Each arrangement has a support agency/company and an area to be tested (e.g. capability, equipment and personnel). For example, an arrangement could be to test Woodside's personnel capability for conducting scientific monitoring, or the ability of the Australian Marine Oil Spill Centre to provide response personnel and equipment. About 75 hydrocarbon spill preparedness arrangements are tested annually across the eight planned exercises, as described above.

The vertical columns under each year in **Figure 7-1** relate to an individual exercise or additional assurance actions that are conducted over the 5-year rolling schedule. The sub-heading for the column describes the standard method of testing (e.g. discussion exercise, desktop exercise), and the blue cells indicate the arrangements that could be tested for each method.

Arrangements in the schedule are tested at least once a year; however, some arrangements may be tested across multiple exercises (e.g. critical arrangements) or via other 'additional assurance' methods outside the formal Testing of Arrangements Schedule that also constitute sufficient evidence of testing of arrangements (e.g. audits, no-notice drills, internal exercises, assurance drills) (refer to the first and second vertical columns for each year in **Figure 7-1**).

7.12.2.2 Exercises, Objectives, and KPIs

Exercises are designed to cumulatively provide assurance for all arrangements within Woodside's Testing of Arrangements Schedule annually across all facilities. Exercise-initiating scenarios are derived from the worst-case credible scenarios as described in the relevant facility's First Strike Plans.

Objectives and KPIs for each exercise are determined by reviewing:

- The Testing of Arrangements Schedule, which identifies which arrangements can be tested for each testing method (**Section 7.12.2**).
- The objectives and KPIs master generic plan, which summarises generic objectives and KPIs that could be tested for specific response strategies, based on industry good practice guidance (i.e. IPIECA) for testing oil spill arrangements.
- The oil spill ALARP commitments register, which summarises all spill response commitments from accepted EPs (e.g. timings, numbers) for different response strategies, and considers priority commitments and worst-cast spill scenarios.
- Actions undertaken from recommendations from previous exercises, where relevant.

The required capabilities, number of personnel, equipment, and timeframes (i.e. arrangements) form specific KPIs during an exercise. Where this is the case, the ALARP commitments register indicates the specific response strategy performance standards to use/test the arrangements against. Where relevant the most stringent performance standard across all in-force EPs is used as the KPI. After each exercise, a report is produced that includes recommendations for improvements, which are then converted to actions and tracked in the Testing of Arrangements Register.

Additional assurance actions are also routinely undertaken outside formal exercises (e.g. response audits, no-notice drills), which support testing of these arrangements. Evidence and outcomes from additional assurance actions are used, where relevant, to support testing individual arrangements, including from external sources (e.g. evidence of suppliers testing their own arrangements).

7.13 Severe Weather Preparation

The activity is scheduled to occur outside of the typical cyclone season (November to April), however cyclones have been known to develop outside of season, between July and October. The seismic

vessel contractor must have a Severe Weather Procedure, or equivalent, in place outlining the processes and procedures that would be implemented during a severe weather event.

The seismic vessel will receive daily forecasts. If a severe weather event is forecast, the path and its development will be plotted and monitored using the forecast data. If there is the potential for the severe weather event to affect the Petroleum Activities Program, the Severe Weather Procedure will be actioned.

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9 LIST OF TERMS AND ACRONYMS

Acronym	Description
@	At
~	Approximately
<	Less/fewer than
>	Greater/more than
≤	Less than or equal to
≥	Greater than or equal to
°C	Degrees Celsius
24/7	24 hours a day, seven days a week
3D	Three-dimensional
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AIS	Automated identification system
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANIMAT	Animal Movement And Exposure Modelling
ANSI	American National Standards Institute
APPEA	Australian Petroleum Production and Exploration Association
AS/NZS	Australian Standard/New Zealand Standard
ASMA	Australian Maritime Safety Authority
ATSB	Australian Transport Safety Bureau
BIA	Biologically Important Area
BMSL	Below Mean Sea Level
BOEM	Bureau of Ocean Energy Management
BP	Boiling Point
CAES	Catch and Effort System
cm	Centimetre
cm^3	Cubic centimetre
CO_2	Carbon dioxide
CONOPS	Concurrent Operations
CP	Cathodic protection
CS	Cost/Sacrifice
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CV	Company Value
DAWE	Former Department of Agriculture, Water and the Environment (now DCCEEW)
db 1 μPa^2m^2s	Decibels relative to one micropascal squared, metres squared, per second

Acronym	Description
dB re 1 µPa	Decibels relative to one micropascal; the unit used to measure the intensity of an underwater sound
dB re 1 µPa²·s	Decibels relative to one micropascal squared, per second
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEH	Department of Environment and Heritage
DEWHA	Former Commonwealth Department of the Environment, Water, Heritage and the Arts (now DCCEEW)
DFO	Department of Fisheries and Oceans
DIS	Draft International Standard
DNP	Director of National Parks
DoEE	Commonwealth Department of the Environment and Energy
DoIMMS	Department of the Interior, Minerals Management Service
DPIRD	Western Australian Department of Primary Industries and Regional Development
DRIMS	Document Retrieval Integrated Management System
DSEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DCCEEW)
DWH	Deepwater Horizon
EMBA	Environment that may be affected
ENVID	Environment Identification (study)
EP	Environment Plan
EPBC	Environmental Protection Biodiversity Conservation
EPO	Environmental Performance Outcome
EPS	Environment Performance Standard
ERM	Environmental Resource Management
ESD	Ecologically Sustainable Development
F	Control feasibility
F-Pil	Flatback turtle – Pilbara stock
FRC	Fast Rescue Craft
GNSS	Global Navigation Satellite System
G-NWS	Green turtle – North West Shelf stock
GP	Good Industry Practice
GPS	Global Positioning System
HAZID	Hazard identification (study)
HF	High Frequency
HSE	Health, Safety, and Environment
H-WA	Hawksbill turtle – Western Australia stock
IAGC	International Association of Geophysical Contractors
IAPP	International Air Pollution Prevention
IMCRA	Intergrated Marine and Coastal Regionalisation of Australia

Acronym	Description
IMO	International Maritime Organisation
IMS	Invasive Marine Species
INPEX	International Petroleum Exploration
IOPP	International Oil Pollution Prevention
IPIECA	International Petroleum Industry Environmental Conservation Association
ISO	International Organization for Standardization
ISPP	International Sewage Pollution Prevention
ITOPF	International Tanker Owners Pollution Federation Ltd
IUCN	International Union for the Conservation of Nature
JASCO	Japan American Society of Central Ohio
JASMINE	JASCO Animal Simulation Model Including Noise Exposure
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
KEF	Key Ecological Feature
kHz	Kilohertz
km	Kilometre
L	Litre
LCS	Legislation, Codes and Standards
$L_{E,}$24h	Cumulative sound exposure over a 24-hour period
LF	Low Frequency
LH-WA	Loggerhead turtle – Western Australia stock
LNG	Liquefied Natural Gas
LP	Low Pressure
$L_{S,E}$	Per-pulse source SEL
$L_{S,PK}$	Peak Source Pressure
m	Metre
m/s	Metres per second
m^2	Square metre
m^3	Cubic metre
MARPOL	The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978.
MC	Measurement Criteria
MDO	Marine diesel oil
MEMS	Micro electro mechanical system
MF	Mid Frequency
MNES	Matters of National Environmental Significance
MOD	Maximum-Over-Depth
MOPO	Manual of Permitted Operation
MP	Master Plan

Acronym	Description
MPA	Marine Protected Area
MSIN	Maritime Safety Information Notifications
MSS	Marine Seismic Survey
n.d.	No date
N/A	Not Applicable
NIMS	Non-indigenous Marine Species
NLPG	National Light Pollution Guidelines
Nm	Nautical Mile
NMFS	National Marine Fisheries Service (US)
NNE	North North East
NOAA	National Oceanic and Atmospheric Administration (US)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NO_X	Oxides of nitrogen
NRC	North Rankin Complex
NSF	National Science Foundation
NTM	Notice to Mariners
NW	North West
NWMR	North-west Marine Region
NWS	North West Shelf
OBN	Ocean Bottom Node
OCNS	Offshore Chemical Notification Scheme
OIW	Oil in water
PAM	Passive Acoustic Monitoring
PEIS	Programatic Environmental Impact Statement
PENV	Pendoley Environmental
PJ	Professional Judgement
PK	Zero-to-peak sound pressure
PK-PK	Peak-to-peak sound pressure
PMI	Potential Mortality Injury
PMST	Protected Matters Search Tool
ppb	Parts per billion
ppm	Parts per million
PS	Performance Standard
PTS	Permanent threshold shift
RBA	Risk-based Analysis
RMS	Root Mean Square
ROV	Remotely operated vehicle
RPS	Rural Planning Services

Acronym	Description
SEL	Sound Exposure Level
SIMAP	Spill Impact Mapping and Analysis program
SMPEP	Spill Monitoring Programme Execution Plan
SNA	Safe Navigation Area
SOLAS	Safety Of Life At Sea
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound pressure level
SSE	South South East
SV	Societal Value
SWMR	South-west Marine Region
TAP	Threat Abatement Plan
TGS	Tomlinson Geophysical Services
TSSC	Threatened Species Scientific Committee
TTS	Temporary threshold shift
UK	United Kingdom
US	United States
USBL	Ultra-Short Baseline Acoustic Positioning System
VOC	Volatile Organic Compound
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WDCS	Whale and Dolphin Conservation Society
WHP	World Heritage Property
WMS	Woodside Management System
WNW	West North West