Echo Yodel Subsea Decommissioning Environment Plan

Operations / Decommissioning

25 February 2022

Revision 4

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1. INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside), as Titleholder under the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (referred to as the Environment Regulations), proposes to remove the Echo Yodel subsea infrastructure within Permit Area WA-9-PL[1]. The 'Echo Yodel subsea infrastructure' is defined as:

- a pipeline with pig launcher connected
- an electrohydraulic umbilical (EHU)
- two umbilical termination assemblies (UTAs)
- an infield umbilical termination basket (IUTB)
- infield control jumpers.

The decommissioning activities will hereafter be referred to as the Petroleum Activities Program and form the scope of this Environment Plan (EP). A more detailed description of the activities is provided in **Section 3**.

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

In accordance with the requirements of Regulation 19 of the Environment Regulations, this EP submission will supersede the management of Echo Yodel subsea infrastructure under the Goodwyn Alpha (GWA) Facility Operations EP (NOPSEMA Document No. A1800RH158693, Revision 8).

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 performed in a manner consistent with the principles of ecologically sustainable development (as defined in Section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (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)

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[1] WA-9-PL (pipeline license) overlaps Petroleum Titles WA-23-L, WA-6-L and WA-5-L.

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

Woodside previously consulted stakeholders in connection the proposal to leave *in situ* the Echo Yodel subsea infrastructure (including the pipeline, EHU, subsea well infrastructure (wellhead, Xmas trees, flowline support base and temporary guide base), a pipeline inspection gauge (pig) launcher and ancillary equipment following an independently facilitated comparative assessment workshop identifying this as the preferred decommissioning option.

However, following additional feedback received from the regulator during the assessment of the Echo Yodel and Capella Plugging and Subsea Decommissioning EP, Woodside now proposes to remove all the Echo Yodel subsea well infrastructure.

This EP has been revised to reflect removal of the subsea infrastructure, and therefore any previous references to leave *in situ*, including relevant technical studies to support leave *in-situ* as the preferred option, stakeholder consultation and associated comparative assessments to assess alternative end states, have now been removed from the EP.

The permanent plugging of Yodel-3, Yodel-4 and Capella-1 wells and removal of the associated wellheads and Xmas trees are addressed in the accepted Echo Yodel and Capella Plugging for Abandonment EP, and are therefore out of the scope of this EP.

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3.**

The Operational Area defines the spatial boundary of the Petroleum Activities Program, as described, risk assessed and managed by this EP. The Operational Area is further defined in **Section 3.4**.

1.4 Environment Plan Summary

This summary has been prepared based on the material provided in this EP, addressing the items listed in **Table 1-1** as required by Regulation 11(4).

Table 1-1: EP Summary

EP Summary material requirement	Relevant section of EP containing EP Summary material
The location of the activity	**Section 3.3**, starting at page 40
A description of the receiving environment	**Section 4**, starting at page 63
A description of the activity	**Section 3**, starting at page 39
Details of the environmental impacts and risks	**Section 6**, starting at page 161
The control measures for the activity	**Section 6.3**, starting at page 164
The arrangements for ongoing monitoring of the titleholder's environmental performance	**Section 7.5**, starting at page 283
Response arrangements in the oil pollution emergency plan	**Section 7.9**, starting at page 293 and **Appendix D**
Consultation already performed and plans for ongoing consultation	**Section 5**, starting at page 139
Details of the titleholder's nominated liaison person for the activity	**Section 1.7**, starting at page 23

1.5 Structure of the Environment Plan

This 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 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	The principle of 'nature and scale' is applicable throughout the EP.	**Section 1** **Section 3** **Section 4** **Section 5** **Section 6**
	Regulation 14: Implementation strategy for the environment plan		
	Regulation 16: Other information in the environment plan		
Regulation 10A(b): Demonstrates that the environmental impacts and risks of the activity will be reduced to ALARP	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) to 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**
Regulation 10A(c): Demonstrates that the environmental impacts and risks of the activity will be of an acceptable level			
Regulation 10A(d): Provides for appropriate EPOs, EPSs and MC	Regulation 13(7): Environmental performance outcomes and standards	Environmental Performance Outcomes (EPOs) Environmental Performance Standards (EPSs) Measurement Criteria (MC)	**Section 6**
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: Environmental Management System (EMS) performance monitoring Oil Pollution Emergency Plan (OPEP – per **Table 7-4**) and scientific monitoring ongoing consultation.	**Section 7** **Appendix D**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
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 performed 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, performed in any part of a declared World Heritage property.	**Section 3** **Section 4**
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, because of the consultations are appropriate	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 performed in the preparation of this EP.	**Section 5**
Regulation 10A(h): complies with the Act and the regulations	Regulation 13(4)a: Describe the requirements, including legislative requirements, that apply to activity and are relevant to the environmental management of the activity Regulation 15: Details of the Titleholder and liaison person Regulation 16(a): A statement of the titleholder's corporate environmental policy 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** **Section 5** **Section 6** **Appendix A** **Appendix B**

1.6 Description of the Titleholder

Woodside, as Titleholder for this activity, on behalf of the North West Shelf Joint Venture comprising BHP Billiton Petroleum (North West Shelf) Pty. Ltd., BP Developments Australia Pty. Ltd., Chevron Australia Pty. Ltd., CNOOC North West Shelf (NWS) Private Ltd. (joint venture partner for all titles except WA-9-PL), Japan Australia Liquefied Natural Gas (LNG) (MIMI) Pty. Ltd., Shell Australia Pty. Ltd and Woodside.

1.7 Details of Titleholder, Liaison Person and Public Affairs Contact

In accordance with Regulation 15 of the Environment Regulations, details of the titleholder, liaison person and arrangements for notifying of changes are described in the next subsections.

1.7.1 Titleholder

Woodside Energy Limited
11 Mount Street
Perth, Western Australia
Telephone: 08 9348 4000
ACN: 63 005 482 986

1.7.2 Nominated Liaison Person

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

1.7.3 Arrangements for Notifying of Change

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

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** drawn from the WMS documentation, which comprises four elements: Compass and Policies, Expectations, Processes and Procedures, and Guidelines, 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 to perform an activity or a process.
- **Guidelines:** Provide recommended practice and advice about how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide

advice about how activities or tasks may be performed, information that may be considered, or how to use tools and systems.

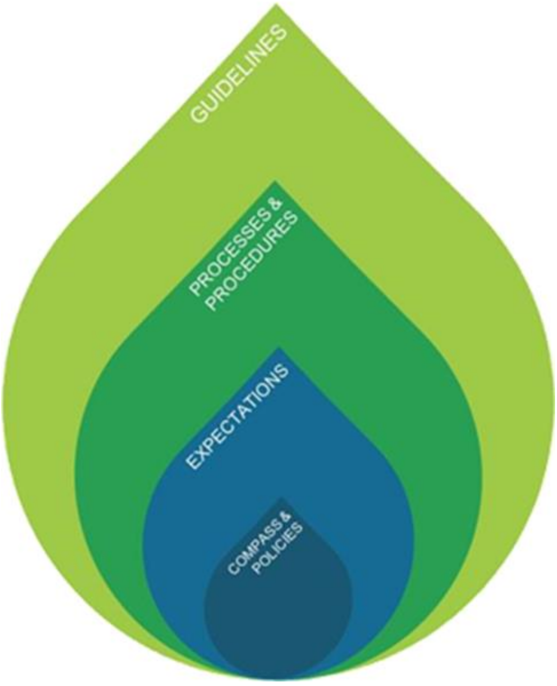

Figure 1-1: The four major elements of the WMS Seed

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.

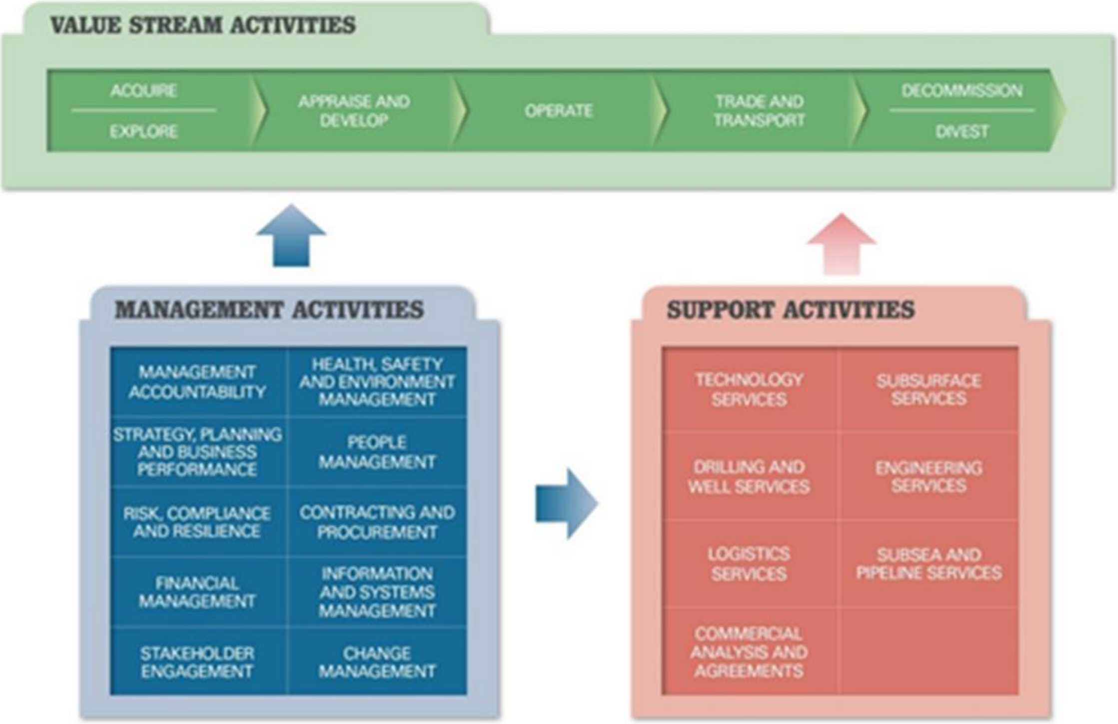

Figure 1-2: The WMS business process hierarchy

1.8.1 Health, Safety and Environment Policy

In accordance with Regulation 16(a) of the Environment Regulations, Woodside’s Corporate Health, Safety and Environment (HSE) 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 Western Australia (WA) *Environment Protection Act 1986* as the activity does not occur on State land or within State waters.

1.9.1 Applicable Environmental Legislation

1.9.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act regulates petroleum 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.

Under subsection 572(3) of the OPGGS Act, a titleholder must remove from the title area all structures that are no longer used in conjunction with the operations. Under subsection 572(7), property removal requirements are subject to any other provision of the OPGGS Act, the regulations, directions given by NOPSEMA or the responsible Commonwealth Minister, and any other law. Under subsection 270(3) of the OPGGS Act, before title surrender, all property brought into the surrender area must be removed to the satisfaction of NOPSEMA, or arrangements that are satisfactory to NOPSEMA must be made relating to the property.

1.9.1.2 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 performed in a manner:

- consistent with the principles of ecological sustainable development (ESD)
- by which the environmental impacts and risks of the activity will be reduced to ALARP
- by which the environmental impacts and risks of the activity will be of an acceptable level.

1.9.1.3 Environment Protection and Biodiversity Conservation Act 1999

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. When a person proposes to take an action that they believe may need approval under the EPBC Act, they must refer the proposal to the Commonwealth Minister for Environment.

1.9.1.3.1 Offshore Project

The GWA facility commenced operations in 1995 and subsequent tie-ins have been referred for assessment under the EPBC Act, including Echo Yodel:

- Echo Yodel Development (2000/11), the decision by the Environment Minister approved the action with conditions.
- Perseus over Goodwyn Development (2004/1326), the decision by the Environment Minister determined the action is not a controlled action.
- Greater Western Flank (GWF) Phase 1 Gas Development (2011/5980) the decision by the Environment Minister determined the action is not a controlled action if undertaken in a particular manner.
- Greater Western Flank 2 and 3 were included in the Greater Western Flank Gas Development (2005/2464), the decision by the Environment Minister determined the action is not a controlled action.

Woodside referred the Echo Yodel Development proposal under the EPBC Act, which involved drilling of two wells in the Echo Yodel field, installing subsea wellheads, each connected by a short rigid flowline to an alloy flowline linking the wells to the existing Goodwyn production platform. The activity was determined to be a ‘controlled action’ under the EPBC Act and the development was approved with conditions in January 2001 (EPBC Approval 2000/11). Conditions in relation to the referral (EPBC 2000/11) that are considered to be relevant to this EP are provided in Table 1-3. The relevance of the remaining referral conditions to this EP is described as follows:

- condition 1 is not relevant, as drilling activities are not covered under this EP. For this reason, condition 3A is also not applicable

Table 1-3: Conditions from Echo Yodel Development referral (EPBC 2000/11) relevant to Echo Yodel Subsea Decommissioning

Condition Number	Condition
2	A decommissioning plan prepared by the person taking the action and approved by the Minister must be implemented before the expiry of the approval.
3	A plan required by condition 1or 2 is automatically deemed to have been submitted to, and approved by, the Minister if the measures (as specified in the relevant condition) are included in an environment plan (or environment plans) relating to the taking of the action that: a) was submitted to NOPSEMA after 27 February 2014; and b) either: i. is in force under the OPGGS Environment Regulations; or ii. has ended in accordance with regulation 25A of the OPGGS Environment Regulations.
3B	Where an environment plan, which includes measures specified in the conditions referred to in conditions 3 and 3A above, is in force under the OPGGS Environment Regulations that relates to the taking of the action, the person taking the action must comply with those measures as specified in that environment plan.

1.9.1.3.2 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):

- NOPSEMA will not accept an EP that proposes activities that will result in unacceptable impacts to a listed threatened species or ecological community.
- 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.
- NOPSEMA will have regard to any approved conservation advice in relation to a threatened species or ecological community before accepting an EP.

1.9.1.3.3 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 (s.362 of the EPBC Act). Relevant AMPs are described in **Section 4.6.1**. 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.

1.9.1.3.4 World Heritage Properties

Australian World Heritage management principles are prescribed in Schedule 5 of the EPBC Regulations 2000. Management principles that are considered relevant to the scope of this EP are provided in **Table 1-4**.

Table 1-4: Relevant management principles under Schedule 5 – Australian World Heritage management principles of the EPBC Act

Number	Principle	Relevant Section of the EP
3	Environmental impact assessment and approval 3.01 This principle applies to the assessment of an action that is likely to have a significant impact on the World Heritage values of a property (whether the action is to occur inside the property or not). 3.02 Before the action is taken, the likely impact of the action on the World Heritage values of the property should be assessed under a statutory environmental impact assessment and approval process. 3.03 The assessment process should: (a) identify the World Heritage values of the property that are likely to be affected by the action; and (b) examine how the World Heritage values of the property might be affected; and (c) provide for adequate opportunity for public consultation. 3.04 An action should not be approved if it would be inconsistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.05 Approval of the action should be subject to conditions that are necessary to ensure protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.06 The action should be monitored by the authority responsible for giving the approval (or another appropriate authority) and, if necessary, enforcement action should be taken to ensure compliance with the conditions of the approval.	3.01 and 3.02: Assessment of significant impact on World Heritage values is included in **Section 6** Principles are met by the submitted EP. 3.03 (a) and (b): World Heritage values are identified in **Section 4** and considered in the assessment of impacts and risks for the Petroleum Activity in **Section 6**. 3.03 (c): Relevant stakeholder consultation and feedback received in relation to impacts and risks to the Ningaloo Coast and Shark Bay World Heritage Properties (which are both within the scope of this EP) are outlined in **Section 5**. 3.04, 3.05 and 3.06: Principles are considered to be met by the acceptance of this EP.

Note that Section 1 – General Principles and 2 -Management Planning of Schedule 5 are not considered relevant to the scope of this EP and, there, have not been included

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 **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 risk that are a result of the proposed activity but are not within Woodside's control.

- Planned activities 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 Identification of property associated with Petroleum Activity

At the commencement of a decommissioning project, a list of infrastructure for decommissioning is collated using as-left data. All wet stored, redundant subsea infrastructure items and locations are maintained in a database. If during the operational lifecycle, equipment is degraded, damaged, or has deteriorated to a level outside acceptance limits for use to the point where replacement is required, the redundant equipment may be wet stored on the sea floor until end of field life decommissioning. Records of redundant equipment are maintained in Woodside's Component Orientated Anomaly Based Inspection System (COABIS).

2.3 Environmental Risk Management Methodology

Woodside recognises 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 31000:2009. 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 are described in **Sections 2.3** to **2.12**.

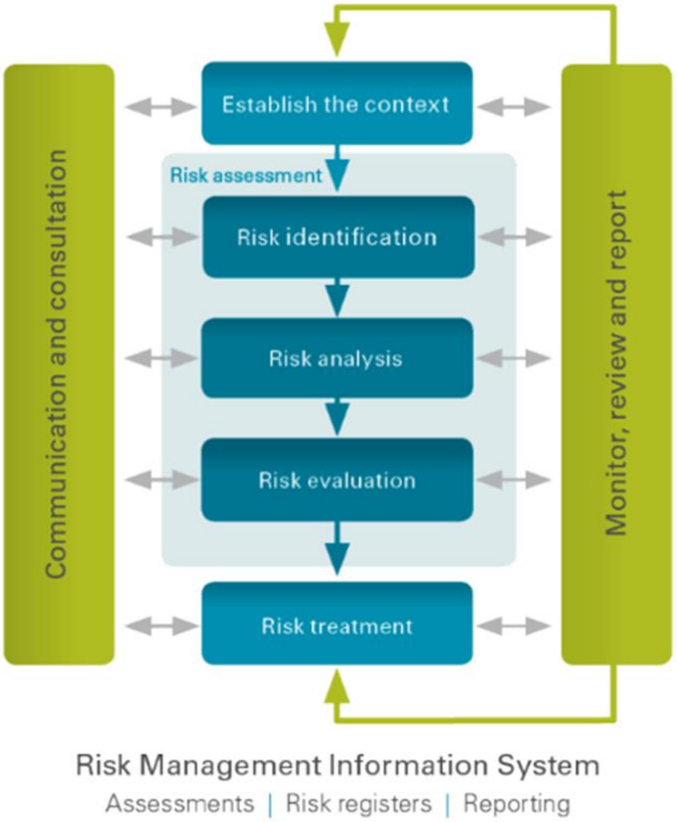

Figure 2-1: Woodside's risk management process

2.3.1 Health, Safety and Environment Management Procedure

Woodside's Health, Safety and Environment Management Procedure provides the structure for managing 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.

2.3.2 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.

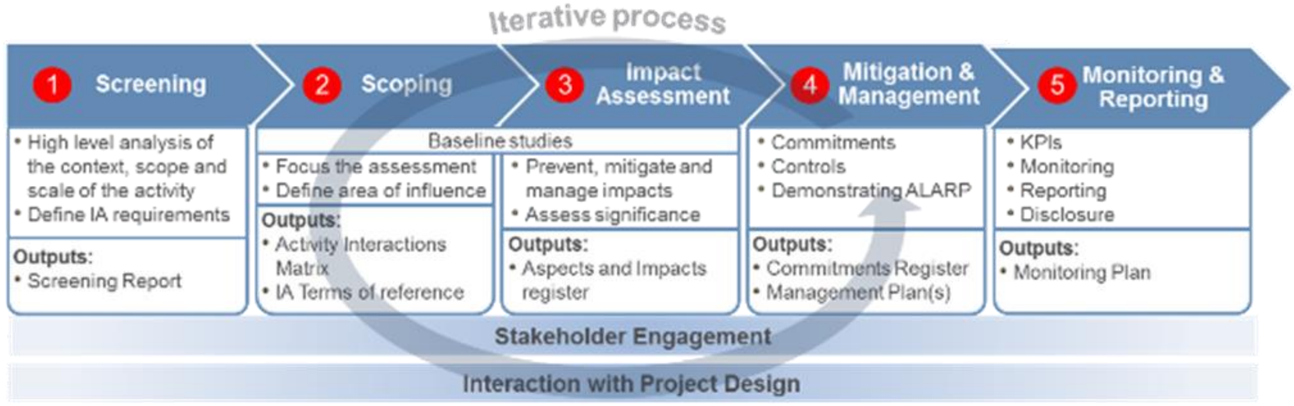

Figure 2-2: Woodside's impact assessment process

2.4 Environment Plan Process

Figure 2-3 illustrates the EP development process. Each element of this process is discussed further in **Sections 2.5** to **2.12**.

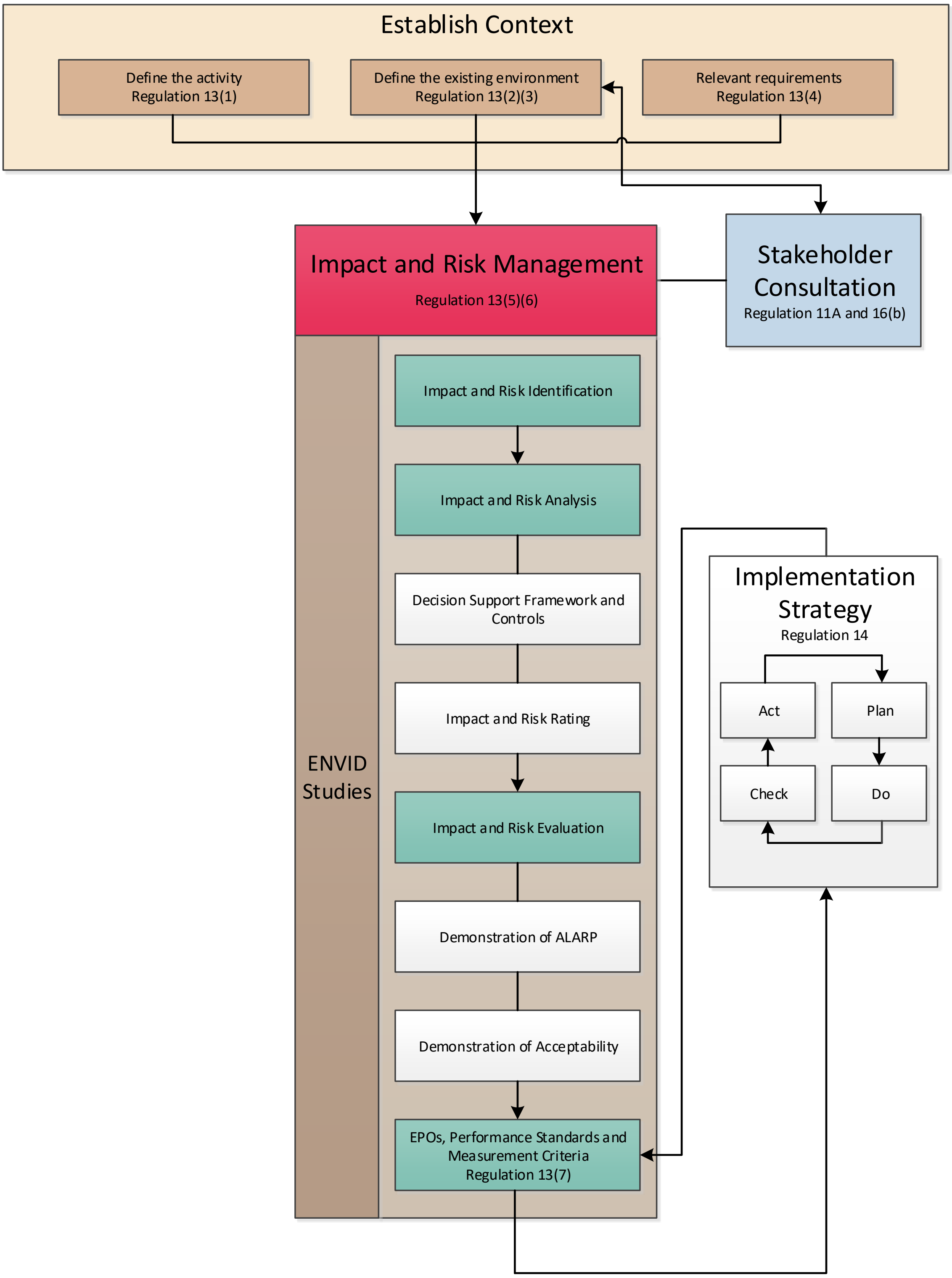

Figure 2-3: Environment plan development process

2.5 Establish the Context

2.5.1 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'[2] 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.

2.5.2 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[3] 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**) and rated for all planned and unplanned activities. Additional detail is provided for evaluating unplanned hydrocarbon spill risk.
- EPBC Act 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 6.9.1**. MNES, as defined within the EPBC Act, are addressed through Woodside's impact and risk assessment (**Section 6**).

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[2] An environmental aspect is an element of the activity that can interact with the environment.

[3] For each source of risk, the credible worst-case scenario in conjunction with impact thresholds is used to determine the spatial extent of the EMBA. The worst-case unplanned event is considered to be an unplanned hydrocarbon release, further defined for each activity through the risk assessment process. Interpretation of stochastic oil spill modelling determines the EMBA for the release, which defines the spatial scale of the environment that may be potentially impacted by the Petroleum Activities Program, which provides context to the 'nature and scale' of the existing environment.

- 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*

2.5.3 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**.

Woodside’s Corporate HSE Policy is presented in **Appendix A**.

2.6 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 (for example, 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.

Three ENVID workshops were performed specific to this EP; an ENVID workshop was conducted on 7 November 2019 for the Echo Yodel subsea infrastructure that at the time was proposed to be permanently left *in situ*. However, this position was determined to be unacceptable by NOPSEMA. On 2 February 2021 a second ENVID workshop was conducted to assess the removal of all subsea infrastructure except the pipeline. As this was also considered unacceptable by NOPSEMA, a third ENVID was conducted on 13 October 2021, to assess the removal of the pipeline and associated infrastructure. Participants included project environmental advisors, environmental engineers and subsea 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

Impacts and Risks Evaluation Summary												
Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***					
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence/Impact***	***Likelihood***	***Risk Rating***	***ALARP Tools***	***Acceptability***
Summary of source of impact/risk												

2.7 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.

2.7.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (**Section 2.8.2**), 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 (**Figure 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.

2.7.1.1 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.

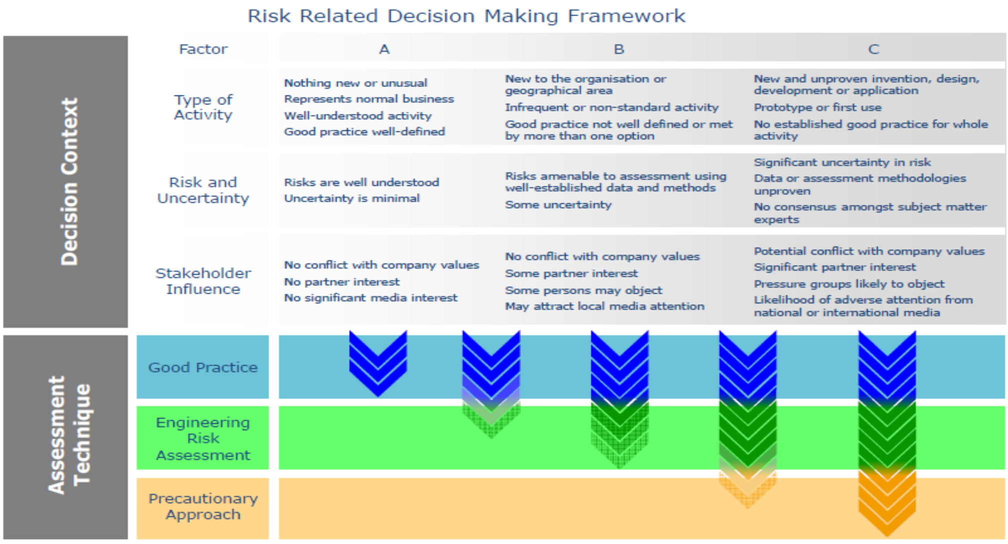
2.7.1.2 Decision Type B

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.

2.7.1.3 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.



Factor	A	B	C
Type of Activity	Nothing new or unusual Represents normal business Well-understood activity Good practice well-defined	New to the organisation or geographical area Infrequent or non-standard activity Good practice not well defined or met by more than one option	New and unproven invention, design, development or application Prototype or first use No established good practice for whole activity
Risk and Uncertainty	Risks are well understood Uncertainty is minimal	Risks amenable to assessment using well-established data and methods Some uncertainty	Significant uncertainty in risk Data or assessment methodologies unproven No consensus amongst subject matter experts
Stakeholder Influence	No conflict with company values No partner interest No significant media interest	No conflict with company values Some partner interest Some persons may object May attract local media attention	Potential conflict with company values Significant partner interest Pressure groups likely to object Likelihood of adverse attention from national or international media

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

2.7.2 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.

2.7.3 Decision Calibration

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

- **Legislation, Codes and Standards/Verification of Predictions** – verification of compliance with applicable LCS and/or GP.
- **Peer Review** – independent peer review of PJs, supported by RBA, 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 SV are considered.

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

2.7.3.1 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** which 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 should a hazardous event occur.
  - Response Equipment: Design measures or safeguards that enable clean-up/response after a hazardous event has occurred.
- **Procedures and Administration** which include management systems and work instructions used to prevent or mitigate environmental exposure to hazards.
- **Emergency Response and Contingency Planning** which includes methods to enable recovery from the impact of an event (for example, protection barriers deployed near the sensitive receptor).

2.7.4 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**).

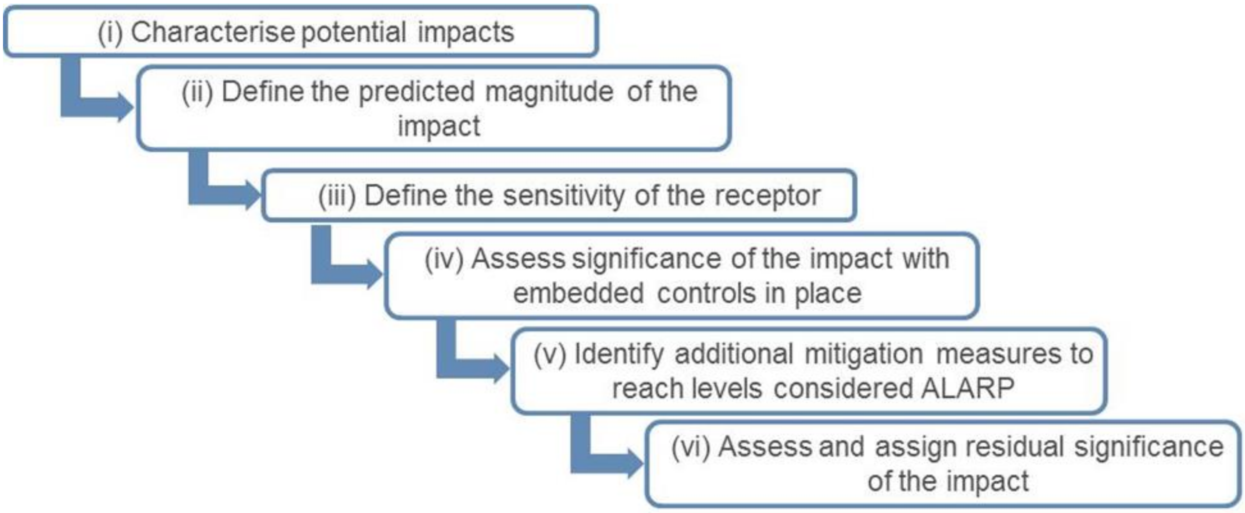


Figure 2-5: Environment impact and risk analysis

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
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

2.7.5 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:

2.7.5.1 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.

2.7.5.2 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**).

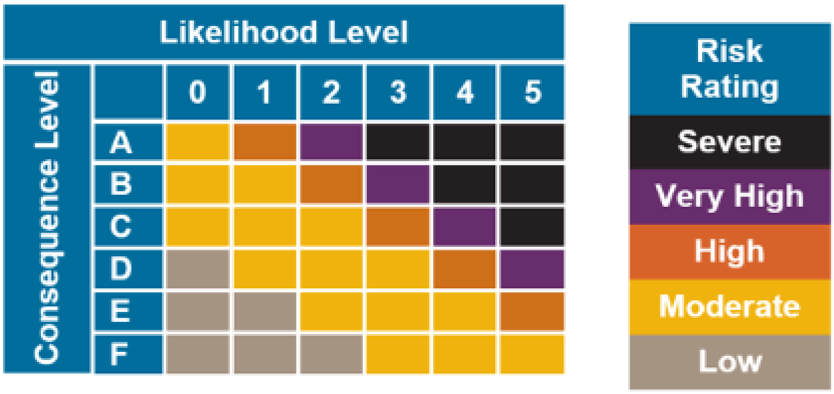
Table 2-4: Woodside risk matrix likelihood levels

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

2.7.5.3 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.



Consequence Level	Likelihood Level 0	1	2	3	4	5
A	🟨	🟧	🟪	⬛	⬛	⬛
B	🟨	🟨	🟧	🟪	⬛	⬛
C	🟨	🟨	🟨	🟧	🟪	⬛
D	🟫	🟨	🟨	🟨	🟧	🟪
E	🟫	🟫	🟨	🟨	🟨	🟧
F	🟫	🟫	🟫	🟨	🟨	🟨

Risk Rating
⬛ Severe
🟪 Very High
🟧 High
🟨 Moderate
🟫 Low

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 7**]), 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.

2.8 Impact and Risk Evaluation

Environmental impacts and risks, cover a wide range of issues, affected by differing species, persistence, reversibility, resilience, cumulative effects and variability in severity. Determining the degree of environmental risk and the corresponding threshold for whether an impact or risk 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 7** and **Appendix A**)
- external context – the environment consequence (Section 6) and stakeholder acceptability (Section 5) are considered
- other requirements – the proposed controls and risk level are consistent with national and international standards, laws and policies.

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

2.8.1 Demonstration of As Low As Reasonably Practicable

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

<table>
<tr><th>Risk</th><th>Impact</th><th>Decision Type</th></tr>
<tr><td><i>Low and Moderate
(below C level consequences)</i></td><td><i>Negligible, Slight, or Minor
(D, E or F)</i></td><td><i>A</i></td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td><i>High, Very High or Severe
(C+ consequence risks)</i></td><td><i>Moderate and above
(A, B or C)</i></td><td><i>B and C</i></td></tr>
<tr><td colspan="3">Woodside demonstrates these higher order risks, impacts and decision types are reduced to ALARP (where it can be demonstrated using GP and RBA) 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.</td></tr>
</table>

2.8.2 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

<table>
<tr><th>Risk</th><th>Impact</th><th>Decision Type</th></tr>
<tr><td><i>Low and Moderate
(below C level consequences)</i></td><td><i>Negligible, Slight, or Minor
(D, E or F)</i></td><td><i>A</i></td></tr>
<tr><td colspan="3">Woodside demonstrates these lower order risks, impacts and decision types are 'Broadly Acceptable' if they meet industry:
• legislation, codes and standards
• good practice
• professional judgement
and where further effort towards reducing risk (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.</td></tr>
<tr><td><i>High, Very High or Severe
(C+ consequence risks)</i></td><td><i>Moderate and above
(A, B or C)</i></td><td><i>B and C</i></td></tr>
<tr><td colspan="3">Woodside demonstrates these higher order risks, impacts and decision types are 'Acceptable' 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).
– 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.</td></tr>
</table>

2.9 Recovery Plan and Threat Abatement Plan Assessment

To support the demonstration of acceptability, a separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer **Section 1.9.1.3.1**). The steps in this process are:

- Identify relevant listed threatened species and ecological communities (**Section 4**).
- Identify relevant recovery plans and threat abatement plans (**Section 4**).
- 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 6.10**).
- 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**).

2.10 Environmental Performance Outcomes, Standards and Measurement Criteria

EPOs, EPSs and MC have been defined to address the potential environmental impacts and risks and are presented in **Section 6**.

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 EMS, 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 7**.

2.12 Stakeholder Consultation

Woodside conducts an assessment to identify relevant persons (as defined under Regulation 11A of the Environment regulations) prior to commencing stakeholder engagement. The assessment is included in **Section 5** and consultation material issued to stakeholders for their feedback is included in **Appendix F**.

A summary of all consultation and feedback received from stakeholders is summarised in **Table 5-2**.

3. DESCRIPTION OF THE ACTIVITY

3.1 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.

3.2 Project Overview

The Echo Yodel field started producing gas in 2001 via two subsea wells tied back to the GWA platform. The field reached the end of its economic life in 2012; the pipeline was cleaned, remaining hydrocarbons removed and put into a state of preservation in 2015/2016. The well tie-in spools were also removed from between the pipeline and the wells. A section of the pipeline was removed in 2018 at the downstream end, just upstream of the Subsea Isolation Valve (SSIV), disconnecting the pipeline from the GWA platform.

The Petroleum Activities Program described in this EP includes removal of the Echo Yodel pipeline, EHU, pig launcher and associated infrastructure. The infrastructure upstream of the SSIV will remain *in situ* and will be maintained under the GWA Operations EP until future reuse or decommissioning plans are finalised.

A generalised schematic of the Echo Yodel subsea infrastructure is presented in **Figure 3-1** and an overview of the Petroleum Activities Program is provided in **Table 3-1**.

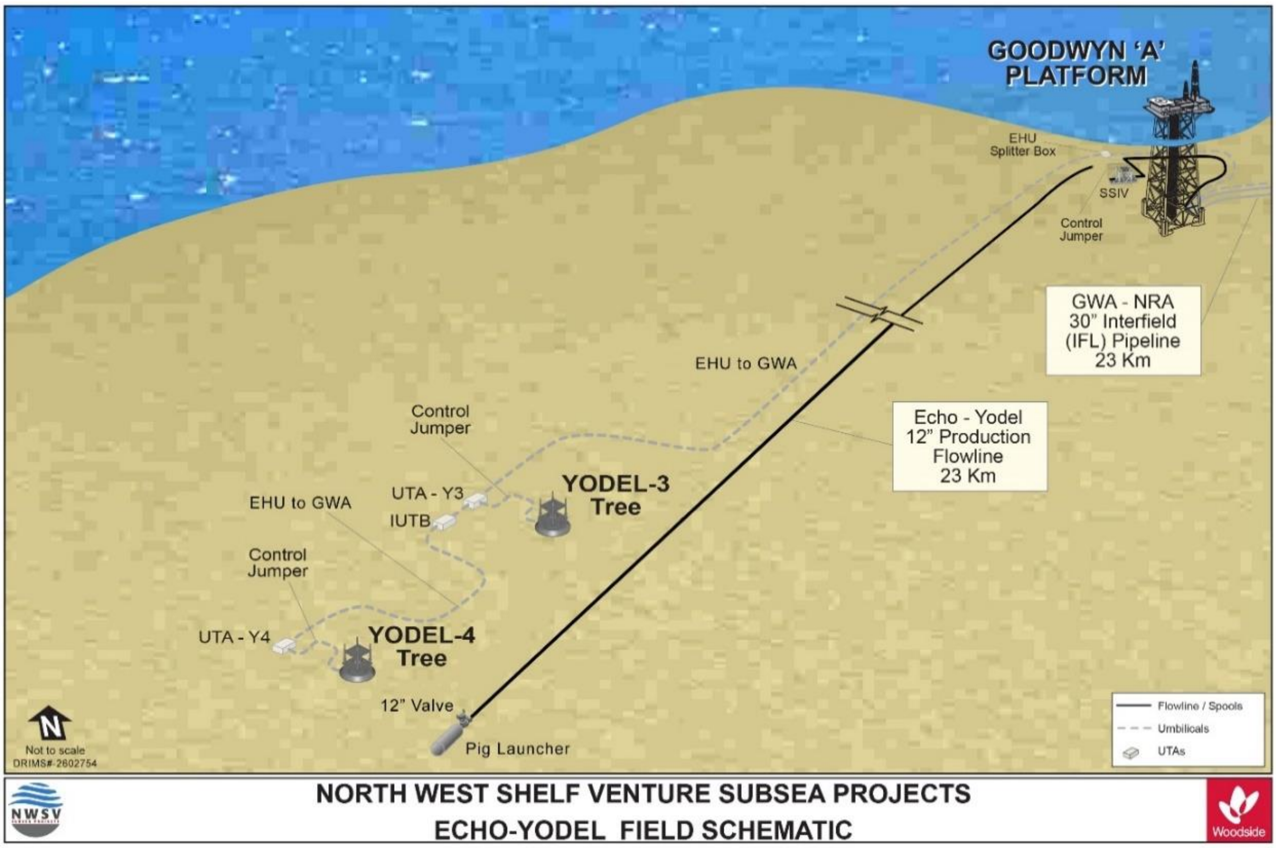


Figure 3-1: Generalised schematic of the Echo Yodel subsea infrastructure

Table 3-1: Petroleum Activities Program overview

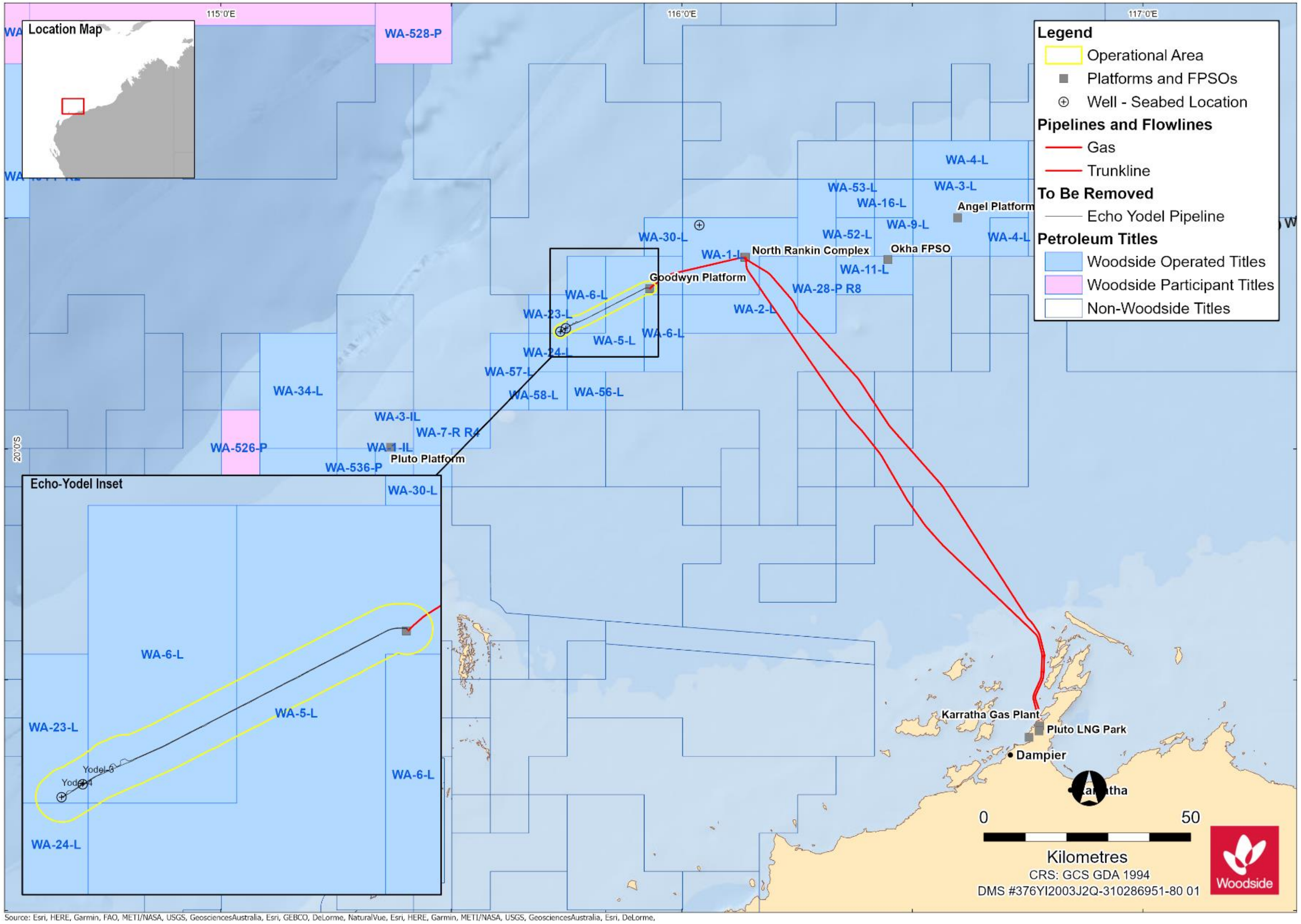
Item	Description
Permit Titles	WA-9-PL (which crosses WA-23-L, WA-6-L and WA-5-L)
Location	NWS Province
Water depth	125 m to 140 m
Pipeline, umbilical and structures	• a 23 km 12-inch diameter polypropylene coated, 13% chromium stainless steel pipeline • a 23 km 5-inch diameter High Density Polyethylene (HDPE) EHU with two UTAs, one IUTB and two infield jumpers • one pig launcher.
Project Vessels	• specialised pipe removal vessels (Reel lay or S-Lay) • offshore support vessels • general support vessels.
Key activities	Removal of the Echo Yodel pipeline, EHU, pig launcher and associated infrastructure.

3.3 Location

The proposed Petroleum Activities Program is located in permit title WA-9-PL in Commonwealth waters in the NWS Province, about 140 km north west of Dampier on the coast of Western Australia (WA) (**Figure 3-2**). The closest landfall to the permit titles is the Montebello Islands, which are approximately 68 km to the south. Approximate location details for the Petroleum Activities Program are provided in **Table 3-2**.

3.3.1 Other Wells and Infrastructure in Title Areas

The three exploration and appraisal wells, Yodel-1, Yodel-2 and Echo-1, were drilled in WA-23-Land have been permanently plugged and abandoned and the seabed cleared. There is no further work required with these wells. There is no other infrastructure in WA-23-L and WA-9-PL.



Source: Esri, HERE, Garmin, FAO, METI/NASA, USGS, GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, METI/NASA, USGS, GeosciencesAustralia, Esri, DeLorme,

Figure 3-2: Location map of the Petroleum Activities program

Table 3-2: Approximate location details for the Petroleum Activities Program

Structure	Water Depth (Approx. m LAT)	Latitude	Longitude	Permit Title
Eastern end of pipeline (SSIV)*	130	19° 39' 04.585" S	115° 55' 47.881" E	WA-9-PL
Western end of pipeline (pig launcher)	125	19° 44' 44.342" S	115° 44' 12.229" E	WA-9-PL
East end of the EHU and associated infrastructure *	130	19° 39’ 04.585” S	115° 55’ 47.881” E	WA-9-PL
Western end of the EHU and associated infrastructure	140	19° 44’ 44.342” S	115° 44’ 12.229” E	WA-9-PL

**The coordinates at the eastern end of the EHU and pipeline are subject to change based on the outcomes of future studies addressing technical and safety risk associated with undertaking removal activities within the 500 m exclusion zone of the GWA platform and surrounding live infrastructure.*

3.4 Operational Area

The Operational Area defines the spatial boundary of the Petroleum Activities Program as described, risk assessed and managed by this EP, including vessel related petroleum activities within the Operational Area. The Operational Area (**Figure 3-2**) includes a radius of 1500 m either side of the pipeline and EHU.

3.5 Timing of Removal Activities

The proposed Petroleum Activities Program is scheduled to commence between Q2 2022 and 2026 and will extend for a maximum cumulative duration of around eight months (**Table 3-3**). The execution window will enable options for early removal if they become available due to campaign synergies that arise. Timing and duration of the removal activities is subject to change due to project schedule requirements, metocean conditions, vessel availability, unforeseen circumstances and weather. Once underway, activities will be 24 hours per day, seven days per week.

Table 3-3: Summary of indicative Petroleum Activities Program

Activity	Approximate cumulative duration in the field[1]	Timing
Removal of Echo Yodel subsea pipeline, pig launcher and associated infrastructure.	Options for removal: • cut and recover: ~6 months • reverse S-lay: ~2 months • reverse reel lay: ~2 months	2022-2026 Decommissioning activities to be completed by end 2026.
Removal of Echo Yodel EHU.	~50 days	

[1] removal activities may occur over multiple campaigns if operational efficiencies with other decommissioning activities are identified and practicable. This will not affect the cumulative duration or likely success of the removal activities.

This EP has risk-assessed removal activities throughout the year (all seasons) to provide operational flexibility for requirements and schedule changes, as well as vessel availability. All the above timeframes are subject to change and, as no particular time periods have been nominated for avoidance based on environmental or stakeholder sensitivities, changes to the above will not be interpreted as ‘new stages’ against Regulation 17(5).

3.6 Infrastructure Overview

This section provides an overview of the infrastructure relevant to the Petroleum Activities Program. A description of the subsea infrastructure is summarised in **Table 3-4.**

Table 3-4: Echo Yodel Subsea Decommissioning Infrastructure Overview

Infrastructure	Materials/ Composition	Specifications	Possible residual chemicals/ hydrocarbons	Status	Last Inspection Date
Echo Yodel Pipeline					
Pipeline - Line pipe	13% chromium weldable martensitic stainless steel	Length: 22.909 km Outside diameter: 324 mm Wall thickness: 16.9 mm Total mass: 2925 tonnes	Flushed with treated seawater (Hydrosure O-3670R 1000 ppm) Water injection lines flushed with seawater, may contain scale. Total Estimated Discharge: 1515 m^3 of treated seawater	Above mudline, with some sections partially or fully buried	2018
	Pipeline - External polymer pipeline coating: Four layer polypropylene: First Layer – 0.25 mm thick fusion bonded epoxy Second Layer – 0.25 mm thick adhesive Third Layer – 10 mm thick foamed polypropylene Fourth Layer – 3 mm thick solid polypropylene	Total coating wall thickness: 13.5 mm Total coating mass: 237 tonnes		Above mudline, with some sections partially or fully buried	
	Pipeline - Field joint coating: IMPU Infill Material - Hyperlast 2851239 Solid Polyurethane (PU) Primer - Hyperlast 2874016 Rigid cross-linked Density = 692 kg/m3	Field Joint Cut Back 200 ± 10 mm Total mass: 4.0 tonnes		Above mudline, with some sections partially or fully buried	
Pipeline - Sacrificial bracelet anodes	Aluminium	Total mass: 12 tonnes		Above mudline, with some sections partially or fully buried	

Pig launcher	Stainless Steel	5.1m (L) x 1.5m (W) x 0.8m (H) Total mass: 2.8 tonnes.		Above mudline	2018
Stabilisation Aids	No stabilisation aids have been used along the Echo Yodel pipeline.				
Other Debris	3 Anode beds. No other debris have been identified. The presence of other debris will be confirmed during the as-found survey described in **Section 3.9.4.1**.				
Echo Yodel Electrohydraulic Umbilical					
EHU	Inner and outer sheath: Thermoplastic HDPE	Length: 23.4 km Outside diameter: 132 mm Total mass: 144 tonnes	Total Estimated Discharge: 18 m^3 MEG and about 21 m^3 hydraulic fluid (Marston Bentley – Type HW443 (water based)	Above mudline, with some sections partially or fully buried	2018
	Armour wire: Galvanised carbon steel (BS EN 10025 S355 J2)				
	Electric cable: Copper conductor				
	Hydraulic Hoses: Nylon Liner, HDPE				
UTAs	Galvanised carbon steel Aluminum alloy Stainless steel	Quantity: 2 Dimensions: 1.7 x 2.5 x 2.1 m Total Mass: 3.72 tonnes each	The control systems associated with the EHU (UTA and IUTBs) contain approximately 27 L of mineral based transformer oil in the electrical distribution unit.	Above mudline	2018
IUTB	Galvanised carbon steel Aluminum alloy Stainless steel Two pack polyurethane	Quantity: 1 Dimensions: 2.4 x 2.5 x 2.1 m Total Mass: 3.53 tonnes		Above mudline	2018
Stabilisation Aids: Concrete Mattress	Concrete mattress located under the EHU, to support the structure.	Quantity: 1 Dimensions: 5 x 5 x 0.2 m Weight: 6,000 kg	NA	Above mudline, with some sections partially buried	2018
Stabilisation Aids: Stabilisation Grout Bags	Grout bags are positioned on top of jumpers at selected intervals.	Quantity: 60 Dimensions: 0.5 x 0.3 x 0.12 m Weight: 11 kg	NA	Above mudline, with some sections partially buried	2018
Other Debris	ROV survey reports have identified minor debris located around or near the EHU, which mainly comprises of soft rope.				

3.6.1 Echo Yodel Pipeline As-Left Condition

The Echo Yodel pipeline is 23 km long and about 12 inches in diameter, comprising of a 13-Chrome stainless-steel inner pipeline coated by a four-layer polypropylene outer used for protection and insulation. A stainless-steel pig launcher is connected to the south end of the pipeline (**Table 3-4**). Anode beds were retrofitted to some failed field joint locations. These structures house additional anodes which are connected to the pipeline via continuity cables.

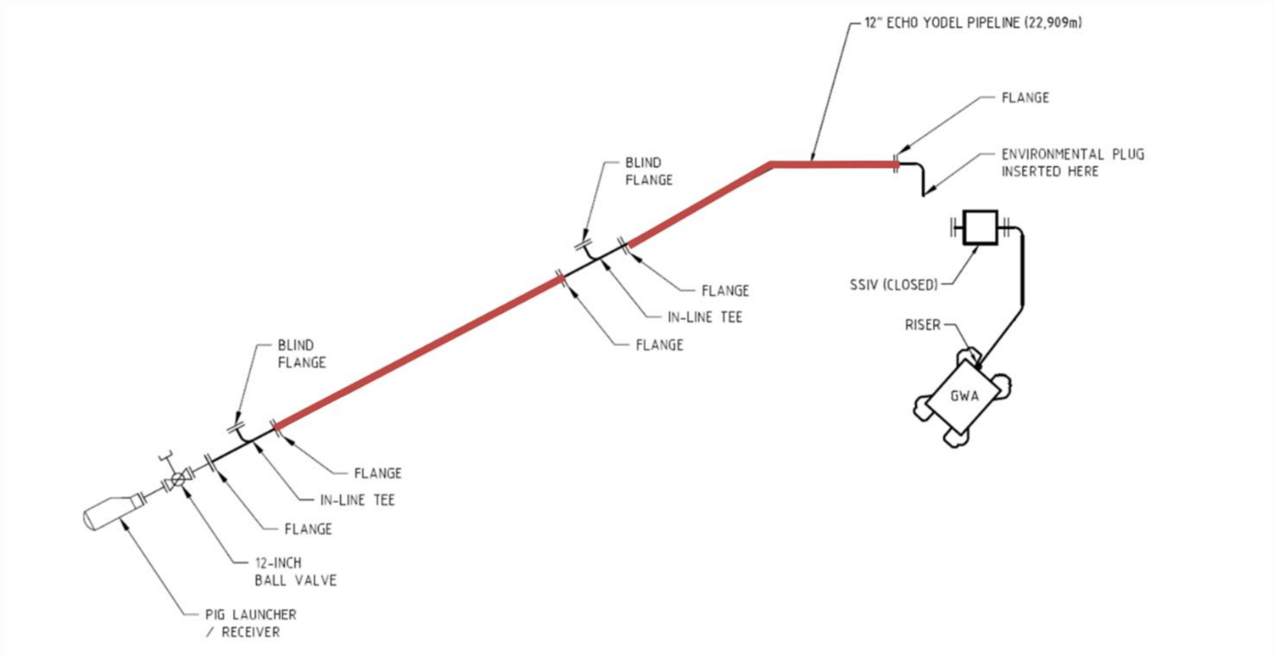


Figure 3-3: Echo Yodel Pipeline schematic

The pipeline was subject to an extensive pigging campaign in 2015/16 to clean and remove hydrocarbons from the pipeline and put into a state of preservation. The pigging campaign is described in **Section 3.7.1**. Approximately 1515 m^3 of treated seawater remains in the pipeline with the ends capped. The seawater was treated with Hydrosure 0 3670R at 1000 ppm.

A Remotely Operated Vehicle (ROV) inspection survey undertaken in 2018 shows the pipeline in various states of burial as outlined in **Section 3.9.1.4**.

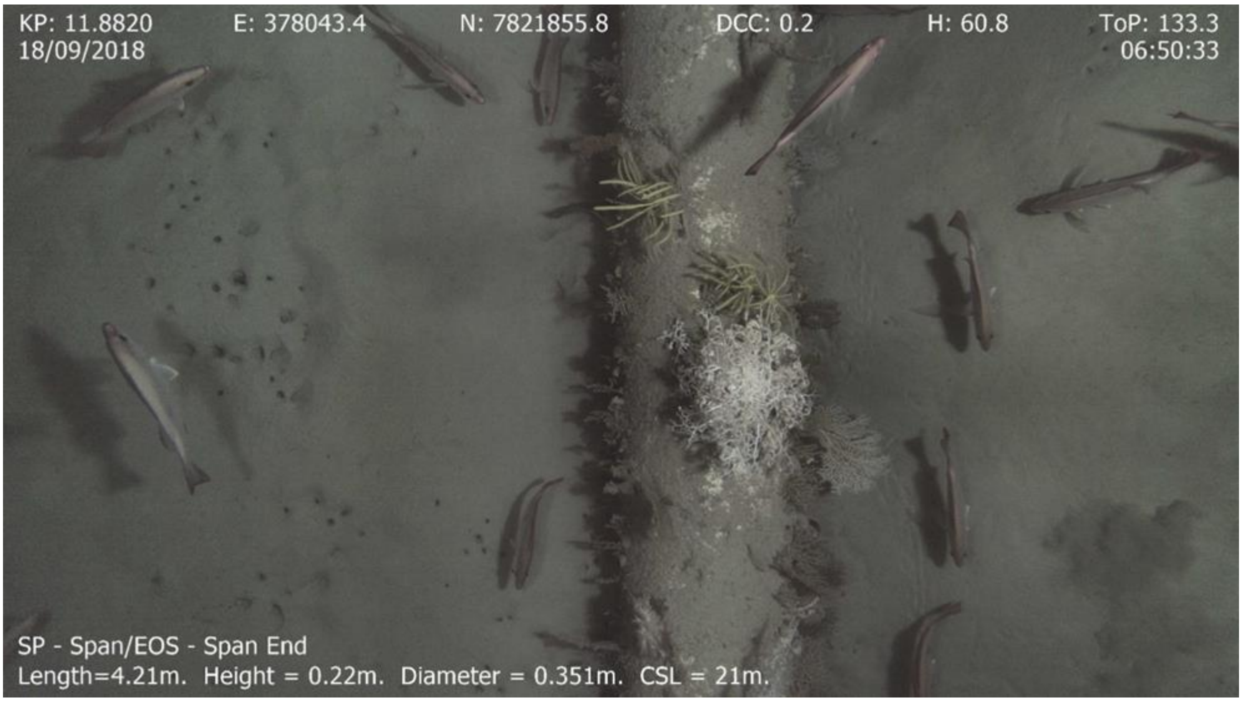


Figure 3-4: Section of the Echo Yodel pipeline *in situ*

3.6.2 Echo Yodel Electrohydraulic Umbilical As-Left Condition

The EHU comprises two sections; the main EHU is approximately 21.2 km long and the infield EHU is 1.8 km (**Figure 3-5**). The main EHU includes seven hydraulic hose cores and eight electrical cores. The infield EHU includes seven hydraulic hose cores and six electrical cores. During production, the hydraulic hose cores within the EHU provided a supply of control fluid (water-based HW443) and mono-ethylene glycol (MEG) to the Yodel-3 and Yodel-4 well X-mas trees.

Attached to the EHU are two UTAs and an IUTB, which are made of steel protected by an anti-corrosion coating system (2 pack epoxy and overcoats) together with anodes. The UTAs provided the means to distribute hydraulic and electrical power to the Yodel-3 and Yodel-4 X-mas trees via electrical and hydraulic jumpers during production. The IUTB, which is a basket containing electrical and hydraulic jumpers that are connected to the Yodel-3 UTA, provided hydraulic and electrical power from the main EHU to the infield EHU.

Aside from the IUTB and bundled electrical/hydraulic jumpers in **Figure 3-5**, the infrastructure in blue (e.g., Yodel-3 and Yodel-4 wells and GWA facility) are outside the scope of the Petroleum Activities Program covered under this EP (**Section 1.3**) and managed under other accepted EPs.

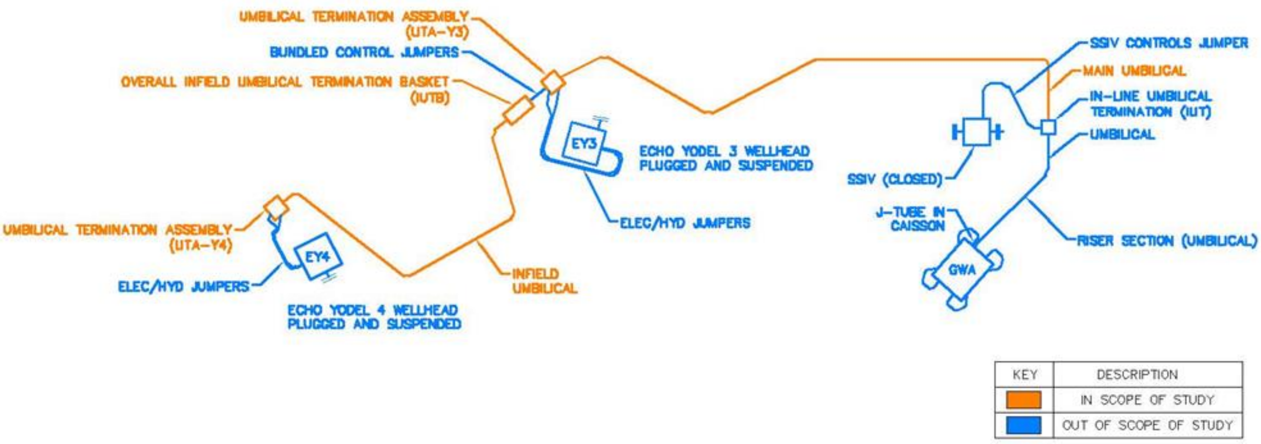


Figure 3-5: Echo Yodel EHU schematic

3.7 Surveys and Studies Undertaken to Support Petroleum Activities Program

3.7.1 Pigging Campaign and Testing for Contamination

The pipeline was tested for contaminants including hydrocarbons, Naturally Occurring Radioactive Material (NORM) and mercury. Results concluded that there are low concentrations of residual hydrocarbons; however, no contamination from NORM or mercury. As such, no environmental impacts from NORM or mercury are expected and risks from these materials have not been discussed in **Section 6**. Results from testing are explained in further detail below.

Testing is not relevant for the EHU given it does not receive hydrocarbons during production.

Hydrocarbons

The pipeline was subject to an extensive pigging campaign in 2015/16 to clean and remove hydrocarbons, scale and debris from the pipeline and bring it into a state of preservation.

Water flushed during the pigging was monitored and tested for oil in water (OIW) content. OIW sampling was undertaken at regular intervals as the treated seawater arrived at the GWA facility. Laboratory analysis of the samples was undertaken, with the residual hydrocarbon level of the treated seawater within the pipeline measured at 6 ppm.

Naturally Occurring Radioactive Material

NORM is the term used to describe materials containing radionuclides that exist in the natural environment. NORM is widely distributed, at varying concentrations in the Earth's crust and consequently also present in natural concentrations in gas and oil reservoirs (IOGP, 2016). The radionuclides of interest include uranium-238 and their radioactive decay products (such as isotopes of radium, radon, polonium, bismuth and lead) (ARPANSA, 2008).

NORM can either precipitate inside the pipeline in the form of scale or create surface contamination on the inside of pipelines during hydrocarbon production (IOGP, 2016).

Scale and debris collected in the pig catcher cleaned from inside the Echo Yodel pipeline was tested for radiation and mercury prior to being handled and disposed. Testing using a hand-held radiation rate meter indicated no radioactive contamination. Spools recovered from both the upstream (well end), and downstream (platform end) of the pipeline were also tested for NORMs using a hand-held radiation meter. Readings showed no radiation contamination as levels were at or below background levels and the spools were cleared as not NORM contaminated by a qualified radiation inspector.

The spools tested for NORM are considered appropriate and representative of the remaining Echo Yodel pipeline as the samples are from both the upstream and downstream ends of the pipeline and the spools comprise the same materials as the pipeline.

In 2022, recovered Yodel Xmas trees were analysed for NORM. Testing using a hand-held radiation rate meter indicated no radioactive contamination.

Mercury

Mercury occurs in trace quantities in hydrocarbon products and over time may accumulate in equipment, vessels and pipelines in the form of scale, or inside the lining of infrastructure (IPIECA, 2014). Mercury is transported in the gas and fluids while the conditions are hot and as temperature decreases, mercury deposition can occur. Mercury deposits will partially vaporise at relatively low temperatures (room temperature) and progressively increases as the temperature rises (IPIECA, 2014).

During pigging operations, mercury was detected in the scale removed from the pipeline during pigging. This concentrated scale and debris removed from the 23 km long pipeline, indicated that there was a potential risk of residual mercury contamination in the remaining Echo Yodel pipeline, and further studies were subsequently undertaken. Mercury vapour testing, non-destructive and destructive testing for mercury contamination was subsequently conducted.

Following recovery to deck, the spools were tested for mercury vapour using a Jerome meter, which has a detection limit of 50 ng/m^3. No mercury vapour was detected. In addition to vapour testing, High-Definition X-Ray Florescence (HDXRF) testing of the inside surface was undertaken. All readings were below detection limit (<0.5 µg/m^2). In addition to non-destructive testing, destructive testing was also undertaken. These results came back as below the detection limit of the instruments (<0.05 mg/kg).

Combined, the three methods have been used to calculate that if a set of worst-case assumptions are made (e.g. mercury content is at the limit of detection) the residual mercury is four orders of magnitude below WA Landfill Waste Class I threshold of mercury contaminated waste of 0.2 mg/kg (DWER, 2019). The results conclude that the pipeline is not mercury contaminated based on all the information and testing conducted.

The spools tested for mercury are considered appropriate and representative of the remaining Echo Yodel pipeline as the samples are from both the upstream and downstream ends of the pipeline and the spools comprise the same materials as the pipeline.

In 2022, recovered Yodel Xmas trees were analysed for mercury. Testing for mercury vapour using a Jerome meter. All results obtained were indicative of background levels measured prior to recovery.

3.7.2 Technical and Scientific Studies

To inform decommissioning planning for Echo Yodel subsea infrastructure, Woodside commissioned a number of scientific and technical engineering studies between 2016 and 2021. Scientific studies provided information about the existing environment in the vicinity of the Echo Yodel subsea infrastructure to inform decommissioning alternatives including removal and leaving infrastructure *in situ*. Studies relating to leave *in situ* are not described in this EP. Technical engineering studies were undertaken to inform recovery activities for the Echo Yodel pipeline. Further assessment of recovery methods will be undertaken through market engagement to confirm the most appropriate method(s) to recover the infrastructure (**Section 3.8**). This may include offshore sample recovery from the pipeline (**Section 3.8.1.3**).

Relevant studies completed to support the removal scope are listed in **Table 3-4**.

Table 3-5: Background studies completed and/or used for the options assessment process

Subject	Study(s) Title	Section
Corrosion Assessment	Echo Yodel Decommissioning – Echo Yodel Pipeline Corrosion Assessment (Atteris, 2021)	The findings of this study are discussed in **Section** Error! Reference source not found.
Pipeline Recoery Feasibility Report	Echo Yodel Decommissioning Study (Subsea7, 2021)	The findings of this study are discussed in **Section 3.7.2.2**.
Pipeline Coating Technical Study	Technical Desktop Study on the integrity of the pipeline coating system during the recovery operations	The findings of this study are discussed in **Section 3.7.2.3**.
Artificial habitat value	McLean, D.L., Partridge, J.C., Bond, T., Birt, M.J., Bornt, K.R., Langlois, T.J., 2017. Using industry ROV videos to assess fish associations with subsea pipelines. Continental Shelf Research 141: 76–97. Doi:10.1016/j.csr.2017.05.006. Bond, T., Taylor, M.D. 2019. Fish & Habitats of EY Pipeline & Umbilical. Report on Research Findings". Report prepared by UWA for Woodside, January 2019, Version 3, 52 pp.	The findings of these studies are discussed in **Section 4.4.1.4**

3.7.2.1 Corrosion Assessment

An engineering study was undertaken on the potential impact of external and internal corrosion to pipeline recovery operations for reverse reel-lay and reverse S-lay. Potential for internal or external corrosion does not affect the cut and recover method. The study concluded that corrosion of the pipeline is not expected to adversely impact recovery of the pipeline via reverse reel-lay or S-lay in the proposed timeframe for planned recovery (2022-2026).

The study found that it was highly unlikely that a loss of wall thickness occurred during operations given the use of corrosion resistant pipeline material, corrosion coatings and a sacrificial CP system. Any loss of in wall thickness that may have occurred while the pipeline has been suspended would also be limited given the water used to suspend the pipeline was treated with Hydrosure 0-3760R and the internal of the pipe is an enclosed environment. The study also concluded that the pipeline coating and CP system have sufficient life remaining to protect the pipe external surface beyond 2031.

Localised corrosion at damaged field joint locations could occur but is unlikely to impact pipeline integrity for recovery operations. Other potential threats to pipeline integrity which have the potential to impact recovery operations include cracking, pipeline overstress and fatigue which were assessed to be a low risk and unlikely to impact recovery operations. Where further assessment determines these threats credible, a partial or full subsea cut and recover method may be employed.

3.7.2.2 Pipeline Recovery Feasibility Assessment

In order to inform the potential pipeline recovery methods, a pipeline recovery feasibility assessment was undertaken for reverse reel lay, S-lay and subsea cut and recovery options. The assessment determined that all recovery methods are feasible. The study acknowledged that pipeline coating degradation may be a potential risk to recovery operations, but further technical studies will mitigate any risk (refer to **Section 3.8.1**). Where further work and assessment determines coating degradation may result in reverse reel-lay or S-lay being not feasible, a partial or full subsea cut and recover method may be employed. All three of these removal methods have been allowed for under this EP to allow further assessment to be undertaken and to minimise any potential threats to pipeline integrity during recovery activities.

3.7.2.3 Pipeline Coating Technical Study

A pipeline coating technical study was undertaken on the parent and field joint coating integrity associated with reverse reel-lay and S-lay removal methods. The study was undertaken to understand how potential coating degradation mechanisms could impact coating integrity and lead to coating failure which could impact pipeline recovery operations if utilising the reverse reel-lay or S-lay methods. The study concluded that there did not appear to be any significant factors that would indicate that the pipeline coating integrity has deteriorated to an extent that would compromise the pipeline recovery operations.

3.8 Decommissioning Planning

The proposed Petroleum Activities Program is scheduled to commence between Q2 2022 and 2026 (**Section 3.5**). Key milestones are presented in **Figure 3-6**. The EHU recovery market engagement is in progress and Woodside is planning to commence market engagement for the pipeline recovery around Q2-Q3 2022.

Following market engagement and when the required contracts are in place, Woodside will work directly with contractor(s) to complete the necessary engineering studies as well as to develop specific procedures and contingency plans. The aim of this work is to enable recovery activities to be executed to achieve the desired safety, environmental and technical outcomes.

The proposed offshore execution window for the Petroleum Activities Program will enable Woodside to undertake market engagement, complete engineering studies for recovery of subsea infrastructure and undertake pipeline sample collection and analysis, if required (refer to **Section 3.8.1**). The proposed offshore execution window will also enable Woodside to utilise options for early removal if they become available due to synergies, such as third-party installation campaigns or vessel of opportunity. Opportunities will be identified through Woodside's integrated offshore project planning processes.

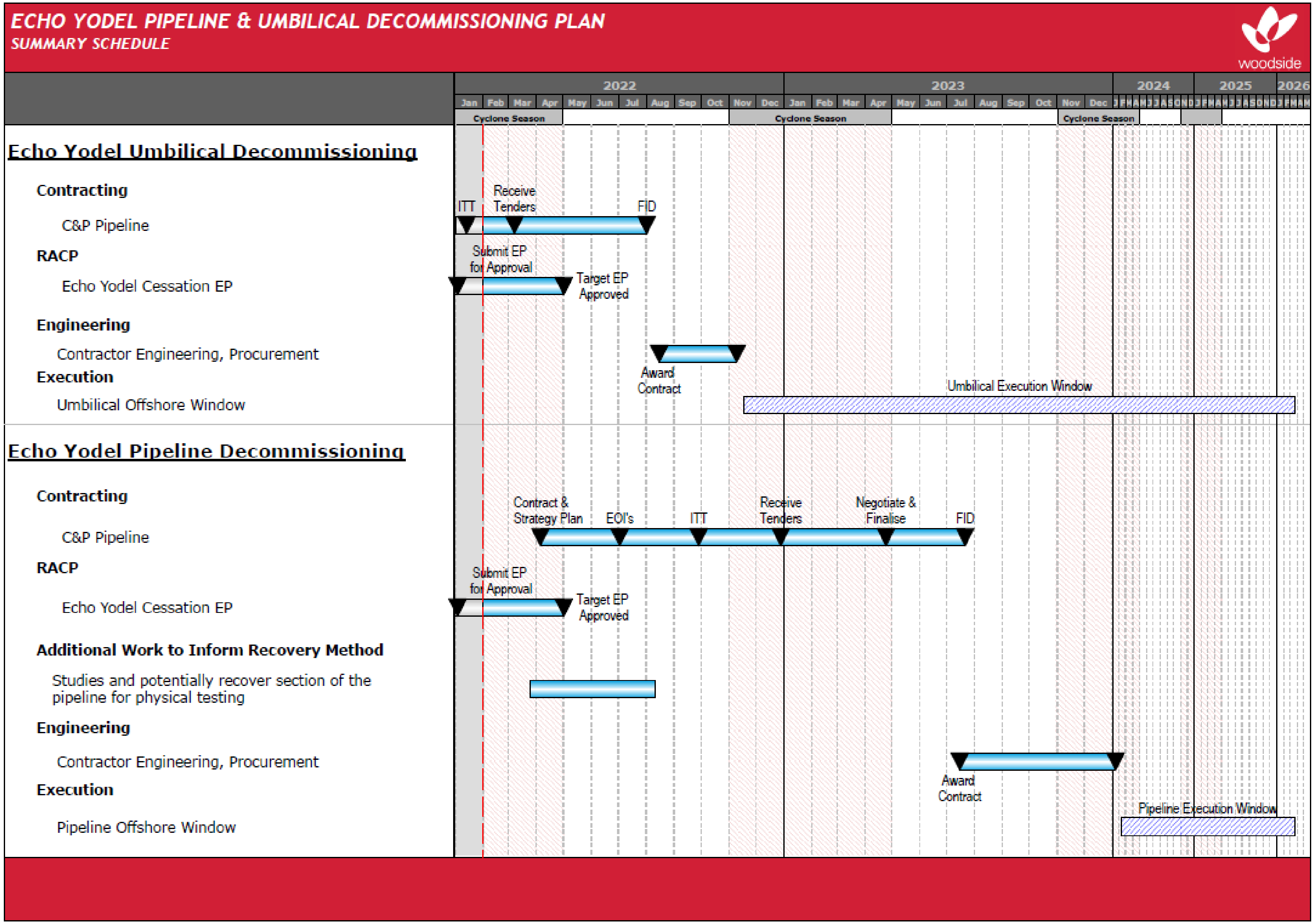


Figure 3-6: Integrated Schedule for Echo Yodel Subsea Decommissioning

3.8.1 Additional Work to Inform Recovery

3.8.1.1 Engineering Critical Assessment

Engineering critical assessment is a specialised engineering study used to analyse existing flaws in pipeline welds and determine if such flaws are acceptable to withstanding the loading conditions the pipeline will be subjected to during recovery operations, in particular the reverse reel-lay.

3.8.1.2 Pipeline Burial

A desktop study will be performed on pipeline burial and how this will impact on recovery operations. The study will consider the soil suction loading on the pipeline whilst the pipeline is being recovered in a reverse reel-lay or S-lay recovery scenario. Outcomes of this study will ensure that loads are within the vessels' capabilities.

3.8.1.3 Pipe Coating Sampling

If determined to be necessary, a sample of the pipeline may be taken for testing prior to commencing removal activities to facilitate the selection of the optimal recovery method (or hybrid methods) for the Echo Yodel pipeline. Up to 100 m of the pipeline may be removed via subsea cut and recover method as described in **Section 3.8.1.1**. The sample will be analysed to determine the suitability of the pipeline and field joint coating to support reverse reel and reverse S-lay removal.

3.8.2 Infrastructure Removal Method Selection Process

The selected removal method (or methods) for the Echo Yodel pipeline and EHU will be determined by market engagement. Following completion of additional work to inform recovery methods (**Section 3.8.1**), Woodside will engage the market to select the tenderer to recover the pipeline and EHU. The selected removal method (or methods) for the Echo Yodel pipeline and EHU will be determined by market engagement. Woodside's process to engage the market to identify a removal method(s) is as follows:

- **Expression of Interest (EOI)** – targets contractors known to Industry who 'likely' have the capability to execute, based on experience and vessels. Through the EOI process, contractors are asked to submit details of relevant experience, basic methodology for removal, and vessel requirement and availability. EOI submissions will be assessed against the requested details to create a short list of contractors who should be invited to respond to the tender.
- **Invitation to Tender and Evaluation** – documents are released to the market and evaluated once the bid submissions have been received. Based on available information in the tender, the tenderer will propose their recommended removal method, proposed equipment and vessels to be used and schedule.
- **Contract Award** – contract awarded to the selected tenderer for removal of the Echo Yodel pipeline and EHU.

3.8.2.1 Removal Method Selection Considerations

The process to confirm removal methods for the pipeline and EHU from those identified in **Section 3.9** will be determined through market engagement and based on:

- **Technical feasibility –** consideration of the technical complexity and probability of success to achieve recovery of the pipeline and EHU.
- **Health and safety risk –** consideration of potential health and safety risks of each method and can these risks be managed to ALARP.

Environmental impacts and risks will be considered as part of the selection process, but technical feasibility and health and safety criteria will be the primary drivers for final method selection. This EP has been scoped to evaluate all impacts and risks, including, where applicable, indirect impacts and risks, arising from all identified removal methods for the pipeline and EHU, to demonstrate they are all ALARP and acceptable.

3.9 Infrastructure Removal and Recovery Activities

3.9.1 Echo Yodel Pipeline

Technical studies (**Section 3.7.2**) and further work proposed (**Section 3.8.1**) will inform the optimal recovery method(s) for the Echo Yodel pipeline, taking into consideration a range of factors including technical feasibility, health and safety, environmental risk and cost. The three methods currently being considered for removal of the pipeline are:

- subsea cut and recover
- reverse reel-lay
- reverse S-lay

Or a combination of above methods (referred to as 'hybrid method').

In order to allow market engagement in the final selection of recovery method(s) for the pipeline (**Section 3.8**), all three recovery methods have been assessed within this EP. Impacts and risks associated with reverse reel-lay and reverse S-lay methods are similar in extent and duration and have therefore been considered together in **Section 6.**

During removal of the pipeline, fluids remaining within it will be released as pipeline lengths are recovered. Volumes and types of fluids in the pipeline are outlined in **Section 3.6**.

3.9.1.1 Subsea Cut and Recover

Subsea cut and recover will take approximately six months to recover the Echo Yodel pipeline. The infield duration is due to the handling and preparatory activities required to cut and recover the pipeline sections (11-12 m lengths) and the numerous interim mobilisations to offload the sections for disposal. The exact lengths of pipeline to be recovered will be determined as an outcome of technical studies considering ease of subsea recovery, on-deck handling, onshore handling and onshore road transport.

Subsea cut and recover will be undertaken as follows:

- transit to the Operational Area
- undertake as-found survey for the length of the pipeline including the SSIV end, in-line tee (ILT), pipeline end termination (PLET) and pig launcher
- perform pipeline deburial (**Section 3.9.1.4**)
- deploy cutting tool (either large shearers or diamond wire saw) and ROV (to assist positioning) to the cutting location
- the topside technicians operate the cutting tool to undertake the cut, once complete the cutting tool is moved via crane to the next cutting location, and this process is repeated approximately 50 times before recovering to deck
- deploy hydraulic grabber to the centre of the cut section and utilise the ROV to assist positioning
- crane recovers hydraulic grabber with the pipe section to deck of vessel where it is landed on the pipe rack

- marine growth removed by high pressure cleaning on the vessel and the residue will be washed back to sea
- repeat process until vessel capacity is reached
- demobilise vessel to offload recovered pipe lengths for onshore disposal
- mobilise vessel and repeat the above steps to recover all cut pipes including the ILT, PLET and pig launcher
- perform as-left survey
- demobilise.

3.9.1.2 Reverse Reel-Lay

Reverse reel-lay will take approximately 2 months to recover the Echo Yodel pipeline. It requires a specialised reel-lay vessel for the operation (**Figure 3-7**). In reverse reel-lay method, the pipeline recovery tool (PRT) is installed on the pipeline end. The PRT and the pipeline will be recovered using the abandonment and recovery winch until the tensioner can grip and proceed to pull the pipeline on to the vessel. Depending on the vessel selected it may require multiple trips to complete the removal.

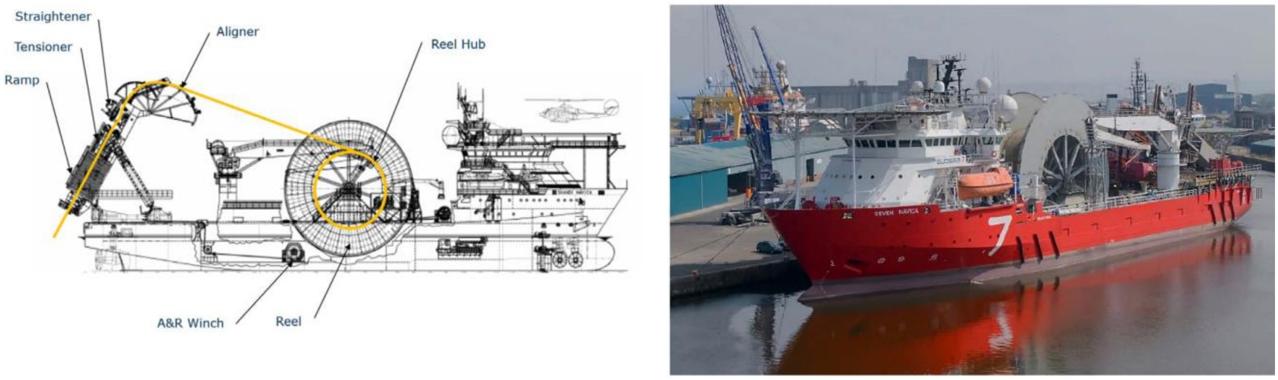


Figure 3-7: Typical reel-lay vessel

The reverse reel-lay method involves the following activities:

- transit to the Operational Area
- undertake as-found survey for the length of the pipeline including the SSIV end, ILT, PLET and pig launcher
- perform pipeline deburial (Section 3.9.1.4)
- deploy cutting tool and ROV to cutting locations (ILT, PLET and SSIV ends) and perform cutting
- install dead man anchor to pipeline end to support recovery process
- install the PRT to the pipeline end, with assistance from an ROV and recover the first pipeline end to the deck
- lock pipeline in at tensioner and remove PRT
- reel pipe until the first pipeline section is completely recovered while water jetting to remove marine growth
- install PRT and recover second pipeline section
- transit vessel to offload unreeled pipe for onshore disposal and then transit back to offshore site.
- recover third section of pipeline as per method described above

- perform as-left survey
- demobilise.

3.9.1.3 Reverse S-Lay

Reverse S-lay is the reversal of the common S-lay pipeline installation technique (**Figure 3-8**). It includes recovering the pipeline from seabed and locking it in at the tensioners before cut into manageable lengths on the vessel. Recovery of the pipeline is estimated to take approximately 2 months using reverse S-lay method.

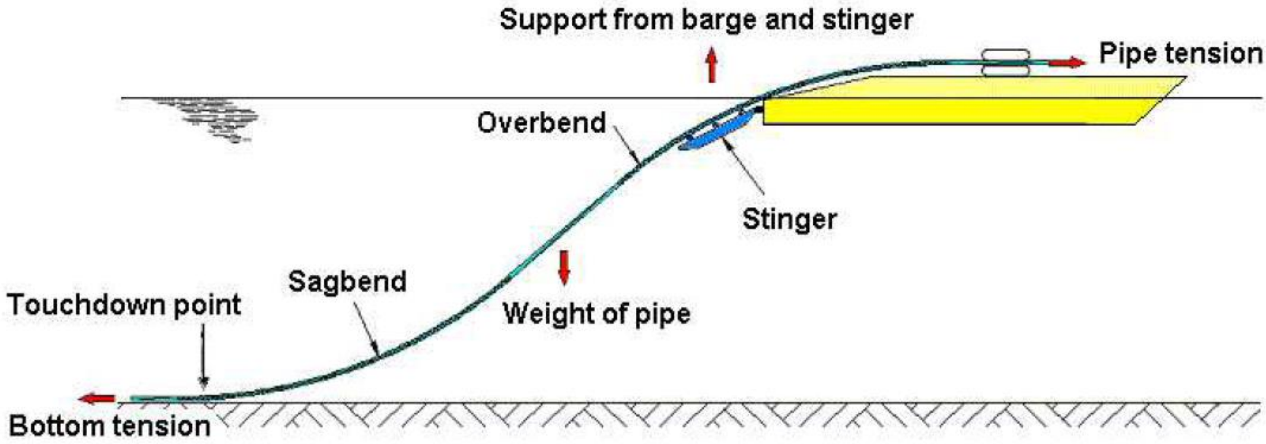


Figure 3-8: Schematic of typical reverse S-lay

The reverse S-lay recovery method involves the following activities:

- transit to the Operational Area
- undertake as-found survey for the length of the pipeline including the SSIV end, ILT, PLET and pig launcher
- perform pipeline deburial (**Section 3.9.1.4**)
- install dead man anchor to pipeline end to support recovery process
- install the PRT to the pipeline end, with assistance from an ROV and recover the first pipeline end to the deck
- lock the pipeline in at the tensioner and remove the PRT
- cut the pipelines into 11-12 m lengths and use a pipeline conveyor to transfer pipes to pipe rack
- remove marine growth using water jetting on the stinger while recovering
- load pipe lengths from pipelay vessel to PSV
- transit PSV between S-lay vessel and quayside, transporting recovered pipe for onshore disposal.
- perform as-left survey
- demobilise.

3.9.1.4 Pipeline Deburial

As described in **Section 3.7**, an ROV survey in 2018 showed the pipeline in various states of burial (**Table 3-6**). Pipeline deburial will be required to facilitate removal for all of the above methods described.

Table 3-6: Echo Yodel Pipeline Burial Assessment from 2018 Survey Data

Burial Level (%OD)	Length	Percentage of Total Length
>100 %	597 m	3 %
50 – 100 %	12,308.8 m	54 %
0 – 50 %	3,955.3 m	16 %
Spanning	6,091.9 m	27 %

Pipeline deburial will be performed using a mass flow excavator (**Figure 3-9**) or ROV jetting to remove the top cover of soil around buried sections of the pipeline to facilitate removal. Deburial activities will be followed by a post-deburial survey. For the subsea cut and recover method deburial will occur for each pipe length to allow the cut and recover, prior to undertaking deburial for the next pipe length. For reverse reel and reverse S-lay an ROV will be travelling approximately 200-300 m ahead of the recovery vessel to blow away the top cover prior to recovery.

Subsea cut and recover method will require the largest extent of pipeline deburial to provide access for the cutting tools, access for the lifting tools and to uncover the pipe length before lifting operations commence. Given the extent of deburial required for subsea cut and recover, it will be assessed in the EP as the worst-case scenario. The extent of deburial required for subsea cut and recover is estimated to be in the range of 550 m^3 to 1100 m^3 of localised sediment displacement to enable pipeline removal. This assumes between 50 to 100 % of the pipeline is buried and an additional 50 to 100 % of the pipeline diameter is covered by sediment based on the 2018 survey burial data (**Table 3-6**) and worst case predicted continued burial over time. Deburial is required to enable the cutting tool to have access to the pipe circumference.

Figure 3-9: Typical ROV Mass Flow Excavator

3.9.1.5 Marine Growth Removal

Marine growth removal will be required for the Echo Yodel pipeline for all recovery methods to enable safe recovery. Marine growth removal, utilising the methods presented in **Table 3-7,** may occur using an ROV prior to removal from the seabed or once placed onboard prior to cutting or reeling. It is estimated that 20 mm of hard marine growth and up to 180 mm of soft marine growth are present along the pipeline.

Table 3-7: Marine growth removal methods

Activity/Equipment	Description
Water jetting	Uses high-pressure water to remove marine growth
Acid (citric acid)	Chemically dissolves calcium deposits

For the subsea cut and recover method the majority of marine growth will be removed by water jetting subsea and the remainder will be water jetted on deck and flushed back to the environment. For reverse reel lay and reverse S-lay a high pressure water jetting system will be installed at the point where the pipeline is onboarded to the vessel and the marine growth will be washed and discharged to the sea.

It is anticipated that jetting will not remove 100% of the marine growth and in order to control odour of the hard marine growth, citric acid may be applied to manage the odour such that it does not become a health and safety risk. Once pipe joints are recovered onboard they will be sprayed with approximately 5 L of citric acid. An estimated volume of up to 10,000 L of citric acid may be applied to the 1850 pipe joints across the full 23 km route length as it is recovered onboard the vessel. Some residual spray from the chemical application may enter the vessel drainage system and be discharged to sea.

3.9.2 EHU

The EHU is planned to be removed in two sections, the main EHU and the infield EHU. The EHU will be recovered to a vessel either onto reels or cut into sections on the back deck of the vessel. Recovery will be undertaken using a heave compensated crane and associated equipment. The UTAs, IUTB, control jumpers will likely be recovered to the same vessel removing the EHU.

ROVs will be used to support the activities, including cutting and/or disconnecting infrastructure from other equipment and placing infrastructure (e.g., jumpers) into ROV baskets to allow recovery. ROVs will also be used to perform water jetting around the base of some infrastructure (e.g., UTAs) to avoid any suction resistance or to remove marine growth, relocate sediment.

During removal of the EHU, fluids remaining within it are likely to be released as the EHU is spooled onto the recovery reels. Volumes and types of fluids in the EHU are outlined in **Section 3.6**.

3.9.2.1 Marine Growth Removal

Marine growth removal will be required for the EHU to enable safe recovery. For marine growth removal, a high pressure water jetting system will be installed at the point where the EHU is onboarded to the vessel and the marine growth will be washed and discharged to the sea. No chemicals will be used.

3.9.3 Stabilisation Aid and Debris Recovery

Stabilisation grout bags will be cut open to release contents to seabed, then lifted via attached slings and recovered to surface. Recovery of a concrete mattress will be attempted using an ROV and placed into a ROV basket. Some water jetting may be required to enable recovery. Water jetting allows access under the structure to safe retrieval. It is expected that sediment relocation will be isolated to around the structure. Other debris (i.e. soft rope) already identified during ROV surveys or identified during the as-found survey will be recovered using an ROV and ROV basket.

3.9.4 Inspection, Maintenance and Repair Activities

The Echo Yodel pipeline, EHU and associated infrastructure has been left in a state of preservation that is not expected to require IMR activities prior to decommissioning. As outlined in **Section 3.8.1**, technical studies have shown that the current condition of the pipeline does not preclude removal within the timeframe presented in this EP (refer to **Section 3.5**).

IMR may be undertaken (e.g. an as-found survey; **Section 3.9.4.1**) to ensure the integrity of the infrastructure for recovery. IMR activities are typically undertaken from an offshore support vessel via ROV. IMR activities often require deployment frames/baskets, which are temporarily placed on the seabed. These frames/baskets typically have a perforated base with a seabed footprint of about 15 m^2. The frames/baskets are recovered to the vessel at the end of the activity.

3.9.4.1 As-Found/As-Left Surveys

An as-found and as-left survey will be conducted along the Echo Yodel pipeline, EHU and other subsea infrastructure locations. An as-found survey is used to identify any issues with the condition of the infrastructure (i.e. burial status) that have the potential to affect decommissioning activities, as well as to identify suitable landing areas for equipment and work baskets. The as-found survey may also identify miscellaneous debris for recovery (in addition to any known infrastructure).

For the pipeline, an as-found survey may utilise an ROV or multibeam echo sounder (MBES) or a magnetometer (or similar) or side scan sonar (SSS), in addition to an ROV mounted camera. MBES and SSS acoustic surveys emit high frequency acoustic signals and are used to identify seabed features as well as any remaining infrastructure that requires removal. For the EHU, only an ROV mounted camera will be utilised for the as-found survey

An as-left survey will be undertaken following the completion of decommissioning activities to confirm that all infrastructure has been recovered and identify any debris for recovery. An as-left survey is planned to be completed once recovery of the pipeline is complete.

An as-left survey using acoustic surveying in combination with an ROV mounted camera will be utilised once EHU has been recovered. The as-left for the pipeline will be undertaken using an ROV and/or acoustic surveying (or similar) approximately 30 m on either side of the pipeline route to identify debris. Any debris identified will be recorded for recovery.

The method of the as-found/as-left surveys are the same for all recovery methods. Upon vessel arrival/departure in the Operational Area, an ROV and/or acoustic survey equipment (or similar) shall be mobilised to perform a detailed survey of the seabed area.

3.10 Project Vessels

Several vessel types will be required to complete the Petroleum Activities Program, including:

- specialised pipe removal vessels (reel lay or S-lay pipeline installation vessels)
- offshore support vessels (e.g. construction vessel for cut and recover and removal of the EHU)
- general support vessels including:
  - PSV
  - anchor handling and cargo vessels for general supply activities.

If a hybrid recovery method is selected, a combination of specialised pipe removal and offshore support vessels may be required. The appropriate vessel(s) will be determined before execution, depending on detailed activity planning and vessel availability.

All project vessels working in the title area will operate on marine diesel oil (MDO) only, regardless of vessel capacity. The contractor Invitation to Tender will specify that any other fuel tanks (e.g. heavy fuel oil) will be flushed prior to entering the Operational Area.

All project vessels are subject to the Marine Offshore Assurance process and review of the Offshore Vessel Inspection Database (OVID). All required audits and inspections will assess compliance with the laws of the international shipping industry, which include safety and environmental management requirements, and maritime legislation including International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 (MARPOL), and other International Maritime Organization standards.

For power generation, vessels may use diesel-powered generators and/or LNG. All vessels will display navigational lighting and external lighting, as required for safe operations. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant legislation, specifically the Navigation Act 2012 and relevant Marine Orders. The support vessels will be lit to maintain operational safety on a 24-hour basis.

3.10.1 Specialised Pipe Removal Vessels and Offshore Support Vessels

Removal of the Echo Yodel pipeline, EHU, pig launcher and associated infrastructure is planned to be done by a specialised pipe removal vessel (reel lay, S-lay) or offshore support vessel (subsea cut and recover and EHU removal).

Three examples are presented below for vessels that could be used for removal activities (**Table 3-8**).

Table 3-8: Example vessel specifications

Component	Specification Range		
	Skandi Singapore	Seven Oceans	DLV 2000
Recovery method/ Vessel type	Subsea Cut & Recover Construction/Offshore support Vessel	Reverse reel lay/Specialised pipe removal vessel	Reverse S-lay/Specialised pipe removal vessel
Length overall	107 m	157 m	184 m
Breadth	21 m	28 m	39 m
Draft	6.6 m	7.5 m	7.9 m
Accommodation	100 personnel (maximum persons on board)	120 personnel (maximum persons on board)	401 personnel (maximum persons on board)
Station Keeping	Minimum of DP2		
Fuel capacity	1153 m^3	1415 m^3	1000 m^3

3.10.2 General Support Vessels

During the Petroleum Activities Program, general support vessels (e.g. PSV, cargo vessels and anchor handling vessels) will be used to transport equipment and materials between the project vessels and port. The general support vessels are also able to assist in implementing the Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H**), should an environmental incident occur (e.g., spills). General support vessels may also have additional capability, such as ROV activities, deployment of subsea equipment, monitoring and inspection.

3.10.3 Bunkering

It is expected that the specialised pipeline removal vessels and offshore support vessels will refuel within the Operational Area, as required. General support vessels will preferentially refuel at port but may be required to refuel in the Operational Area. Other fuel transfers may occur on board the vessels such as refuelling of cranes, helicopters or other equipment as required.

3.11 Other Support

3.11.1 Remotely Operated Vehicles

Project vessels may be equipped with an ROV system that is maintained and operated by a specialised contractor aboard the vessel. ROVs may be used for activities such as:

- visual inspections/observations
- placement of ROV tool baskets on the seabed
- open water tool observation and guidance
- localised sediment removal
- water jetting.

3.11.2 Helicopters

During the Petroleum Activities Program, crew changes will be performed using helicopters as required. Helicopter operations within the Operational Area are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck.

3.12 Project Wastes

Generated wastes may be broadly classified into one of two categories:

1. general non-hazardous solid wastes
2. hazardous solid and liquid wastes.

Non-hazardous solid wastes produced on project vessels include cardboard, plastic, aluminium and paper.

Hazardous wastes are materials that are harmful to human health or the environment and include waste prescribed in the Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 and WA Environmental Protection (Controlled Waste) Regulations 2004. Hazardous wastes stored on vessels may include:

- lubricating oils, hydraulic fluids, cleaning and cooling agents
- oil filters and batteries
- oily rags
- paint, aerosol cans
- medical wastes
- acids/caustics and solvents.

Key waste materials generated from infrastructure removal include:

- Approximately 23 km of pipeline material 13% chromium alloy
- Pipeline 4LPP coating
- Approximately 24 km of control umbilical and associated UTA’s comprising of steel, copper, HDPE and Nylon 11.

3.12.1 Management of Wastes and Recovered Infrastructure

Non-hazardous waste materials will be stored on board the project vessels in suitable containers (segregated from hazardous waste materials) for transport back to shore for disposal/recycling in accordance with local regulations.

All hazardous waste generated will be documented and tracked, segregated from other waste streams and stored in suitable containers. Recyclable hazardous wastes, such as oils and batteries, will be stored separately from non-recyclable materials. All of these wastes are disposed of onshore at a licensed facility.

All waste streams will be classified and managed in accordance with applicable legislative requirements, or in accordance with international guidance where applicable, for example:

- Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 which implements the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- WA Environmental Protection (Controlled Waste) Regulations 2004
- MARPOL: International Convention for the Prevention of Pollution from Ships
- International Finance Corporation: EHS Guidelines: Environmental Waste Management.

Recovered infrastructure will be managed through the projects contracting strategy which will include an infrastructure disposal strategy where waste management solutions will be assessed against the principles of the waste management hierarchy.

While no NORMs/mercury contamination is expected (**Section 3.7.1**), handling and disposal of the infrastructure includes contingency procedures for dealing with contaminants onshore and offshore, should any be detected (**Section 6.9.5**).

3.13 Project Fluids

3.13.1 Assessment of Project Fluids

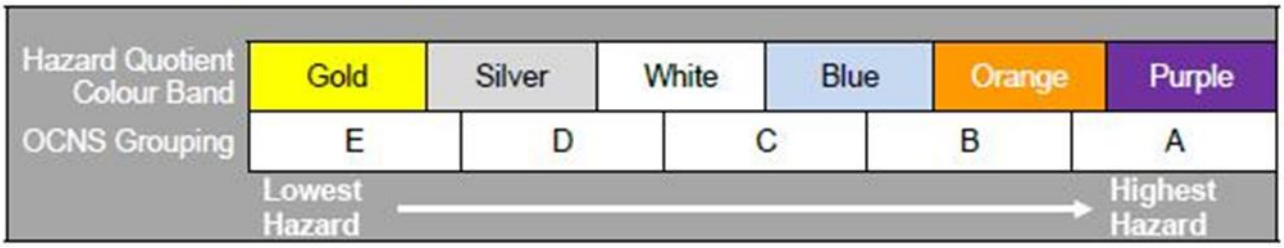
All chemicals that are used during Petroleum Activities Programs are evaluated using a defined framework and set of tools, to ensure the potential impacts are acceptable, ALARP and meet Woodside’s expectation for environmental performance. This is also the case for chemicals that have been left in the Echo Yodel pipeline and EHU. Whilst the assessment of these chemicals has been completed during activities outside the scope of this EP, the following overview of the Woodside chemical assessment process provides context for how the chemicals that may be released under this EP were assessed.

The Woodside chemical assessment process follows the principles outlined in the Offshore Chemical Notification Scheme (OCNS), which manages chemical use and discharge in the United Kingdom and the Netherlands. It applies the requirements of the Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic [OSPAR] Convention). The OSPAR Convention is widely accepted as best practice for managing chemicals.

All chemical substances listed on the OCNS ranked list of registered products have an assigned ranking based on toxicity and other relevant parameters, such as biodegradation and bioaccumulation, in accordance with one of two schemes (as shown in Figure 3 9):

- Hazard Quotient (HQ) Colour Band: Gold, Silver, White, Blue, Orange and Purple (listed in order of increasing environmental hazard), or

- OCNS Grouping: E, D, C, B or A (listed in order of increasing environmental hazard). Used for inorganic substances, hydraulic fluids and pipeline chemicals only.



Hazard Quotient Colour Band	Gold	Silver	White	Blue	Orange	Purple
OCNS Grouping	E	D	C	B	A	

Figure 3-10: OCNS ranking scheme

Chemicals fall into the following assessment types:

- No further assessment: Chemicals with an HQ band of Gold or Silver, or an OCNS ranking of E or D with no substitution or product warnings, do not require further assessment. Such chemicals do not represent a significant impact on the environment under standard use scenarios and are therefore considered ALARP and acceptable.
- Further assessment/ALARP justification required: The types of chemicals that need to be assessed further to understand the environmental impacts of discharge into the marine environment are:
    - chemicals with no OCNS ranking
    - chemicals with an HQ band of white, blue, orange, purple or an OCNS ranking of A, B or C
    - chemicals with an OCNS product or substitution warning.

Further assessment includes assessing the ecotoxicity, biodegradation and bioaccumulation of the chemicals in the marine environment in accordance with the CEFAS hazard assessment and the Department of Mines and Petroleum (now Department of Mines, Industry Regulation and Safety) Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline (2013).

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 EMBA 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 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. The ecological impact thresholds used to delineate the EMBA are defined in **Table 4-1** and **Section 6.9.1.1**. The worst-case credible spill scenario for this EP is a marine diesel spill as a result of vessel collision. No shoreline contact was identified above thresholds defined in **Table 4-1**, therefore, these hydrocarbons do not form part of the EMBA.

Woodside recognises that hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds defined in **Table 4-1** and **Section 6.9.1.1**. 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 (MPA), National and Commonwealth Heritage Listed places, areas of tourism and recreation, and commercial and traditional fisheries. For this EP, the socio-cultural EMBA for surface hydrocarbons encompasses an area fully within the boundaries of the EMBA for ecological impacts. The EMBA and socio-economic EMBA are shown in **Figure 4-1**.

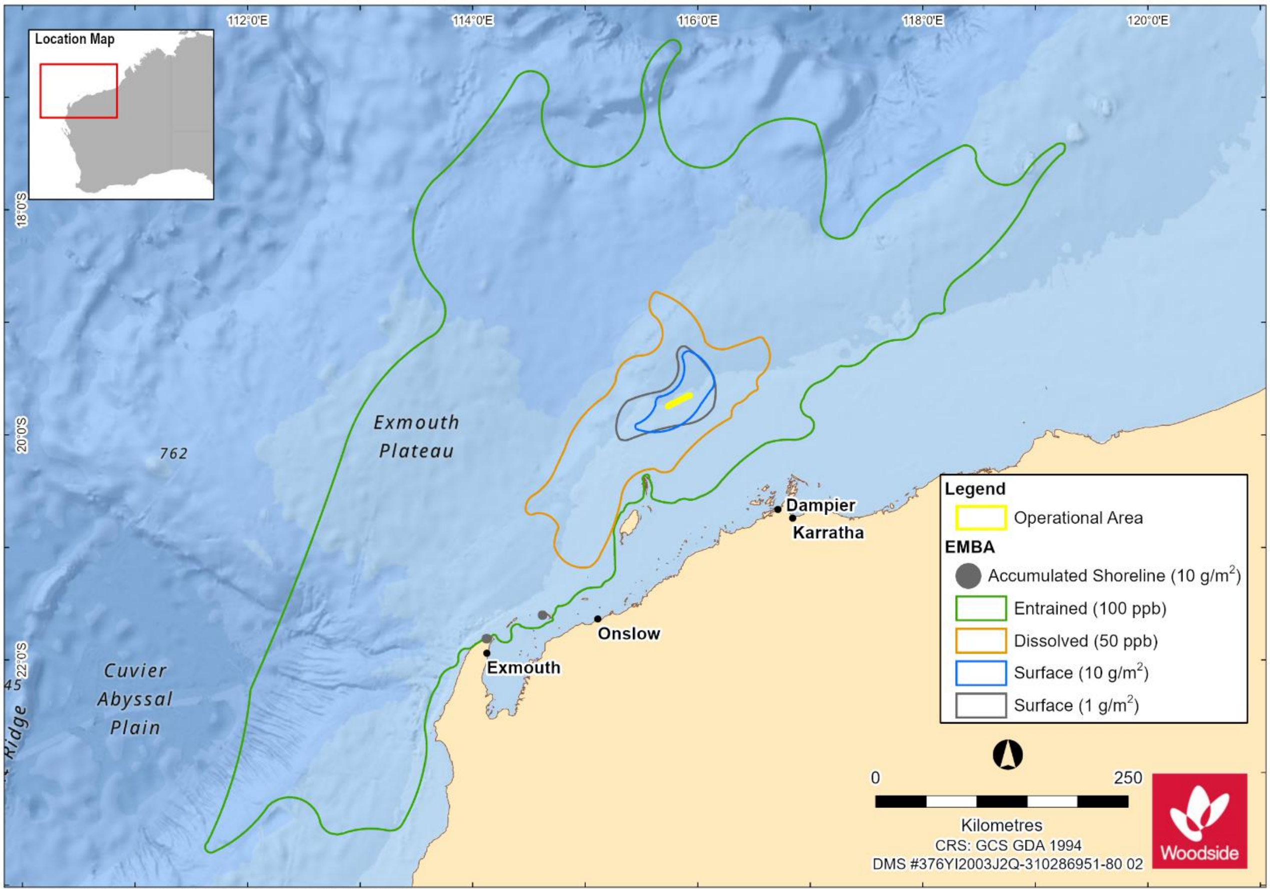
It should be noted that each EMBA presented does not represent the predicted coverage of any one hydrocarbon spill or a depiction of a slick or plume at any particular instant in time. Rather, the areas are a composite of a large number of theoretical paths, integrated over the full duration of the simulations under variations in metocean conditions.

Table 4-1: Hydrocarbon Spill Thresholds used to Define Exposure Areas 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 the 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, is below concentrations at which ecological impacts are expected to occur. This low exposure value also establishes planning area for scientific monitoring (NOPSEMA guidance note: A652993, April 2019).	
Dissolved	50 ppb This represents potential toxic effects, particularly sublethal 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 are associated with ecological impacts. Therefore, dissolved hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur.		10 ppb This low exposure value establishes planning area for scientific monitoring (based on potential for exceedance of water quality triggers) (NOPSEMA guidance note: A652993, April 2019). This
Entrained	100 ppb		

Hydrocarbon Type	EMBA[1]	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
	This represents potential toxic effects, particularly sublethal 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 are associated with ecological impacts. Therefore, entrained hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur.		area is described further in **Appendix D:** Figure 5-1. In the event of a spill, DNP will be notified of AMPs which may be contacted by hydrocarbons at this threshold.
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 6.9.1.1.***



Sources: Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 4-1: Environment that may be affected by the Petroleum Activities Program

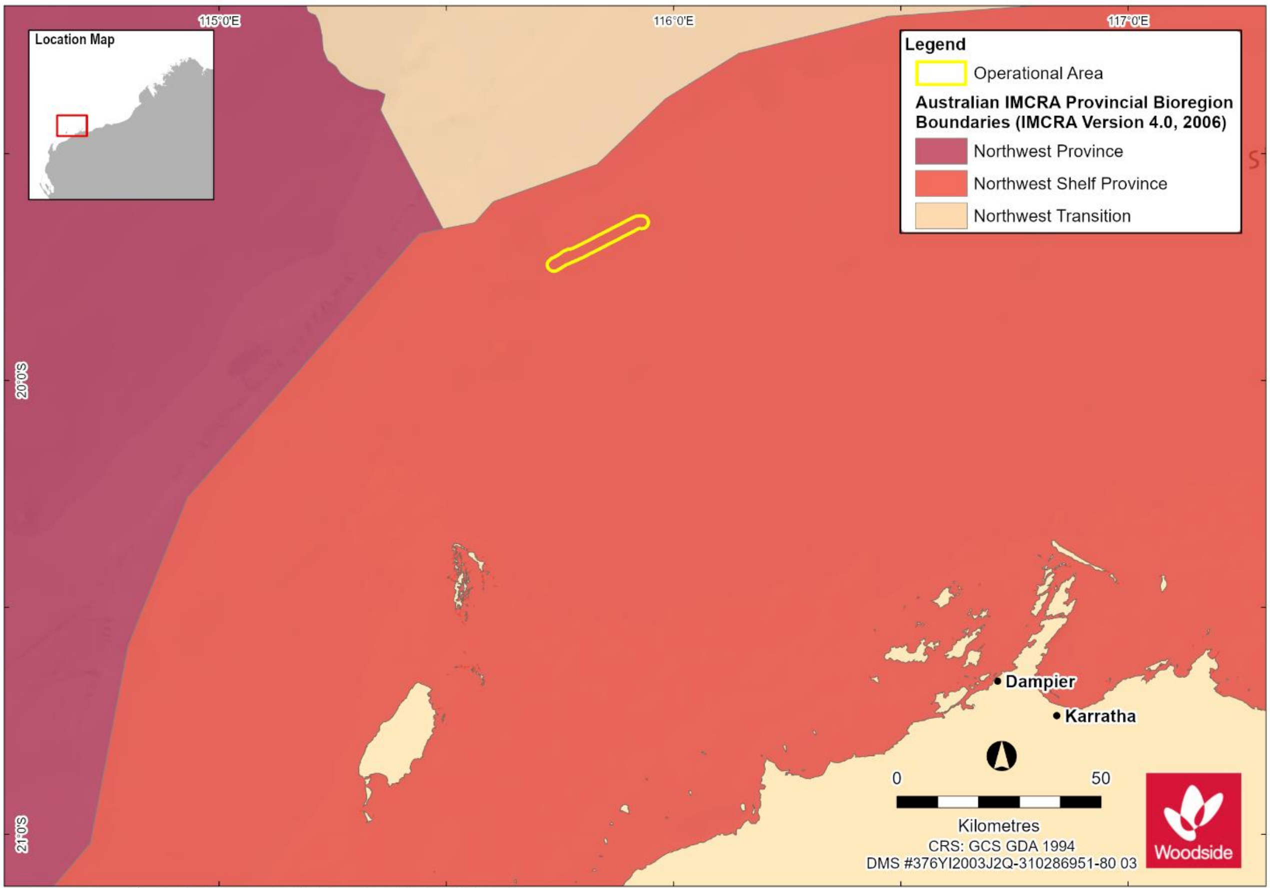
4.2 Regional Context

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 125 m to 140 m. Within the NWMR, the Operational Area lies within the NWS Province.

The NWS Province is characterised by the following biophysical features (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2012a):

- There are transitional climatic conditions between dry tropics to the south and humid tropics to the north.
- There are strong seasonal winds and moderate offshore tropical cyclone activity.
- Deeper surface waters are tropical year-round and highly stratified during summer months (thermocline occurring at water depths between 30 and 60 m). In winter, surface waters are well mixed with thermoclines occurring deeper, around 120 m depth.
- Surface ocean circulation is strongly influenced by the Indonesian Through Flow (ITF) via the Eastern Gyre. During the summer when the ITF is weaker, south-west winds cause intermittent reversals in currents. These events may be associated with occasional weak, shelf upwellings.
- Internationally significant migratory routes, resident populations, and breeding and/or feeding grounds for a number of EPBC Act listed threatened and migratory marine species, including humpback whales, marine turtles, whale sharks, seabirds and migratory shorebirds, are all present.
- The region has high species richness, but a relatively low level of endemism compared to other areas of Australian waters. Furthermore, most of the region’s species are tropical and are recorded in other areas of the Indian Ocean and Western Pacific Ocean.
- Benthic communities range from nearshore benthic primary producer habitats, such as seagrass beds, coral communities and mangrove forests, to offshore soft sediment seabed habitats associated with low density sessile and mobile benthos, such as sponges, molluscs and echinoids (with noted areas of sponge hotspot diversity).
- The seabed in the region consists of sediments that generally become finer with increasing water depth, ranging from sand and gravels on the continental shelf to mud on the slope and abyssal plain. About 60 to 90% of the sediments in the region are carbonate derived (Brewer *et al.*, 2007). The distribution and re-suspension of sediments on the inner shelf is strongly influenced by the strength of tides across the continental shelf as well as episodic cyclones. Further offshore, on the mid to outer shelf and on the slope, sediment movement is primarily influenced by ocean currents and internal tides, the latter causing re suspension and net downslope deposition of sediments (DSEWPaC, 2012a).

Other marine bioregions within the EMBA include the Northwest Transition, Northwest Province and Central Western Transition (**Figure 3-2**).



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

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

4.3 Physical Environment

Unless specifically stated, the next sections provide information about the physical environment of the Operational Area and/or immediately surrounding region. The physical environment of the EMBA is only described if relevant to the broader risk assessment.

4.3.1 Climate and Meteorology

4.3.1.1 Seasonal Patterns

The Operational Area, which lies within the NWS Province, experiences a tropical monsoon climate, with distinct wet (October to April) and dry (May to September) seasons (BoM, 2020). There are often distinct transition periods between the summer and winter regimes, which are characterised by periods of relatively low winds (Pearce *et al.*, 2003).

Air temperatures in the region, as measured at the North Rankin A platform (which is about 23 km from the closest point of the Operational Area), indicate maximum average temperatures during summer of 39.5 ºC and minimum temperatures of 15.6 ºC in winter (BoM, 2020; Woodside, 2012).

Rainfall in the region predominantly occurs during the wet season (summer), with highest rains observed during late summer (BoM, 2020), often associated with the passage of tropical low pressure systems and cyclones (Pearce *et al.*, 2003). Rainfall outside this period is typically low (**Figure 4-3**).

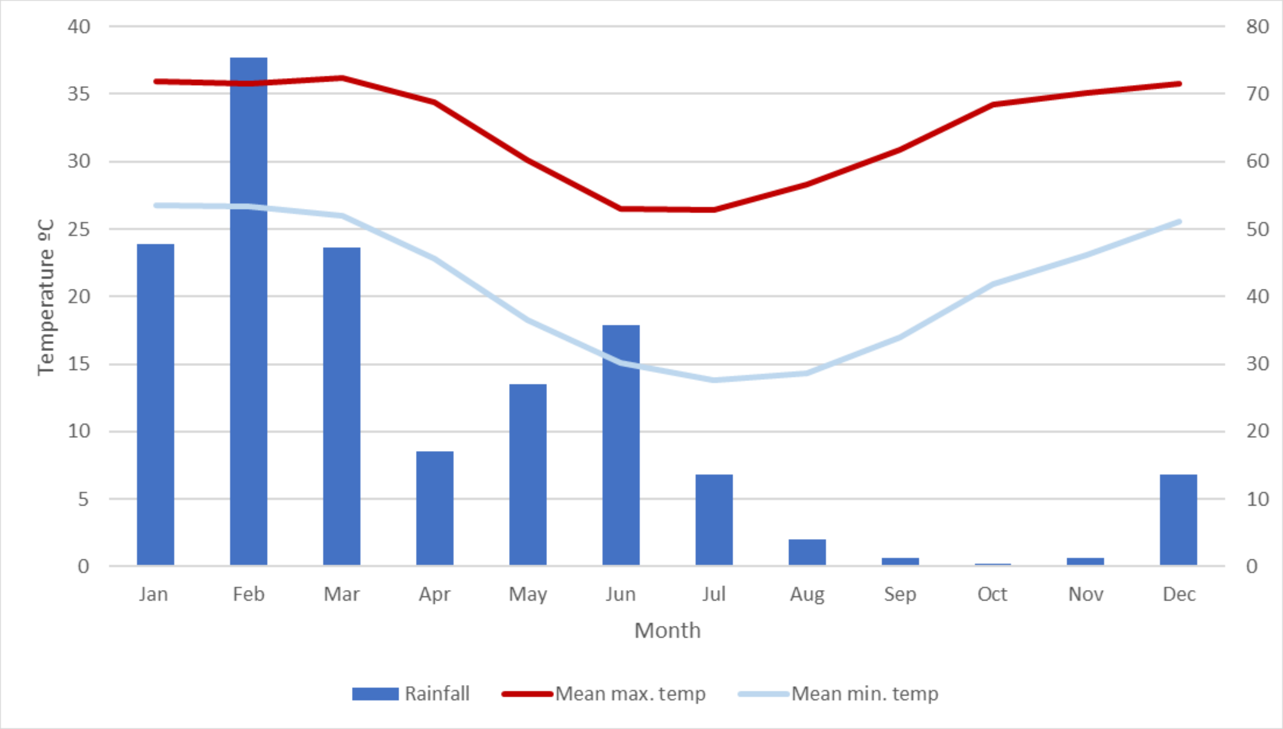


Figure 4-3: Mean monthly maximum temperature, minimum temperature and rainfall from Karratha Aerodrome meteorological station from January 1993 to Dec 2019 (BoM n.d.)

4.3.1.2 Wind

Winds vary seasonally, with a tendency for winds from the south-west quadrant during summer and the south-east quadrant in winter. The summer south-westerly winds are driven by high pressure cells that pass from west to east over the Australian continent. During winter months, the relative position of the high-pressure cells moves further north, leading to prevailing south-easterly winds blowing from the mainland (Pearce *et al.*, 2003). Winds typically weaken and are more variable during the transitional period between the summer and winter regimes, typically April and August (**Figure 4-4**).

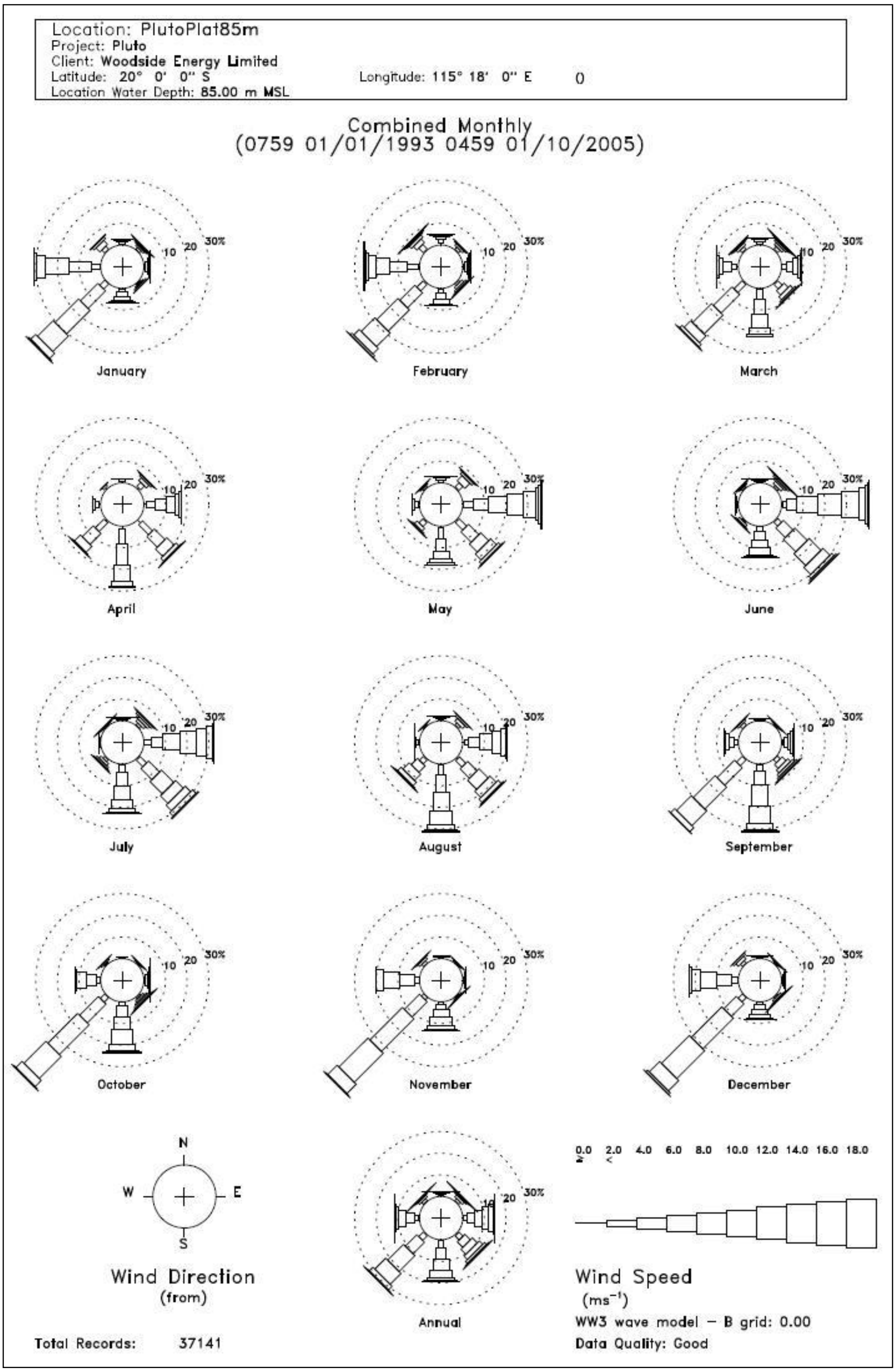
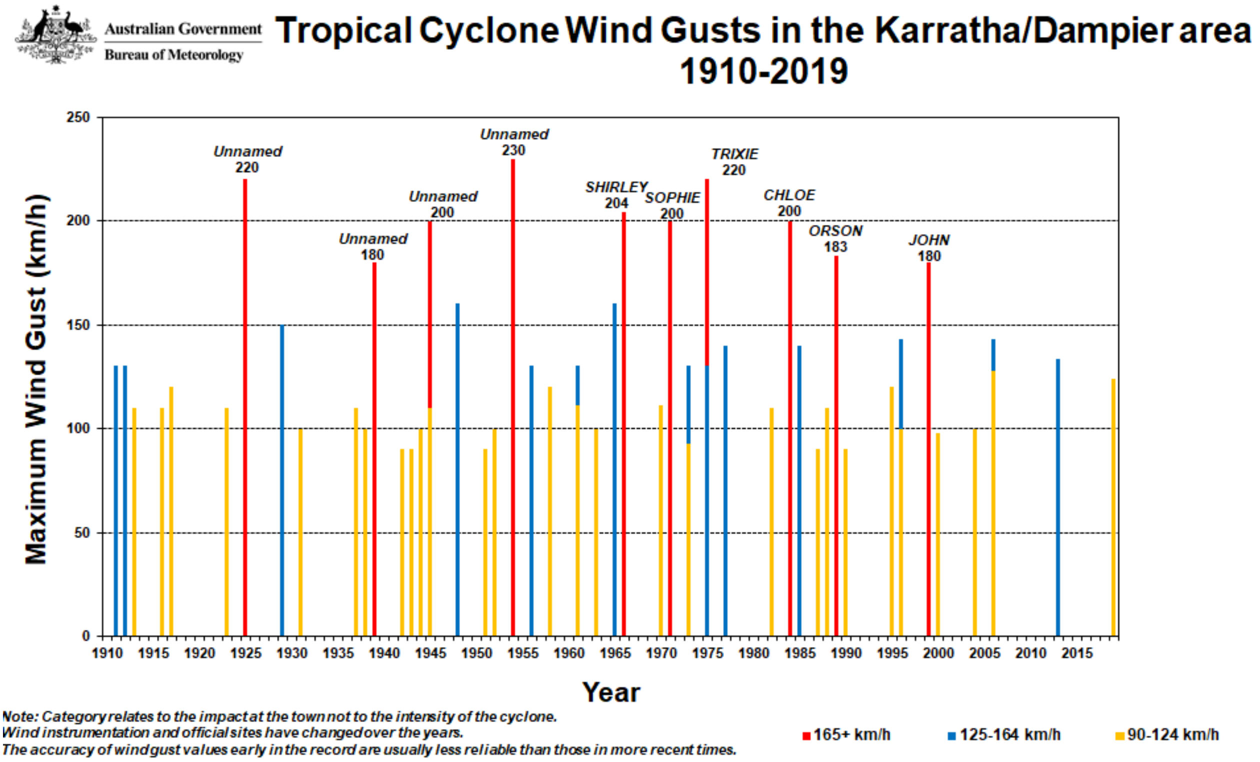


Figure 4-4: Non-cyclonic monthly wind-roses measured at the Pluto Facility from 1993 to 2005

4.3.1.3 Tropical Cyclones

Tropical cyclones are a relatively frequent event in the NWS region (**Figure 4-5**), with the Pilbara coast experiencing more cyclonic activity than any other region of the Australian mainland coast (BoM, 2020). Tropical cyclone activity can occur between November and April and is most frequent in the area during January to March, with an annual average of about one storm per month. Cyclones are less frequent in the area in the months of November, December and April. However, historically, the most severe storms have occurred in April.



Note: Category relates to the impact at the town not to the intensity of the cyclone.
Wind instrumentation and official sites have changed over the years.
The accuracy of wind gust values early in the record are usually less reliable than those in more recent times.

Figure 4-5: Tropical cyclone activity in the Dampier/Karratha region 1910 to 2019 (source: BoM, n.d.)

4.3.2 Oceanography

4.3.2.1 Currents and Tides

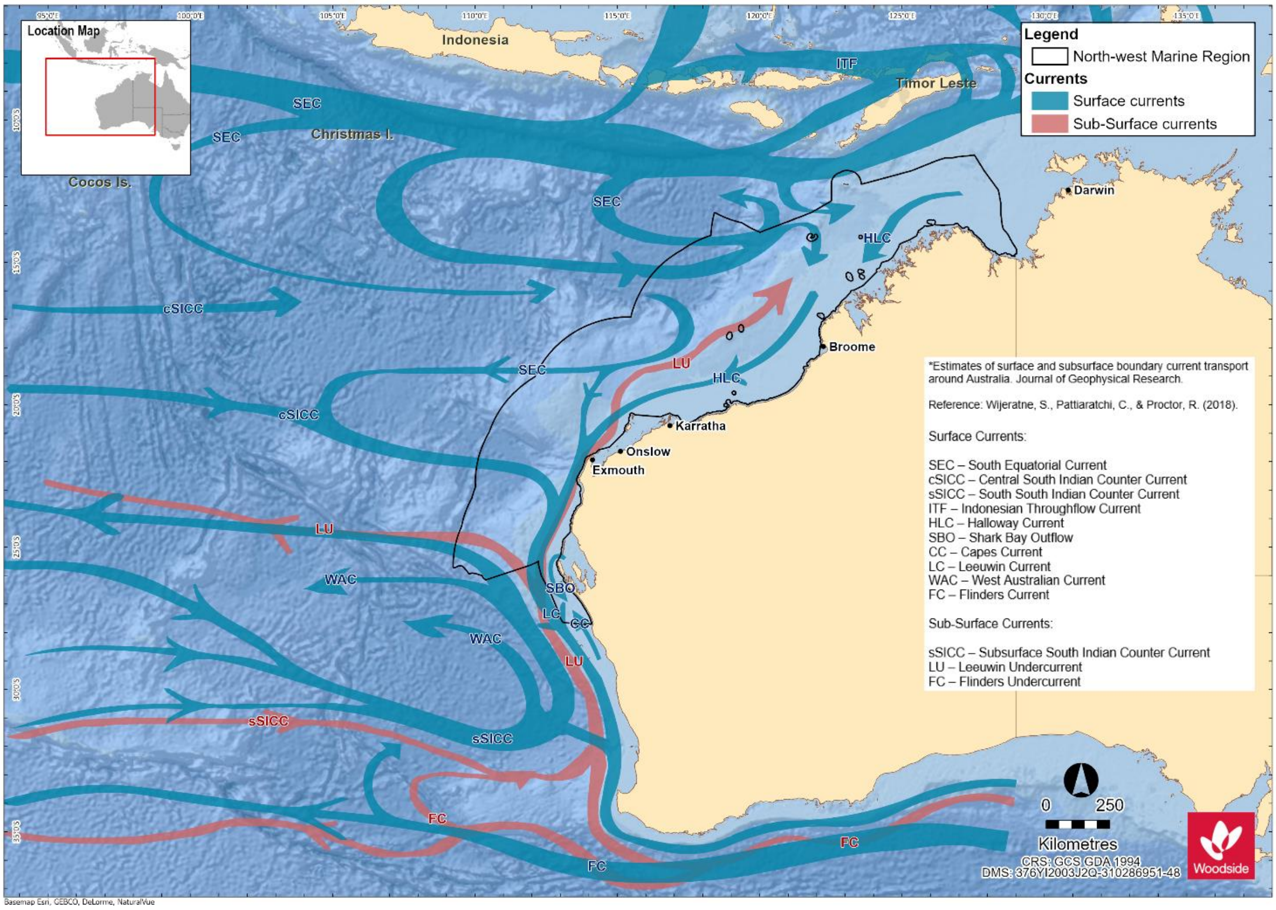
Currents in the region are local driven by winds and tides, superimposed on synoptic scale geostrophic currents. Local winds generate stress on the water surface, forcing the surface layer in the general direction of wind movement, but with an offset (15 to 45%) in an anti-clockwise direction (Coriolis Effect). In the open ocean, sustained winds result in wind-forced currents of about 3% of the wind speed (Holloway and Nye, 1985). Thus, a sustained wind of 20 knots may force surface currents of up to 0.6 knots. Wind patterns in the region are described in **Section 4.3.1** and shown in **Figure 4-4**.

The large-scale ocean circulation of the NWS is primarily influenced by the ITF (Meyers *et al.*, 1995; Potemra *et al.*, 2003), and the Leeuwin Current (Batteen *et al.*, 1992; Godfrey and Ridgway, 1985; Holloway and Nye, 1985; James *et al.*, 2004; Potemra *et al.*, 2003). Both currents are significant drivers of the region's ecosystems. The currents are driven by pressure differences between the equator and the higher density cooler and more saline waters of the Southern Ocean, strongly influenced by seasonal change and El Niño and La Niña episodes (DSEWPaC, 2012a). The ITF and Leeuwin Current are strongest during late summer and winter (Holloway and Nye, 1985; James *et al.*, 2004). Flow reversals to the north-east associated with strong south-westerly winds are typically weak and short-lived, but can generate upwelling of cold deep water onto the shelf (Condie *et al.*, 2006; Holloway and Nye, 1985; James *et al.*, 2004).

The Leeuwin Current, which originates in the region, flows southward along the edge of the continental shelf and is primarily a surface flow (up to 150 m deep). It is strongest during winter (Woodside, 2002). Eddies formed by the Leeuwin Current transport nutrients and plankton communities offshore (Department of Environment, Water, Heritage and the Arts, 2008). During summer, the Leeuwin Current typically weakens, and the Ningaloo Current develops, facilitating upwellings of cold, nutrient-rich waters up onto the NWS (DSEWPaC, 2012a). The Ningaloo Current flows in the opposite direction to the Leeuwin Current, running northward along the outside of Ningaloo Reef and across the inner shelf from September to mid-April (**Figure 4-6**). In March, on the termination of the Northwest Monsoon, an ‘extended Leeuwin Current’, currently known as the Holloway Current, develops, flowing to the south-east along the NWS Province (DSEWPaC, 2012a).

In addition to the synoptic-scale current dynamics, tidally driven currents are a significant component of water movement in the NWMR. Wind driven currents become dominant during the neap tide (Pearce *et al.*, 2003). In summer, the stratified water column and large tides can generate internal waves over the upper slope of the NWMR (Craig, 1988). As these waves pass the shelf break at about 125 m depth, the thermocline may rise and fall by up to 100 m in the water column (Holloway, 1983; Holloway and Nye, 1985). Internal waves of the NWMR are confined to water depths between 70 and 1000 m. The dissipation energy from such waves can enhance mixing in the water column (Holloway *et al.*, 2001).

Tides in the NWS are semi-diurnal and have a pronounced spring-neap cycle, with tidal currents flooding towards the south-east and ebbing towards the north-west (Pearce *et al.*, 2003). The NWS exhibits a considerable range in tidal height, from microtidal ranges (less than 2 m) south-west of Barrow Island to macrotidal (more than 6 m) north of Broome (Brewer *et al.*, 2007; Holloway, 1983). Storm surges and cyclonic events can also significantly raise sea levels above predicted tidal heights (Pearce *et al.*, 2003).



*Estimates of surface and subsurface boundary current transport around Australia. Journal of Geophysical Research.

Reference: Wijeratne, S., Pattiaratchi, C., & Proctor, R. (2018).

Surface Currents:

SEC – South Equatorial Current
cSICC – Central South Indian Counter Current
sSICC – South South Indian Counter Current
ITF – Indonesian Throughflow Current
HLC – Halloway Current
SBO – Shark Bay Outflow
CC – Capes Current
LC – Leeuwin Current
WAC – West Australian Current
FC – Flinders Current

Sub-Surface Currents:

sSICC – Subsurface South Indian Counter Current
LU – Leeuwin Undercurrent
FC – Flinders Undercurrent

Figure 4-6: Large-scale ocean circulation of the NWRM including the location of the ITF and other currents of significance (Department of Environment, Water, Heritage and the Arts [DEWHA], 2008)

4.3.2.2 Wave Height

Waves within the NWS reflect the direction of the synoptic winds and flow predominantly from the south-west in the summer and from the east in winter (Pearce *et al.*, 2003). Only 10% of significant wave heights off Dampier exceed 1.2 m, with the average wave height being 0.7 m (Pearce *et al.*, 2003). Storms and cyclones may generate swells up to 8.0 m high (Pearce *et al.*, 2003).

4.3.3 Seawater Characteristics

4.3.3.1 Open Water

The offshore, oceanic seawater characteristics of the NWS exhibit seasonal and water depth variation in temperature and salinity, being greatly influenced by major currents in the region. Surface waters are relatively warm year-round due to the tropical water supplied by the ITF and the Leeuwin Current, with temperatures reaching 30 °C in summer and dropping to 22 °C in winter (Pearce *et al.*, 2003). Near seabed temperatures in deeper waters (greater than 120 m water depth) are less variable, with temperatures averaging 22 to 24 °C year-round.

During summer, the water column is thermally stratified due to surface heating, with the thermocline occurring between 30 and 60 m water depth, indicating surface waters are well mixed within the Operational Area (BMT Oceanica, 2015; James *et al.*, 2004). Surface waters are also relatively well mixed in winter due to a weaker thermal gradient and persistent south-easterly winds promoting mixing, with the thermocline occurring at around 120 m depth (DSEWPaC, 2012a; James *et al.*, 2004).

Seawater temperature records around the Pluto platform (located about 46 km to the south-west of the Operational Area) over a period of 13 months from December 2005 to January 2007 show surface waters reach their maximum average temperatures in March and April (average about 28.5 °C) and are coolest in August, September and October (average about 24.3 °C) (BMT Oceanica, 2015; Woodside Energy Limited, 2006).

Variation in surface salinity across the NWMR throughout the year is minimal (between 35.2 and 35.7 PSU), with slight increases occurring during the summer months due to intense coastal evaporation (James *et al.*, 2004; Pearce *et al.*, 2003). This small increase in salinity during summer is then countered by the arrival of the lower salinity waters of the Leeuwin Current and ITF in autumn and winter (James *et al.*, 2004).

Turbidity is primarily influenced by sediment transport by oceanic swells and primary productivity (Pearce *et al.*, 2003). Upwelling of nutrient-rich waters may increase phytoplankton productivity in the photic zone, which may increase local turbidity (Wilson *et al.*, 2003). Periodic events, such as major sediment transport associated with tropical cyclones, may influence turbidity on a regional scale (Brewer *et al.*, 2007).

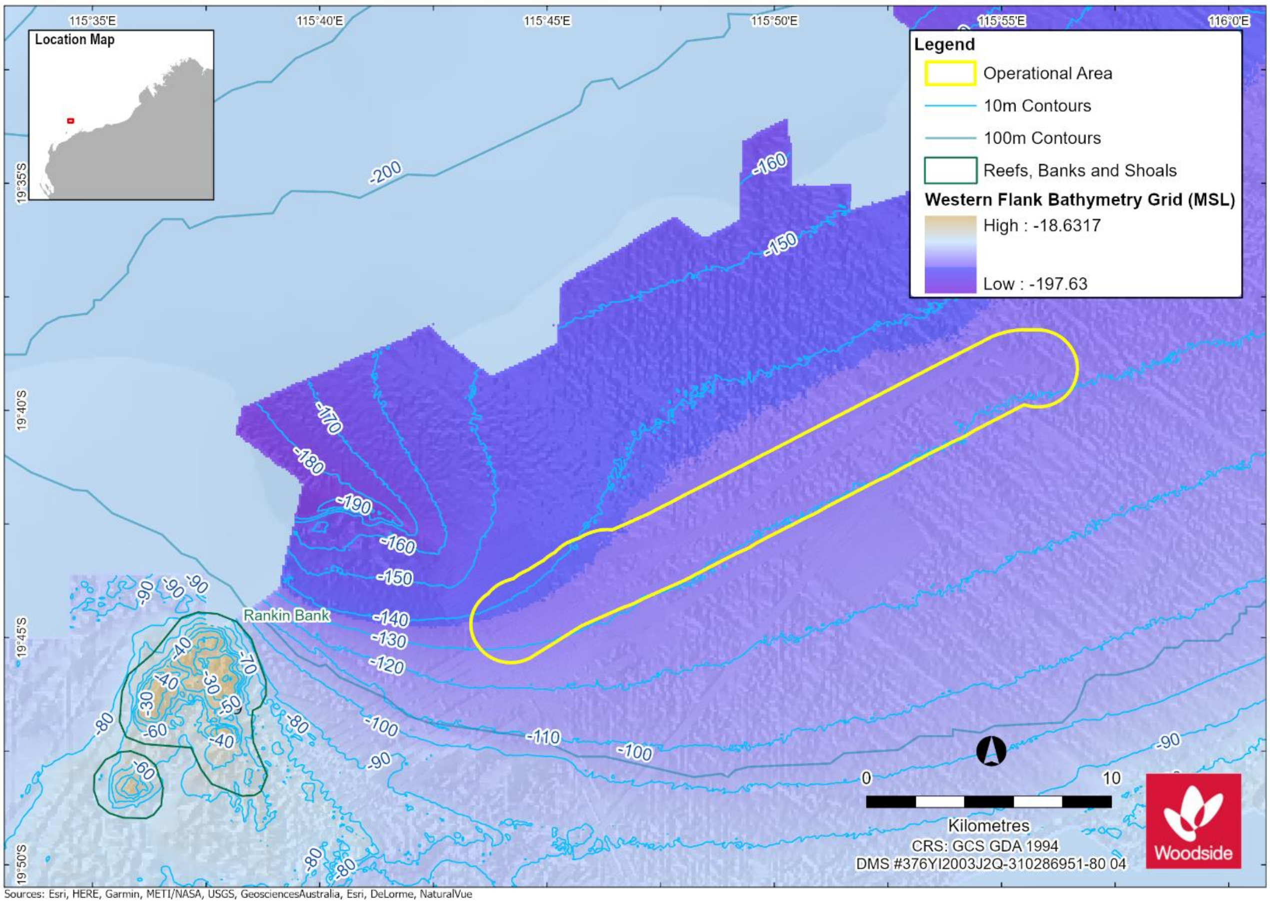
Water quality in the Operational Area is expected to reflect the offshore oceanic conditions of the NWS, which are described as low in nutrient levels and contamination (such as metals and hydrocarbons) (Wenziker *et al.*, 2007). Furthermore, water quality sampling was conducted in the vicinity of the Operational Area in 2010 (RPS, 2011). Salinity was about 35 PSU at the surface and remained consistent throughout the water column. Surface water temperature was about 24.5 °C and decreased marginally with depth to the base of the thermocline at about 55 m (RPS, 2011). Turbidity was found to be negligible throughout the water column, indicating pristine and generally very clear waters. Petroleum hydrocarbons (total petroleum hydrocarbons, polyaromatic hydrocarbon (PAH) and benzene, toluene, ethylbenzene and xylene) were not detected (RPS, 2011). Nutrient concentrations within the water column in the proximity of the Operational Area (including total nitrogen, total phosphorous, ammonia and orthophosphates) were found to reflect typical ranges for tropical offshore, oceanic waters. Higher concentrations of nitrogen were recorded nearer to the seabed, possibly reflecting stratification and non-mixing of deeper waters with the upper surface layers (Condie and Dunn, 2006).

4.3.4 Bathymetry and Seabed Habitats

The Operational Area is located in waters about 125 m to 140 m deep on the outer continental shelf, consisting of relatively flat and featureless seabed (**Figure 4-7**). Isobaths of the Echo Yodel field show the seabed sloping gently from 125 m in the south to 150 m in the northern parts.

The NWS Province encompasses more than 60% of the continental shelf in the NWMR (Baker *et al.*, 2008). It gradually slopes from the coastline to the shelf break at the edge of the region and includes water depths of 0 m to 200 m. About half of the province is located in water depths of 50 m to 100 m (DEWHA, 2008). The NWS Province includes a number of seafloor features, including submerged banks and shoals, and valley features that are thought to be morphologically distinct from other features of these types in different regions of the NWMR (DEWHA, 2008). Seabed characteristics identified in the Echo Yodel field during side-scan surveys in 1998 include:

- predominant coverage of deep (more than 5 m), fine to silty carbonate sand with very small shell fragments
- shallow depressions or pockmarks
- fine to medium carbonate sands with outcrops and sub-crops of cemented carbonate sediments (calcilutite, calcarenite and calcirudite)
- sediment waves of about 1.5 m in height
- relic anchor and trawl scars.



Sources: Esri, HERE, Garmin, METI/NASA, USGS, GeosciencesAustralia, Esri, DeLorme, NaturalVue

Figure 4-7: Bathymetry of the Operational Area

4.3.4.1 Marine Sediments

Sediments in the outer NWS are relatively homogenous and are typically dominated by sands and a small portion of gravel (Baker *et al.*, 2008). Fine sediment size classes (e.g. muds) increase with proximity to the shoreline and the shelf break, but are less prominent in the intervening continental shelf (Baker *et al.*, 2008). Carbonate sediments typically account for the bulk of sediment composition, with both biogenic and precipitated sediments present on the outer shelf (Dix *et al.*, 2005). Beyond the shelf break within the NWMR (200 m depth contour), the proportion of fine sediments increases along the continental slope towards the abyssal plain (Baker *et al.*, 2008).

Seabed sediment sampling programs performed in the vicinity of the Operational Area (SKM, 2006; RPS, 2012) confirmed sediments comprising coarse sands, silts, fine sands and some gravel. Sediment grain size in the north-east section (close to the GWA facility) is dominated by coarse sand (about 40%), silts (about 25%), fine sand (about 15%) and some gravel (about 12%); whereas sediment in the south-west of the survey area is predominantly fine sand (30%) and silt (25%), and some coarse sand (20%) (RPS, 2012).

Hard substrates within the region more broadly can host more diverse benthic communities. Hard substrate may be associated with the Ancient Coastline at 125 m Depth Contour key ecological feature (KEF). Nutrient levels (total nitrogen and total phosphorous) in the vicinity of the Operational Area are typically low and are consistent with other offshore locations within the area that are a considerable distance from typical nutrient sources such as estuaries (RPS, 2012). Sediment quality in the NWS is generally high, with the exception of areas in proximity to ports (Department of Environment and Conservation [DEC], 2006), where elevated concentrations of metals and hydrocarbons may occur).

4.3.5 Air Quality

There is a lack of air quality data for the offshore NWMR air sheds. Studies have been performed for the nearshore Pilbara environment to monitor known sources of potential air pollution for locations such as the Burrup Peninsula and Port Hedland, but no monitoring is performed offshore.

Due to the extent of the open ocean area and the activities that are currently performed, it is considered the ambient air quality across the Operational Area and wider offshore NWMR will be of high quality.

4.4 Biological Environment

4.4.1 Habitats

4.4.1.1 Critical Habitat and Threatened Ecological Communities – EPBC Listed

No marine Critical Habitats or Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the Operational Area and EMBA, as indicated by the EPBC Act Protected Matters Report extracted on 7 and 25 October 2021 (**Appendix C**).

4.4.1.2 Marine Primary Producers

Sea floor communities in deeper shelf waters receive insufficient light to sustain ecologically sensitive primary producers such as seagrasses, macroalgae or zooxanthellate corals. Given the depth of water for the Operational Area (between about 125 to 140 m), these benthic primary producer groups will not occur in the Operational Area, but may occur within the EMBA in shallower waters (typically less than 30 m water depth) near offshore islands, reefs and sedimentary banks such as Rankin Bank.

Coral Reef

Coral reef habitats have a high diversity of corals, associated fish and other species of both commercial and conservation importance. No coral reefs occur in the Operational Area, as the seabed depth receives insufficient photosynthetically active radiation to support such communities. Coral reef habitats within the EMBA include (approximate distance and direction from the Operational Area in brackets):

- Rankin Bank (12 km west)
- Glomar Shoal (67 km east)
- Rowley Shoal (377 km north east)
- Ningaloo Coast (281 km south west)
- Muiron Islands (250 km south west)
- Barrow Island (106 km south)
- Montebello Islands (68 km south).

Hard corals in the region typically have a distinct spawning season, with most species spawning during autumn (March/April) (Rosser and Gilmour, 2008; Simpson *et al.*, 1993).

Seagrass Beds/Macroalgae

Seagrass beds and benthic macroalgae reefs are a main food source for many marine species and also provide key habitats and nursery grounds (Heck Jr. *et al.*, 2003; Wilson *et al.*, 2010). In the northern half of WA, these habitats are restricted to sheltered and shallow waters due to large tidal movement, high turbidity, large seasonal freshwater run-off and cyclones. No seagrass beds or macroalgae occur in the Operational Area, as the seabed depth receives insufficient photosynthetically active radiation to support such communities. However, seagrass beds and macroalgae habitats are widespread in shallow waters in the region. The nearest such areas are the offshore islands of the Montebello/Barrow/Lowendal islands (about 68 km south of the Operational Area) within the EMBA.

4.4.1.3 Lifecycle Stages ‘Critical’ Habitats

Spawning, Nursery, Resting and Feeding Areas

Critical habitats for species conservation include spawning, nursery, resting and feeding areas. These critical habitats will vary for each species. No critical habitat for protected species was identified as overlapping the Operational Area or EMBA from the EPBC Protected Matters search reports (**Appendix C**); however, areas that have been identified as habitat critical to the survival of a species (e.g. marine turtles) do overlap the EMBA as described in further detail below.

Migration Corridors

Many marine species, including cetaceans, whale sharks and migratory seabirds and shorebirds, migrate seasonally between feeding, breeding and nursery habitats using migration corridors. Any migration corridor for a protected species that passes through the Operational Area or the EMBA, is outlined in **Section 4.4.2** within biologically important areas (BIAs) and the relevant species sub-sections.

4.4.1.4 Other Communities/Habitats

Plankton

Phytoplankton within the Operational Area and EMBA is expected to reflect the conditions of the NWMR. Primary productivity of the NWMR appears to be largely driven by offshore influences (as reported by Brewer *et al.*, 2007), with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. There is a tendency for offshore phytoplankton communities in the NWMR to be characterised by smaller taxa (e.g. bacteria), whereas shelf waters are dominated by larger taxa such as diatoms (Hanson *et al.*, 2007).

Phytoplankton abundance and diversity within the Operational Area is generally expected to reflect that of the NWMR. Primary productivity of the NWMR appears to be largely driven by offshore influences (Brewer *et al.*, 2007), with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. There is a tendency for offshore phytoplankton communities in the NWMR to be characterised by smaller taxa (e.g. bacteria), whereas shelf waters are dominated by larger taxa such as diatoms (Hanson *et al.*, 2007).

Zooplankton within the Operational Area and EMBA may include organisms that complete their lifecycle as plankton (termed holoplankton) as well as larval stages of other taxa such as fishes, corals and molluscs (termed meroplankton). Peaks in zooplankton are highly seasonal and higher plankton concentrations generally occur during the dry season (Hayes *et al.* 2005). Mass coral spawning events (typically in March and April) (Rosser & Gilmour, 2008; Simpson *et al.*, 1993), and fish larvae throughout the year contribute the plankton populations. A key locality within the EMBA for nutrient productivity is Ningaloo Coast; peak primary productivity occurs here in late summer/early autumn along the shelf edge of the Ningaloo Reef. It also links to a larger biologically productive period in the area that includes mass coral spawning events, peaks in zooplankton and fish larvae abundance (Marine Parks Reserves Authority (MPRA), 2005) with periodic upwelling throughout the year.

Pelagic and Demersal Fish Populations

Fish species in the NWMR comprise small and large pelagic and demersal species. Small pelagic fish inhabit a range of marine habitats, including inshore and continental shelf waters. They feed on pelagic phytoplankton and zooplankton and represent a food source for a wide variety of predators, including large pelagic fish, sharks, seabirds and marine mammals (Mackie *et al.*, 2007). Large pelagic fish in the NWMR include commercially and recreationally targeted species, such as mackerel, wahoo, tuna, swordfish and marlin. Large pelagic fish are typically widespread, found mainly in offshore waters (occasionally on the shelf) and often travel extensively.

Fish assemblage species richness in the NWMR has been shown to decrease with depth (Last *et al.*, 2005) and positively correlate with habitat complexity, with more complex habitat supporting greater species richness and abundance than bare areas (Gratwicke and Speight, 2005). As described in **Section 4.7.3.2**, the Continental Slope Demersal Fish Communities in the region have been identified as a KEF of the NWMR (DSEWPaC, 2012a). The KEF is located within the EMBA, about 25 km from the Operational Area.

The demersal fish fauna of the NWS is moderately well known as a result of fishery stock surveys (Wilson, 2013). During the period 1959-1990 fishing in water depths <200 m across the region was dominated by foreign trawlers (Sainsbury *et al.*, 1997), with effort peaking in 1973 at over 30,000 trawl hours and with fish catches then exceeding 37,000 tonnes (Ramm, 1994). In the early 1990s declining catches and concerns over the impacts of trawling on benthic habitats led to a ban on foreign trawling and the development of a smaller domestic fishery. As a result of this historical fishing activity incidental catches of sponges and other macrobenthos declined simultaneously with a change in the fish community (Sainsbury *et al.*, 1997).

Over time, the fish assemblage composition was altered from one dominated by high value snapper (Lutjanidae) and emperors (Lethrinidae) to one characterised by lower-value lizardfish (Synodontidae) and threadfin bream (Nemipteridae) (Sainsbury *et al.*, 1997). This change in fish assemblages is likely to have resulted from pair-trawling, which modified the habitat by removing well-developed epibenthic invertebrate communities with which snappers and emperors are associated, resulting in a prevalence of sparser habitats with which lizardfish and threadfin bream are more typically associated (Sainsbury *et al.*, 1997).

Fish trawl surveys in the late 1990s indicated that catch rates of commercially important fish were higher in the shallower waters of the survey areas where hard bottom communities and sponges were more abundant (Newman *et al.*, 2000). Lutjanidae were found to be the most dominant and commercially important fish landed during the surveys. The demersal fish resource in the 100-200 m depth zone was somewhat similar to that of the 50-100 m depth zone although the key species were different. Juveniles and adults of *Glaucosoma buergeri* (pearl perch), *Lutjanus malabaricus* (saddletail snapper), *Pristipomoides multidens* (goldband snapper) and *P. typus* (sharptooth snapper) all appear to be present in depths of 100-200 m, while the juveniles and sub-adults of *L. russellii* (Moses' snapper) were not caught. The possibility exists that sub-adult or adult *L. russellii* undertake cross-shelf migrations to deeper offshore waters. The key species (*G. buergeri, L. malabaricus, L. russelli, P. multidens and P. typus*) are, in general, slow growing, long lived fishes that have low rates of natural mortality (Newman *et al.*, 2000).

Key indicator species for commercial fisheries currently active in the region include a number of demersal scalefish, primarily goldband snapper (*P. multidens*), Rankin cod (*Epinephelus multinotatus*), red emperor (*L. sebae*), and blue-spotted emperor (*Lethrinus punctulatus*) (S Newman, personal communication, April 2019). Adult goldband snapper occur in continental shelf waters at depths of 50–200 m, often forming large schools in proximity to shoals, areas of hard flat bottom and offshore reefs. Adult Rankin cod are found at depths of 10–150 m, usually in association with drop-offs and deep rocky reefs, while juveniles are generally found in inshore coral reefs. Red emperor are widely distributed across the continental shelf and found in depths of 10–180 m. The species is associated with reefs, lagoons, epibenthic communities, limestone sand flats and gravel patches (Newman *et al.*, 2018). Blue-spotted emperor occurs in depths from 5–110 m, often in association with shallow reef, sand and mud areas. Low levels of heterogeneity indicate extensive connectivity between populations over large distances (Johnson *et al.*, 1993; Moran *et al.*, 1993).

The available data suggests that the relative composition of the multispecies fish community of the NWS (including the commercially important demersal scalefish) is, to some extent, habitat dependent, and historical changes in species composition were in part a result of trawl-induced modification of the epibenthic habitat (Salisbury *et al.*, 1997).

Filter Feeders and Other Benthic Communities

Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWHA, 2008). Filter feeders generally live in areas that have strong currents and hard substratum. They are closely associated with substrate type, with areas of hard substrate typically supporting more diverse epibenthic communities (Heyward *et al.*, 2001). Conversely, higher diversity infauna are mainly associated with soft unconsolidated sediment and infauna communities are considered widespread and well represented along the continental shelf and upper slopes of the NWMR (Brewer *et al.*, 2007; Rainer, 1991; SKM, 2006; Woodside Energy Limited, 2006).

A number of targeted surveys investigating epibenthos and infauna within offshore NWS Province shelf and slope environments have been performed by Woodside. Woodside has collected survey data from numerous sampling locations within and surrounding the Operational Area using ROV/video investigations of benthic habitats and infauna/epifauna sampling using sediment grabs and epibenthic sled (SKM, 2006; Ocean Affinity, 2018). Elsewhere on the NWS Province, surveys have included grab samples of seabed sediments from around North Rankin Complex, Goodwyn A, Angel facilities and their export pipeline routes (SKM, 2006), as well as additional sampling throughout the broader region (SKM, 2007).

The Operational Area is unlikely to contain suitable habitat for significant filter feeder communities as they comprise mostly homogeneous soft sediments with little or no hard substrate. However, various benthic communities have become established on the Echo Yodel subsea infrastructure, as documented through ROV surveys. These artificially created habitats are discussed further down.

Filter feeders at Rankin Bank and Glomar Shoal make up minor components of the benthic communities, about 3% and 4% of the benthic cover respectively (AIMS, 2014b). Sponges are among the most abundant filter feeders at both locations, and soft corals are more diverse at Glomar Shoal (AIMS, 2014). Benthic communities at Rankin Bank are similar to those recorded at other shoals in the NWS region (AIMS, 2014) and other regions of the NWMR (Heyward *et al.*, 2012).

Within the EMBA, the NWMR has been identified as a sponge diversity hotspot, with a variety of areas of potentially high and unique sponge biodiversity, particularly in the Commonwealth waters of Ningaloo Marine Park (CALM, 2005; Rees *et al.*, 2004).

Other Communities / Habitats

Sponges and mixed sponge benthic groups were the dominant benthic group at Glomar Shoal, with hard corals, algae, soft corals and mixed benthos only making up 10% of the study area (AIMS 2014a). In contrast, Rankin Bank has almost equal areas of hard corals, soft corals and sponges (AIMS 2014b). The study indicated that both Rankin Bank and Glomar Shoal had characteristic transitions in habitat types with depth, from shallow hard coral and associated algae groups, to deeper soft coral areas with sponges (AIMS 2014b). A study by Wahab *et al.* (2018) also observed filter feeders being the dominant non-algal taxa in waters below 80 m depth at Rankin Bank.

Artificially Created Habitats

There is an increasing body of scientific literature overseas and in Australia looking at the ecosystem value of oil and gas subsea infrastructure. This knowledge is required and used to understand impacts and benefits of the offshore industry on the marine environment and inform decommissioning decisions. In Australia these have largely focused on the NWS, where the Echo Yodel subsea infrastructure is located. The key findings of these studies indicate that the Echo Yodel subsea infrastructure has been found to create habitat for a number of species, including commercially valuable species that are in low abundance across the region (**Figure 4-8**).

- McLean *et al.* (2017) assessed the fish diversity and abundance as well as epibenthic habitats and invertebrates along two pipelines in the north-west of Australia, one of which was the Echo Yodel pipeline.
  - A total of 5962 individual fish from 92 species and 42 families were observed in ROV footage taken during routine inspection and maintenance activities along the two pipelines. The findings included the presence of larval fish, juveniles, sub-adults and adults, which indicates the populations around the pipelines may be increasing. It was also found that both pipelines, including the Echo Yodel pipeline, provided habitat that supported a high abundance of commercially important fish including snappers (Lutjanidae) and groupers (Epinephelidae).
  - Analysis of 1318 ROV transects sampled from the Echo Yodel pipeline in 2013 observed complex deep water epibenthic habitat forming filter-feeders including deep water corals, crinoids (feather stars), Gorgonocephalidae (basket stars), hydroids, true anemones and sponges. Historically high trawling effort is thought to have extensively removed and modified complex epibenthic habitats in the region. These habitats were considered to be important to commercially targeted species. The modification or loss of these habitats is thought to have negatively impacted the valuable commercial fisheries in the region. However, McLean *et al.* (2017) demonstrates that modern pipeline structures such as the Echo Yodel pipeline

can offer a significant epibenthic habitat and refuge for fish, potentially comparable to the historical habitats lost to trawling.

- In 2018 Bond and Taylor (2019) continued and added to the work completed by McLean *et al.* (2017) who investigated changes in the fish community and habitat on the Echo Yodel pipeline from 2007, 2008 and 2013 using ROV surveys. They looked at pipeline changes over time and differences between the pipeline and EHU. Their conclusions include:
  - Species richness was, on average, 25% higher on the Echo Yodel pipeline than off, while relative abundance of fish was nearly double on the pipeline than in adjacent natural habitats. The pipeline was characterised by large, commercially important species known to associate with complex epibenthic habitat and, as such, possessed a biomass of commercial fish 7.5 times higher and catch value 8.6 times higher than in adjacent natural habitats (Bond *et al.*, 2018a).
  - Changes in habitat coverage on the pipeline continue to show trends described by McLean *et al.* (2017). Additional to increases in sand/rubble/cobble and reduction in the overall area of bare pipe, true anemones continued to reduce in cover while crinoids and gorgonocephalids increased in cover. True anemones found on the pipeline in 2008 are no longer present and those recorded in the 2018 are of a different species.

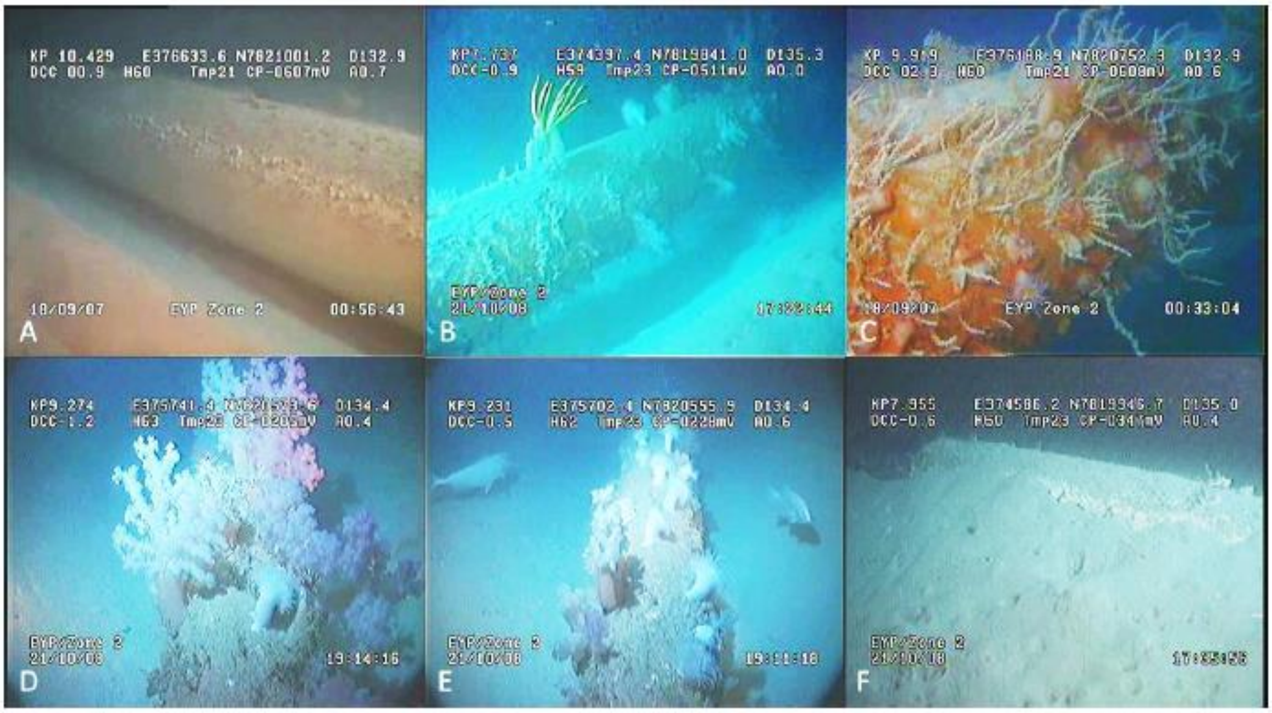


Figure 4-8: Habitats documented along the Echo Yodel Pipeline through ROV surveys

4.4.2 Protected Species

The EPBC Act Protected Matters Search Tool (PMST) has been used to identify listed species under the EPBC Act that may occur within and adjacent to the Operational Area and EMBA. The results of the search inform the assessment of planned events, as well as unplanned events, in Section 6 that are confined to the Operational Area (**Table 4-2**). 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.

A total of 33 EPBC Act listed species considered to be MNES were identified as potentially occurring within the Operational Area (**Appendix C**). Of those listed, 16 are considered threatened marine species (MNES) and 31 migratory species under the EPBC Act.

A total of 60 EPBC Act listed marine species were identified as potentially occurring within the EMBA (**Appendix C**). Of those listed, 30 species within the EMBA are considered threatened marine species (MNES) and 50 migratory species under the EPBC Act.

Table 4-2: Threatened and migratory marine species under the EPBC Act potentially occurring with the Operational Area or within the EMBA

Species Name	Common Name	Threatened Status	Migratory Status	Operational Area/EMBA	
				Operational Area	***EMBA***
Mammals					
Balaenoptera borealis	Sei Whale	Vulnerable	Migratory	✓	✓
Balaenoptera musculus intermedia	Blue Whale	Endangered	Migratory	✓	✓
Balaenoptera physalus	Fin Whale	Vulnerable	Migratory	✓	✓
Megaptera novaeangliae	Humpback Whale	Vulnerable	Migratory	✓	✓
Balaenoptera edeni	Bryde’s Whale	N/A	Migratory	✓	✓
Physeter macrocephalus	Sperm Whale	N/A	Migratory	✓	✓
Orcinus orca	Killer Whale, Orca	N/A	Migratory	✓	✓
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	N/A	Migratory	✓	✓
Sousa chinensis	Indo-Pacific Humpback Dolphin	N/A	Migratory	X	✓
Dugong dugon	Dugong	N/A	Migratory	X	✓
Eubalaena australis	Southern Right Whale	Endangered	Migratory	X	✓
Balaenoptera bonaerensis	Antarctic Minke Whale	N/A	Migratory	X	✓
Reptiles					
Caretta caretta	Loggerhead Turtle	Endangered	Migratory	✓	✓
Chelonia mydas	Green Turtle	Vulnerable	Migratory	✓	✓
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth	Endangered	Migratory	✓	✓
Eretmochelys imbricata	Hawksbill Turtle	Vulnerable	Migratory	✓	✓
Natator depressus	Flatback Turtle	Vulnerable	Migratory	✓	✓

Species Name	**Common Name**	**Threatened Status**	**Migratory Status**	**Operational Area/EMBA**	
				Operational Area	***EMBA***
Aipysurus apraefrontalis	Short-nosed Seasnake	Critically endangered	N/A	X	✓
Aipysurus foliosquama	Leaf-scaled seasnake	Critically endangered	N/A	X	✓
Fish					
Carcharodon carcharias	White Shark, Great White Shark	Vulnerable	Migratory	✓	✓
Carcharhinus longimanus	Oceanic Whitetip Shark	N/A	Migratory	✓	✓
Isurus oxyrinchus	Shortfin Mako, Mako Shark	N/A	Migratory	✓	✓
Isurus paucus	Longfin Mako	N/A	Migratory	✓	✓
Lamna nasus	Porbeagle, mackerel shark	N/A	Migratory	X	✓
Rhincodon typus	Whale Shark	Vulnerable	Migratory	✓	✓
Carcharias taurus	Grey Nurse Shark (west coast population)	Vulnerable	N/A	✓[1]	✓
Manta birostris (recently revised taxonomy *Mobula birostris* (White *et al.*, 2017))	Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray	N/A	Migratory	✓	✓
Manta alfredi (recently revised taxonomy *Mobula alfredi* (White *et al.*, 2017))	Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray	N/A	Migratory	✓	✓
Anoxypristis cuspidata	Narrow Sawfish, Knifetooth Sawfish	N/A	Migratory	✓	✓
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	Vulnerable	Migratory	✓	✓
Sphyrna lewini	Scalloped Hammerhead	Conservation Dependent	N/A	✓	✓
Thunnus maccoyii	Southern Bluefin Tuna	Conservation Dependent	N/A	✓	✓
Pristis clavata	Dwarf Sawfish, Queensland Sawfish	Vulnerable	Migratory	X	✓
Avifauna					
Calidris canutus	Red Knot, Knot	Endangered	Migratory	✓	✓

Species Name	**Common Name**	**Threatened Status**	**Migratory Status**	**Operational Area/EMBA**	
				Operational Area	***EMBA***
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically endangered	Migratory	✓	✓
Actitis hypoleucos	Common Sandpiper	N/A	Migratory	✓	✓
Anous stolidus	Common Noddy	N/A	Migratory	✓	✓
Calidris acuminata	Sharp-tailed Sandpiper	N/A	Migratory	✓	✓
Calidris melanotos	Pectoral Sandpiper	N/A	Migratory	✓	✓
Fregata ariel	Lesser Frigatebird, Least Frigatebird	N/A	Migratory	✓	✓
Calonectris leucomelas	Streaked Shearwater	N/A	Migratory	✓	✓
Sternula nereis	Australian Fairy Tern	Vulnerable	Migratory	✓	✓
Fregata minor	Great Frigatebird, Greater Frigatebird	N/A	Migratory	✓	✓
Phaethon lepturus fulvus	Christmas Island white-tailed tropicbird, golden bosunbird	Endangered	N/A	✓	✓
Calidris ferruginea	Curlew Sandpiper	Critically endangered	Migratory	X	✓
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit, Tusskoye bar-tailed godwit	Critically endangered	N/A	X	✓
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	Endangered	Migratory	X	✓
Pandion haliaetus	Osprey	N/A	Migratory	X	✓
Apus pacificus	Fork-tailed Swift	N/A	Migratory	X	✓
Ardenna carneipes	Flesh-footed Shearwater	N/A	Migratory	X	✓
Sterna dougallii	Roseate Tern	N/A	Migratory	X	✓
Hydroprogne caspia	Caspian tern	N/A	Migratory	X	✓
Onychoprion anaethetus	Bridled tern	N/A	Migratory	X	✓
Sternula albifrons	Little tern	N/A	Migratory	X	✓

Species Name	Common Name	Threatened Status	Migratory Status	Operational Area/EMBA	
				Operational Area	***EMBA***
Phaethon lepturus	White-tailed tropicbird	N/A	Migratory	X	✓
Papasula abbotti	Abbott’s booby	Endangered	N/A	X	✓
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	X	✓
Charadrius leschenaultii	Greater sand plover, large and plover	Vulnerable	N/A	X	✓
Falco hypoleucos	Grey falcon	Vulnerable	N/A	X	✓
Thalassarche impavida	Campbell albatross, Campbell black-browed albatross	Vulnerable	Migratory	X	✓
Rostratula australis	Australian Painted Snipe	Endangered	N/A	X	✓
Ardenna pacifica	Wedge-tailed Shearwater	N/A	Migratory	✓[2]	✓

1 Although not identified in the PMST report, this species has been observed around oil and gas subsea infrastructure in the NWMR at the depths of the Echo Yodel infrastructure and therefore has the potential to occur in Operational Area.

2 Although not identified in the PMST report, this species was defined as having a potential to be present in the Operational Area given a BIA for the species overlaps the areas.

A full list of species identified from the Protected Matters Search is provided in the EPBC Act Protected Matters Search Report (**Appendix C**).

4.4.2.1 EPBC Act Part 13 Statutory Instruments

Conservation advice and recovery plans for listed threatened species, threat abatement plans for key threatening processes, and wildlife conservation plans for listed migratory/marine species and cetaceans, are developed and implemented under Part 13 of the EPBC Act (**Section 1.9.1.3.1**).

Recovery plans are enacted under the EPBC Act and remain in force until the species is removed from the threatened list. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to facilitate the conservation of a listed species or ecological community.

Table 4-3 outlines the Part 13 statutory instruments relevant to those species identified by the EPBC Protected Matters search.

A screening process was conducted to identify which of these species, and associated Part 13 statutory instruments, are relevant in the context of the assessment of impacts and risks associated with the Petroleum Activities Program. These criteria were used for this screening:

- Overlap between the Operational Area and EMBAs with habitat critical for the survival of marine turtles, and with BIAs for any listed threatened species as reported in the PMST searches.
- Published literature, unpublished reports and/or credible anecdotal information (e.g. feedback from stakeholders) indicating species presence/occurrence within the Operational Area.
- Temporal overlap between the timing of the Petroleum Activities Program and peak periods for key behaviours (e.g. breeding, nesting, calving, resting, foraging, migration).
- An aspect associated with the activity has been identified as a key threat to the species in a Part 13 statutory instrument (e.g. anthropogenic noise, light emissions, marine debris, etc.).

For those Part 13 statutory instruments identified as relevant to the activity, the objectives, action areas and actions were considered during the assessment of impacts and risks (**Section 6.10**).

Table 4-3: Part 13 statutory instruments for EPBC Act listed species identified from PMST searches

Species	EPBC Act Part 13 statutory instrument	Considered during impact/risk assessment	Relevant EP section
All vertebrate fauna			
All vertebrate fauna	Threat abatement plan for the impacts of marine debris on vertebrate marine life (Commonwealth of Australia, 2018).	Y	**Section 6** and **Table 6-15**
Cetaceans (Whales and Dolphins)			
Sei whale	Conservation Advice for *Balaenoptera borealis* (Sei whale) (Threatened Species Scientific Committee 2015a)	N	N/A
Blue whale	Conservation management plan for the blue whale: A recovery plan under the EPBC Act 1999 2015–2025 (Commonwealth of Australia 2015a)	Y	**Section 6** and **Table 6-12**
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (Fin whale) (Threatened Species Scientific Committee 2015b)	N	N/A
Humpback whale	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (Threatened Species Scientific Committee 2015a)	Y	**Section 6**
Southern right whale	Conservation management plan for the southern right whale: a recovery plan under the EPBC Act 1999 2011-2021 (DSEWPaC, 2012b)	N	N/A
Reptiles			
All marine turtle species (loggerhead, green, leatherback, hawksbill, flatback, olive ridley)	Recovery plan for marine turtles in Australia (Commonwealth of Australia 2017)	Y	**Section 6** and **Table 6-11**
Leatherback turtle	Approved conservation advice for *Dermochelys coriacea* (Leatherback Turtle) (Threatened Species Scientific Committee 2008a)	Y	
Short-nosed seasnake	Approved conservation advice for *Aipysurus apraefrontalis* (short-nosed sea snake) Threatened Species Scientific Committee 2010a)	Y	**Section 6**
Leaf-scaled seasnake	Approved conservation advice for *Aipysurus foliosquama* (leaf-scaled sea snake) (Threatened Species Scientific Committee 2010b)	Y	**Section 6**

Species	EPBC Act Part 13 statutory instrument	Considered during impact/risk assessment	Relevant EP section
Sharks and Rays			
White shark	Recovery plan for the white shark (*Carcharodon carcharias*) (Commonwealth of Australia 2013c)	N	N/A
All sawfish (green, dwarf, narrow)	Sawfish and river shark multispecies recovery plan (Commonwealth of Australia 2015b).	Y	**Section 6** and **Table 6-14**
Dwarf sawfish	Approved conservation advice for *Pristis clavata* (dwarf sawfish) (Threatened Species Scientific Committee 2009).	Y	
Green sawfish	Approved conservation advice for green sawfish (Threatened Species Scientific Committee n.d.)	Y	
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (Commonwealth of Australia 2014)	Y	**Section 6** and **Table 6-13**
Whale shark	Approved Conservation advice *Rhincodon typus* (whale shark) (Threatened Species Scientific Committee 2015b)	Y	**Section 6**
Birds			
Migratory shorebird species	Wildlife conservation plan for migratory shorebirds (Commonwealth of Australia 2015c).	Y	**Section 6**
Red knot, knot	Approved Conservation Advice for *Calidris canutus* (red knot) (Threatened Species Scientific Committee, 2016c)	Y	
Eastern curlew, far eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (eastern curlew) (Threatened Species Scientific Committee, 2015d)	Y	
Australian painted snipe	Approved conservation advice on *Rostratula australis* (Australian Painted Snipe) (Threatened Species Scientific Committee 2013)	Y	
Abbott's booby	Conservation advice *Papasula abbotti* Abbott's booby (Threatened Species Scientific Committee, 2015f)	Y	
Curlew sandpiper	Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper) (Threatened Species Scientific Committee 2015c)	Y	
All petrels and albatrosses (southern giant-petrel, soft-plumaged petrel,	National recovery plan for threatened albatrosses and giant petrels 2011–2016 (Commonwealth of Australia 2011)	Y	

Species	EPBC Act Part 13 statutory instrument	Considered during impact/risk assessment	Relevant EP section
northern giant petrel, indian yellow-nosed albatross, tasmanian shy albatross, white-capped albatross, campbell albatross, black-browed albatross)			
Soft-plumaged petrel	Conservation advice Pterodroma mollis soft plumage petrel (Threatened Species Scientific Committee, 2015g)	Y	
Bar-tailed godwit (*baueri*)	Conservation advice *Limosa lapponica baueri* bar-tailed godwit (western Alaskan) (Threatened Species Scientific Committee 2016a)	Y	
Northern Siberian bar-tailed godwit	Conservation advice *Limosa lapponica menzbieri* bar-tailed godwit (northern Siberian) (Threatened Species Scientific Committee 2016b)	Y	
Australian fairy tern	Conservation advice for Sterna nereis (Australian Fairy tern) (Threatened Species Scientific Committee 2011a)	Y	

4.4.2.2 Habitat Critical to the Survival of a Species

In accordance with the EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance, an action is deemed to have a significant impact if there is a real chance or possibility that it will adversely affect habitat critical to the survival of a species. Habitat critical to the survival of marine turtles identified for each genetic stock are outlined in the Recovery Plan for Marine Turtles in Australia 2017–2027 (CoA, 2017). The Operational Area does not overlap with any habitat critical to the survival of a species; however, habitat critical to the survival of green, flatback and hawksbill turtles (i.e. nesting and internesting buffer) do overlap the EMBA (as described in **Table 4-4**).

Table 4-4: Nesting and internesting areas identified as habitat critical to the survival of marine turtles for each stock that overlaps the EMBA

Species	Nesting Location (CoA, 2017)	Major Nesting Area	Internesting Buffer	Nesting Period	Hatching Period	Distance from Operational Area
Green turtle	Barrow Island	✓	20 km	Nov-Mar	Jan-May (peak: Feb-Mar)	~90 km
	Montebello Islands (all with sandy beaches)	✓				~50 km
	Serrurier Island	x				~220 km
	Northwest Cape	✓				~260 km
	Thevenard Island	x				~180 km
	Ningaloo Coast	x				~280 km
Hawksbill turtle	Montebello Islands (including Ah Chong Island, South East Island and Trimouille Island)	✓	20 km	Oct-Feb	All year (peak: Dec-Feb)	~50 km
	Lowendal Islands (including Varanus Island, Beacon Island and Bridled Island)	x				~80 km
Flatback turtle	Montebello Islands (all with sandy beaches)	x	60 km radius	Oct-Mar	Feb-Mar	~10 km
	Barrow Island	✓				~50 km
	Coastal islands from Cape Preston to Locker Island	x				~72 km
	Dampier Archipelago	✓				~50 km
Loggerhead turtle	Ningaloo Coast	x	20 km	Nov-May	Jan-May	~280 km
	Muiron Islands	x				~230 km

4.4.2.3 Biologically Important Areas

A review of the Department of Agriculture, Water and Environment (DAWE) National Conservation Values Atlas identified that the following BIAs overlap spatially with the Operational Area:

- whale shark foraging BIA (presence during northward migration from Ningaloo Marine Park along the 200 m isobath (July to November)
- flatback turtle internesting BIA (80 km buffer) during the breeding season (November to March)

- wedge-tailed shearwater breeding and foraging BIA during its breeding season (August to April)

BIAs that overlap the Operational Area and EMBA are listed in **Table 4-5**. In some instances, the BIAs are also identified as 'habitat critical to the survival of a species' which are detailed in **Table 4-4**.

Table 4-5: BIAs overlapping the Operational Area and EMBA

Species	BIA type	Approximate distance from Operational Area (km)
Mammals		
Humpback whale	Migration (north and south)	29
Pygmy blue whale	Migration	29
Dugong	Foraging	270
	Breeding	270
Reptiles		
Flatback turtle	Internesting buffer (Montebello Islands)	Overlaps
	Aggregation, foraging, mating, nesting (Montebello Islands)	66
	Internesting buffer (Thevenard Island – South Coast)	120
Green turtle	Internesting buffer (Montebello and Barrow Islands)	42
	Nesting (Montebello Islands)	63
	Internesting buffer (North and South Muiron Islands)	227
Hawksbill turtle	Internesting buffer	46
	Foraging, mating, nesting (Montebello Islands)	66
	Internesting buffer (Thevenard Island)	177
	Internesting buffer (Ningaloo coast and Jurabi coast)	270
Loggerhead turtle	Internesting buffer (Montebello Islands)	56
	Muiron Islands	227
Shark, Fish and Rays		
Whale shark	Foraging	Overlaps
Oceanic Seabirds and/or Migratory Shorebirds		
Wedge-tailed shearwater	Breeding (foraging buffer)	Overlaps
Roseate tern	Breeding	65
Fairy tern	Breeding	63
Lesser crested tern	Breeding	69
Little tern	Resting	375
White-tailed tropicbird	Breeding	280

4.4.2.4 Seasonal Sensitivities of Protected Species

Periods of the year coinciding with key environmental sensitivities for the Operational Area and the EMBA, including EPBC Act listed threatened and/or migratory species potentially occurring within the Operational Area, are presented in **Table 4-6**. These relate to breeding, foraging or migration of the indicated fauna.

The following species were listed in the EPBC Act Protected Matters Search but have been excluded from **Table 4-6**:

- Bryde's whale and sperm whales may occasionally transit the area. However, information is not available to support a definitive seasonality in the NWS Province.
- The leatherback turtle is not confirmed as a nesting species within WA (Limpus, 2008; DoEE, 2017a).
- Great white, shortfin mako and longfin mako sharks have not been included as seasonality is not defined, as they are ocean going and can be present at any time, but are not known to have significant populations with regular migratory routes or breeding/foraging aggregations within the Operational Area.

Table 4-6: Key environmental sensitivities and timings for fauna (indicative). Migratory whale periods are specific to the NWS Region based on scientific literature. Timing will vary with geographic location along the WA coast

Species	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Operational Area												
Blue whale – northern migration (North West Cape, Montebello)[1]				🟨	🟥	🟥	🟨	🟨				
Blue whale – southern migration (North West Cape, Montebello)[2]	🟨									🟨	🟥	🟥
Humpback whale – northern migration (Jurien Bay to Montebello)[3]					🟨	🟥	🟥	🟨				
Humpback whale – southern migration (Montebello to Jurien Bay)[4]								🟥	🟥	🟨	🟨	
Killer whale – foraging (Shark Bay)[5]						🟨	🟨	🟨				
Whale shark* – foraging/aggregation near Ningaloo[6]			🟨	🟥	🟥	🟨	🟨	🟨	🟨	🟨	🟨	
Green turtle – various nesting areas[8]	🟥	🟥	🟨								🟨	🟨
Flatback turtle – various nesting [7]	🟥	🟨	🟨							🟨	🟨	🟥

Species	January	February	March	April	May	June	July	August	September	October	November	December
Loggerhead turtle – various nesting areas [7]	🟥	🟨	🟨	🟨	🟨						🟨	🟥
Hawksbill turtles – various nesting areas [8]	🟥	🟨								🟨	🟨	🟥
Manta rays – presence, aggregation, breeding (Ningaloo)[9]			🟨	🟨	🟨	🟨	🟨	🟨				
Fairy tern – breeding (Ningaloo)[10]			🟨	🟨	🟨	🟨	🟨					
Wedgetailed shearwater – various breeding sites[12]	🟨	🟨	🟨	🟨				🟨	🟨	🟨	🟨	🟨
EMBA												
Osprey – breeding (Ningaloo)[11]				🟨	🟨	🟨	🟨	🟨	🟨	🟨		
Roseate tern – breeding (Ningaloo)[12]	🟨	🟨	🟥	🟥	🟥	🟥	🟥	🟨	🟨	🟨	🟨	🟨

🟨	Species may be present in the region
🟥	Peak period. Presence of animals reliable and predictable each year

References for species seasonal sensitivities:

1. DSEWPaC, 2012a, b; McCauley and Jenner, 2010; McCauley, 2011
2. DSEWPaC, 2012a, b; McCauley and Jenner, 2010
3. CALM, 2005; Environment Australia, 2002; Jenner *et al.*, 2001; McCauley and Jenner, 2001
4. McCauley and Jenner, 2001; Threatened Species Scientific Committee, 2015c
5. McCauley, 2011
6. CALM, 2005; DSEWPaC, 2012a; Environment Australia, 2002; Sleeman *et al.*, 2010
7. Chevron Australia Pty Ltd, 2015; CALM, 2005; DSEWPaC, 2012a
8. Chevron Australia Pty Ltd, 2015; DSEWPaC, 2012a
9. Environment Australia, 2002
10. CALM, 2005; Environment Australia, 2002
11. Higgins and Davies, 1996
12. DSEWPaC, 2012c; Environment Australia, 2002.

**Periods of sensitivity include whale shark foraging northward from the Ningaloo Marine Park along the 200 m isobath (July to November).*

4.4.2.4.1 Marine Mammals

Cetaceans – Whales

<u>Sei Whale</u>

The sei whale is a baleen whale that, like many species of baleen whales, was significantly reduced in numbers by commercial whaling operations. The species has a worldwide oceanic distribution, and is expected to perform seasonal migrations between low latitude wintering areas and high latitude summer feeding grounds (Bannister *et al.*, 1996; Prieto *et al.*, 2012). Sei whales have been infrequently recorded in Australian waters (Bannister *et al.*, 1996), which could be due to the similarity in appearance of sei whales and Bryde's whales leading to incorrect recordings. There are no known mating or calving areas in Australian waters. The species prefers deep waters, and typically occurs in oceanic basins and continental slopes (Prieto *et al.*, 2012); records of the species occurring on the continental shelf (less than 200 m water depth) are uncommon in Australian waters (Bannister *et al.*, 1996).

Occurrence within the Operational Area is likely to be restricted to one or few individuals infrequently transiting the area, with a higher likelihood of occurrence during winter months. Sei whales may also occur in the EMBA, in oceanic waters beyond the continental shelf during winter months when the species moves away from Antarctic feeding areas.

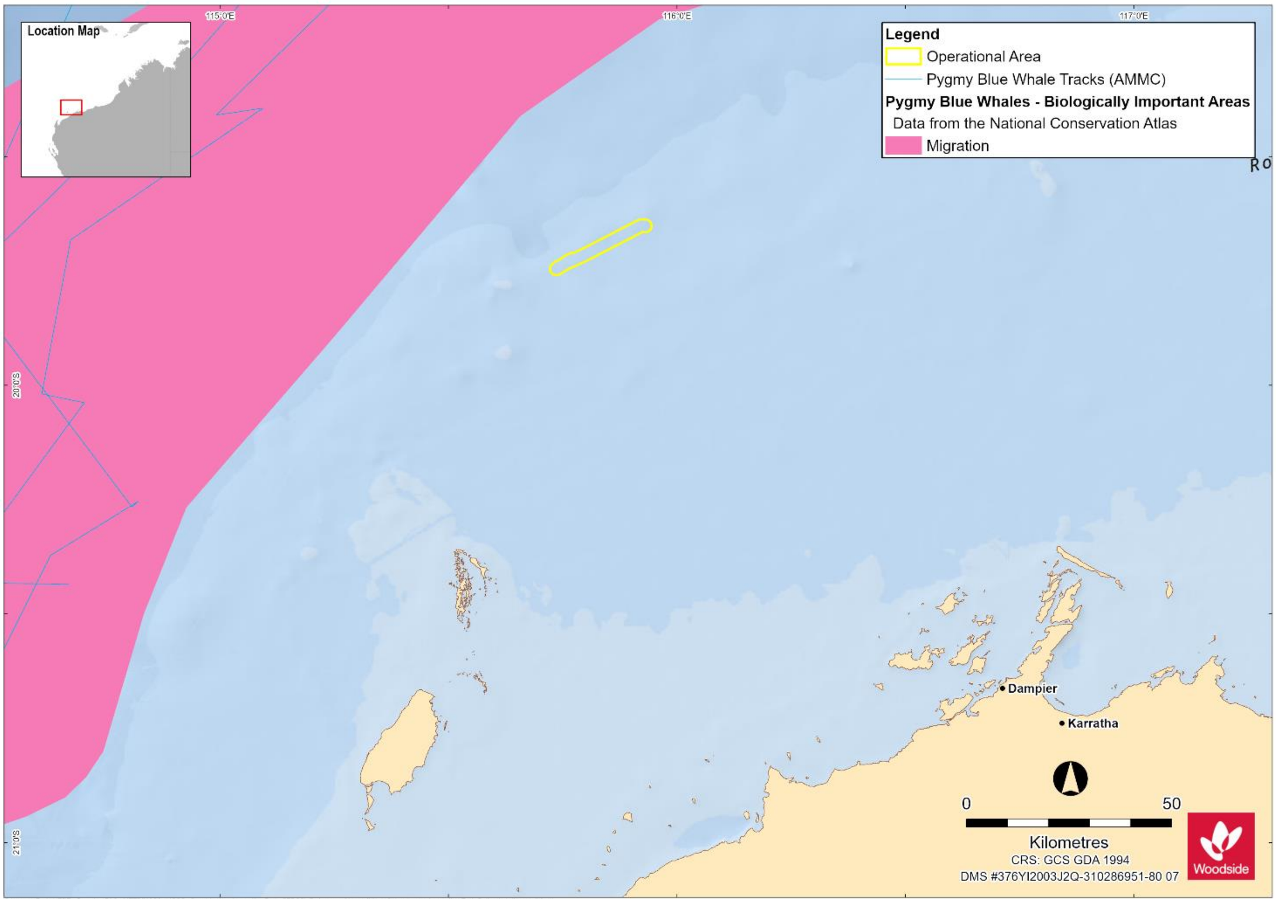
<u>Blue Whale</u>

There are two recognised subspecies of blue whale in the Southern Hemisphere, both of which are recorded in Australian waters. These are the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*) (CoA, 2015a). In general, southern blue whales occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (i.e., not in the Antarctic) (CoA, 2015a). Recent assessment of the distribution and population parameters of the pygmy blue whale in Australian waters found that whales in WA waters utilise the full latitude range of the Indian Ocean, from northern Indonesia to the Southern Ocean (McCauley *et al.*, 2018). This has allowed further delineation of stock structure, and this sub population is now recognised as the Eastern Indian Ocean pygmy blue whale population. On this basis, nearly all blue whales sighted in the NWMR within the EMBA are likely to be pygmy blue whales.

The East Indian Ocean pygmy blue whale population migrates annually through the offshore waters of WA, completing a northbound migration through the NWMR between mid-April to early August, and southbound migration from October to January (McCauley and Jenner, 2010; McCauley and Duncan, 2011; Jolliffe *et al.*, 2019; Gavrilov *et al.*, 2018) (**Figure 4-9**). This area has been defined as a migration BIA for pygmy blue whales, which the Operational Area lie about 26 km south of. Satellite tagging (2009 to 2012) indicated that the general distribution of East Indian Ocean pygmy blue whales is offshore in water depths over 200 m and commonly over 1000 m (Double *et al.*, 2012a) (**Figure 4-9**). Whales tagged in WA during March and April migrated northwards post tag deployment. The tagged whales travelled relatively near to the Australian coastline (100.0 ± 1.7 km) in water depths of 1369.5 ± 47.4 m, until reaching the North West Cape, after which they travelled offshore (238.0 ± 13.9 km) into progressively deeper water (2617.0 ± 143.5 m). Whales reached the northern terminus of their migration and potential breeding grounds in Indonesian waters by June (Double *et al.*, 2014). Noise logger data collected on the Exmouth Plateau during the southbound migration in 2014 found that the whales tend to travel southward at much greater distances from the coast than during the northbound migration, at distances up to 400 km from the shoreline (Gavrilov *et al.*, 2018). Therefore, although the BIA for this species has been spatially defined as the migration corridor centred between the 500 m and 1000 m depth contours, this data suggests individuals transit the deeper waters even further to the west of the Operational Area during the northbound and southbound migrations.

The Conservation Management Plan for the blue whale identifies a possible foraging area at Ningaloo Reef/North West Cape (Commonwealth of Australia, 2015a), outside the EMBA, where evidence for feeding is based on limited or direct observations or indirect evidence, such as prey occurring close to the whale or satellite tracks showing circling tracks for one individual. Satellite tracks of the pygmy blue whale's northern migration (Double *et al.*, 2012a, 2014) showed that most of the tagged whales (n=3) continued past the North West Cape with little directional variation, while one tagged whale showed circling tracks (**Figure 4-9**). As such, it is possible that pygmy blue whales feed opportunistically while transiting the region.

Given the Operational Area is about 29 km south of the defined migration BIA for pygmy blue whales, it is possible that individuals may transit the Operational Area during their northbound or southbound migration. However, their presence within the Operational Area is considered unlikely.



Sources: Esri, HERE, Garmin, FAO, METI/NASA, USGS, GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, GeosciencesAustralia, Esri, DeLorme, NaturalVue

Figure 4-9: Operational Area and pygmy blue whale satellite tracks and BIAs (after Double *et al.*, 2012b, 2014)

Fin Whale

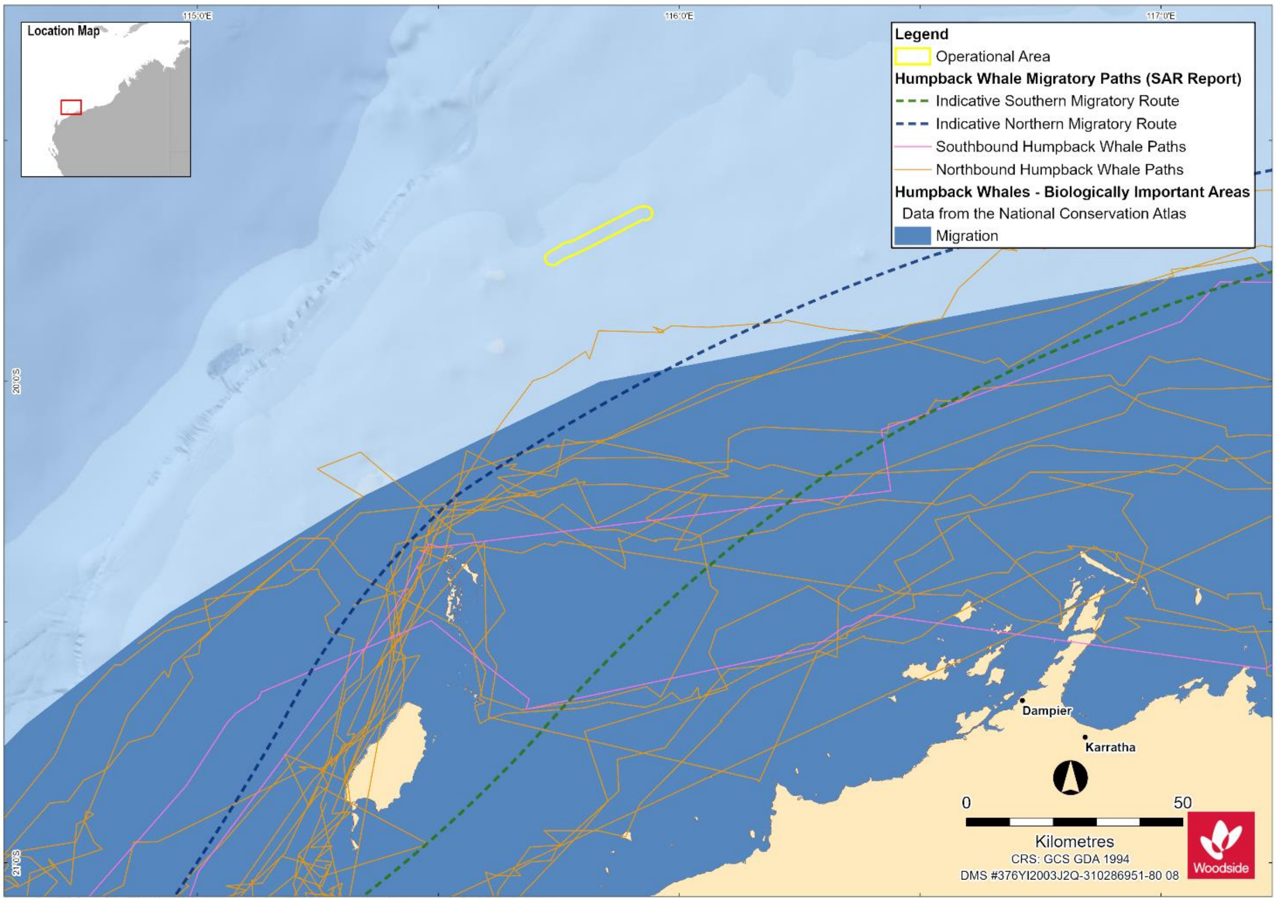
The fin whale is a large baleen whale with a cosmopolitan distribution in all ocean basins between 20°S and 75°S (Department of the Environment and Heritage, 2005a). The global population of fin whales was reduced significantly by commercial whaling, with the species being targeted due to its large size and broad distribution. Like other baleen whales, fin whales migrate annually between high latitude summer feeding grounds and lower latitude over-wintering areas (Bannister *et al.*, 1996).

Fin whales are thought to follow oceanic migration paths and are uncommonly encountered in coastal or continental shelf waters. The Australian Antarctic waters are important feeding grounds for fin whales, but there are no known mating or calving areas in Australian waters (Morrice *et al.*, 2004). There are also no known BIAs for fin whales in the NWMR. Fin whales are likely to infrequently occur within the Operational Area. Occurrence within this area and offshore areas of the EMBA are likely to be restricted to a few individuals occasionally transiting the area, mainly during winter months when the species may move away from Antarctic feeding areas.

Humpback Whale

Humpback whales occur throughout Australian waters, as two genetically distinct, east and west populations; both populations' distributions are influenced by migratory pathways and aggregation areas for resting, breeding and calving. In the west, humpback whales migrate north to breeding grounds in Camden Sound of the west Kimberley, between May and August, after feeding in Antarctic waters during the summer months (Jenner *et al.*, 2001). Calving typically occurs between mid-August and early September, within nearer shelf waters of the Camden Sound (outside the EMBA; more than 1000 km away from the Operational Area). The whales' southern migration runs between August and November, with females and calves being the last to leave the breeding grounds. Current population growth for the humpback whale population that migrates along the WA coast is estimated to be between 9.7 and 13% per annum (Threatened Species Scientific Committee, 2015c). Using the Salgado-Kent *et al.* (2012) estimate in 2008 of 26,100 individuals and an annual population growth rate of 10%, 2019 population estimates could be greater than 75,000 individuals.

From the North West Cape, north-bound humpback whales travel along the edge of the continental shelf, passing mainly to the west of the Muiron, Barrow and Montebello islands. The southern migratory route follows a relatively narrow track between the Dampier Archipelago and Montebello Islands. The humpback migration BIA is 26 km from the Operational Area within the EMBA. Exmouth Gulf and Shark Bay are known resting/aggregation areas for southbound humpback whales. In particular, Exmouth Gulf is where cow/calf pairs may stay for up to two weeks. The Exmouth Gulf and Shark Bay humpback whale BIAs are located within the EMBA, about 253 km and 588 km respectively from the Operational Area. Noise logger deployment conducted near the Goodwyn facility (which is adjacent to the Operational Area) detected humpback whales present at the end of September, likely migrating south, and from June to mid-August in deeper water, nearer to the continental shelf, likely migrating north (RPS Environment and Planning, 2011). The southbound migration of cow/calf pairs is slightly later during October (extending into November and December). During the southbound migration, it is likely that most individuals, particularly cow/calf pairs, stay closer to the coast than the northern migratory path. During these migration periods, low numbers of humpback whales may occur within the Operational Area.



Sources: Esri, HERE, Garmin, FAO, METI/NASA, USGS, GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, GeosciencesAustralia, Esri, DeLorme, NaturalVue

Figure 4-10: Operational Area and humpback whale satellite tracks and BIA (Double *et al.*, 2010, after 2012a)

Bryde's Whale

Bryde's whales are distributed widely throughout tropical and sub-tropical waters (DoE, 2021). Bryde's whales have been identified as occurring in both oceanic and inshore waters, with the only key localities recognised in WA being in the Abrolhos Islands and north of Shark Bay (Bannister *et al.*, 1996). Two movement behaviours are recognised for Bryde's whales: inshore (largely sedentary) and offshore (may perform migrations). Data suggests offshore whales may migrate seasonally, heading towards warmer tropical waters during the winter; however, information about migration is not well known (McCauley and Duncan, 2011). There is some taxonomic confusion, with Bryde's whales bearing similarity to, and historically confused with, the sei whale (Bannister *et al.*, 1996), particularly in whaling catch statistics (Slijper *et al.*, 1964).

Bryde's whales may occur through a broad area of the continental shelf in the NWMR regions, including the Operational Area and EMBA (McCauley and Duncan, 2011; RPS Environment and Planning, 2011). This species has been detected within the NWMR from mid-December to mid-June, peaking in late February to mid-April (RPS Environment and Planning, 2011). There are no known BIAs for Bryde's whales in the NWMR. The presence of Bryde's whales in the Operational Area is likely to be a remote occurrence and limited to a few individuals. In the EMBA, occurrence is also likely to be limited.

Sperm Whale

Sperm whales are the largest of the toothed whales and are distributed worldwide in deep waters (greater than 200 m) off continental shelves and sometimes near shelf edges (Bannister *et al.*, 1996). Sperm whales have been recorded in all Australian State waters and are known to migrate northward in winter and southwards in summer (Bannister *et al.*, 1996). In WA, sperm whales have two BIAs recognised for foraging activities. These two areas are located west of Rottnest Island (within the EMBA) and along the southern coastline between Cape Leeuwin and Esperance (outside the EMBA). In deep water off the North West Cape, sperm whales have been sighted in pod sizes up to six animals between February and April from two separate surveys, in 2010 and 2017 (RPS Environment and Planning, 2010).

There is limited information about sperm whale distribution in Australian waters; however, they are usually found in deep offshore waters, with more dense populations close to continental shelves and canyons (DoEE, 2019). The species may occur in severely fragmented populations. Key localities in Australia include: the southern coastline between Cape Leeuwin and Esperance, WA (Bannister *et al.*, 1996); south-west of Kangaroo Island, SA; deep waters off the Tasmanian west and south coasts; southern New South Wales; and deep waters off Stradbroke Island, Queensland (Ceccarelli *et al.*, 2011). There are no known BIAs for sperm whales in the Operational Area or EMBA. In the open ocean, there is a general movement of sperm whales southwards in summer, and corresponding movement northwards in winter, particularly for males (DoEE, 2019). Detailed information about the distribution and migration patterns of sperm whales off the WA coast is not available.

Females with young may reside within the NWMR all year round, males may migrate through the region, and the species may be associated with canyon habitats (Ceccarelli *et al.*, 2011). Sperm whales have been recorded in deep waters off North West Cape (Jenner *et al.*, 2010) and appear to occasionally venture into shallower waters in other areas. Twenty-three sightings of sperm whales (variable pod sizes, ranging from one to six animals) were recorded by marine mammal observers (MMOs) during the North West Cape MC3D marine seismic survey conducted between December 2016 and April 2017. These animals were observed in deep, continental slope waters of the Montebello Saddle (maximum distance of about 90 km from North West Cape), and the waters overlying the Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF.

Sperm whales are likely to only infrequently occur within proximity to the Operational Area and in far offshore waters of the EMBA. Their presence is likely to be a rare occurrence and limited to a few individuals infrequently transiting the area, particularly during winter months.

Cetaceans – Toothed Whales and Dolphins

Killer Whale

The killer whale has a widespread distribution from polar to equatorial regions of all oceans and has been recorded off all states of Australia (Bannister *et al.*, 1996). Killer whales appear to be more common in cold, deep waters; however, they have been observed along the continental slope and shelf, particularly near seal colonies, as well as in shallow coastal areas of WA (Bannister *et al.*, 1996; Thiele, D. and Gill, P.C., 1999).

Anecdotal evidence suggests killer whales may feed on dugongs in Shark Bay (within the EMBA), between June and August (Department of Environmental Protection, 2001), but there are no recognised key localities or important habitats for killer whales within the Operational Area or EMBA. The presence of killer whales is likely to be a rare occurrence and limited to few individuals infrequently transiting the EMBA.

Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)

There are four known subpopulations of spotted bottlenose dolphins, of which the Arafura/Timor Seas population was identified as potentially occurring within the Operational Area and the EMBA. The species occurs in open coastal waters, primarily within the continental shelf, and within the coastal waters of oceanic islands from Shark Bay to the western edge of the Gulf of Carpentaria. The species forages in a wider range of habitats and within deeper waters than most dolphin species, but is generally restricted to water depths of less than 200 m (DSEWPaC, 2012a).

The Arafura/Timor Sea spotted bottlenose dolphin population is considered migratory; however, their movement patterns are considered highly variable, with some individuals displaying year-round residency to a small area and others performing long-range movements and migrations (DoEE, 2017). The species is likely to occur only infrequently in the Operational Area. Within the EMBA, the species is likely to transit across the continental shelf waters of the NWMR.

4.4.2.5 Marine Turtles

Five of the six marine turtle species recorded for the NWMR have the potential to occur within the Operational Area (**Appendix C**): the loggerhead, green, leatherback, hawksbill and flatback turtles. The olive ridley turtle has the potential to occur within the EMBA.

There is no emergent habitat within the Operational Area; therefore, nesting aggregations of marine turtles are unlikely to occur in the vicinity of the Operational Area. Flatback turtle internesting BIAs, extending from nesting locations at the Montebello Islands and Dampier Archipelago, overlap the EMBA. The Flatback turtle internesting BIAs from nesting locations at the Montebello Islands also partially overlaps the Operational Area. The BIAs are considered very conservative, as it is based on the maximum range of internesting females. However, many turtles are likely to remain near their nesting beaches, and as they leave beaches they typically spread out and, consequently, density decreases rapidly with increasing distance from a nesting beach.

The 60 km internesting buffer for flatback turtles in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017), defined as habitat critical to the survival of a species, is based primarily on the movements of tagged internesting flatback turtles along the NWS reported by Whittock *et al.* (2014), which found that flatback turtles may demonstrate internesting displacement distances up to 62 km from nesting beaches. However, these movements were confined to longshore movements in nearshore coastal waters or travel between island rookeries and the adjacent mainland (Whittock *et al.*, 2014). There is no evidence to date to indicate flatback turtles swim out into deep offshore waters during the internesting period.

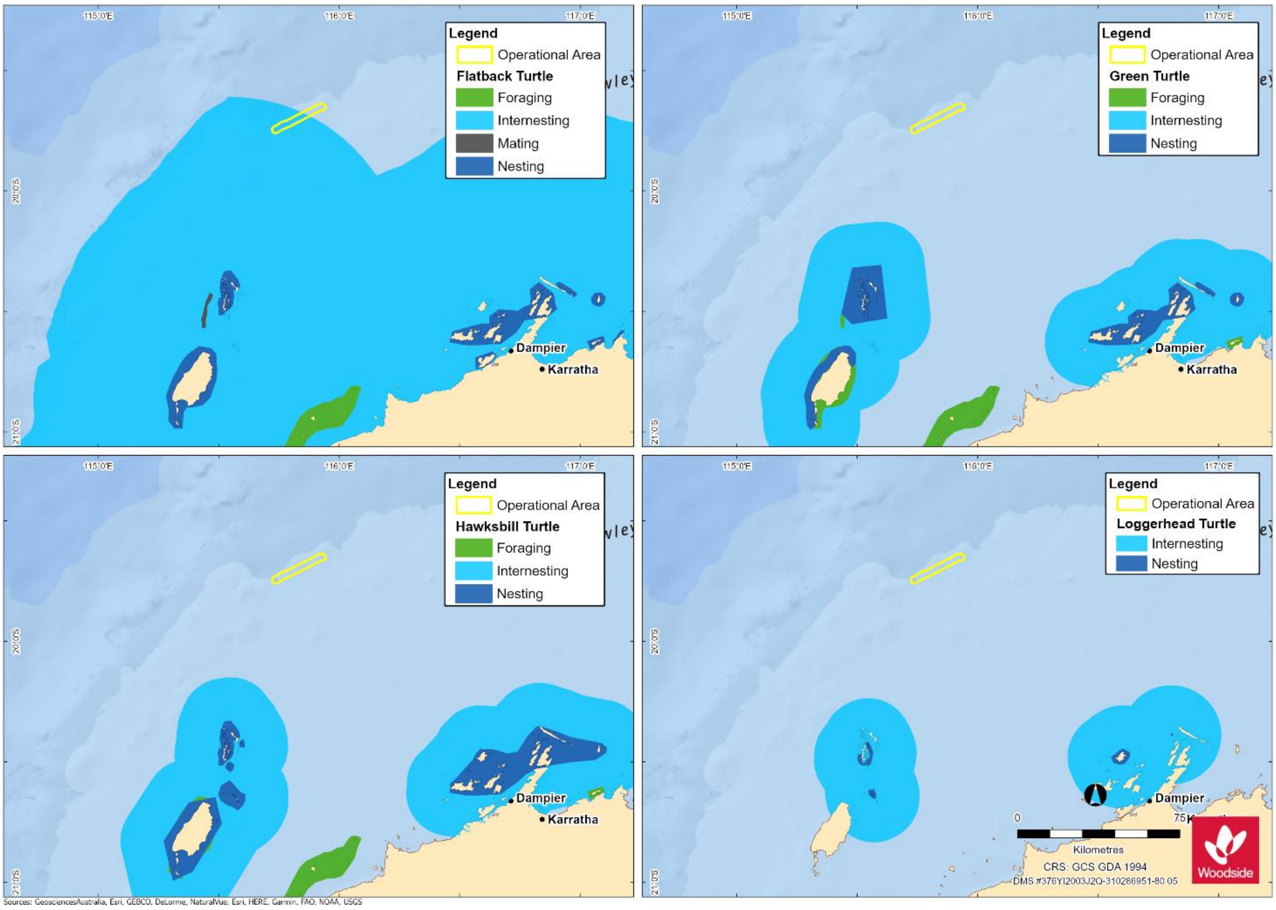
A more recent paper by the same authors (Whittock *et al.*, 2016) has more precisely defined flatback turtle internesting habitat along the NWS. The Whittock *et al.* (2016) study developed a habitat suitability map to identify areas where internesting flatback turtles may be present within the EMBA based on data compiled for a suite of environmental variables and satellite tracks of 47 internesting flatback turtles from five different mainland and island rookeries tracked over 1289 days. Whittock *et al.* (2016) defined suitable internesting habitat as water 0 to 16 m deep and within 5 to 10 km of the coastline, while unsuitable internesting flatback habitat was defined as waters more than 25 m deep and more than 27 km from the coastline. The primary environmental variables that influenced flatback internesting movement were bathymetry, distance from coastline and sea surface temperature. Suitable areas of internesting habitat were located close to many known flatback turtle rookeries across the region (Whittock *et al.*, 2016). This modelling study clearly demonstrates that all of the internesting buffer BIA and habitat critical to the survival of flatback turtles overlapped by the EMBA, do not represent suitable habitat for flatback turtles during internesting periods. Hence, it is highly unlikely that significant numbers of flatback turtles will be in the offshore, deep waters of the Operational Area. The evidence, that suitable internesting habitat for flatback turtles is likely to be limited to relatively shallow waters within close proximity of the coastline, is further supported by data from satellite telemetry of 11 flatback turtles after nesting on the Lacepede Islands (Thums *et al.*, 2017). This study found that “During the inter-nesting phase, flatback turtles remained at an average distance of 15.75 ± 12.25 km from West Lacepede Island, in water depths of 16 ± 3 m…” (Thums *et al.*, 2017).

Four of the turtle species (green, loggerhead, flatback and hawksbill) have significant nesting rookeries on beaches along the mainland coast and islands off the coast, including the Montebello/Barrow Islands and Dampier Archipelago, all of which are within the EMBA (68 km and 119 km from the Operational Area respectively) (CoA, 2017; Limpus, 2007, 2008a, b, 2009a, b). **Table 4-7** provides additional details of the marine turtle species identified, including breeding and nesting seasons, diet and key habitats (including BIAs). **Figure 4-11** and **Figure 4-12** show the BIAs and habitat critical to the survival of marine turtles respectively.

Table 4-7: Key information on marine turtles in the EMBA

Turtle species	Key seasons within the NWMR	Diet	Key habitats
Green turtle	**Breeding**: Approximately September to March. **Nesting**: November to April. Peak period from January to February.	Seagrasses and algae.	**Preferred habitat**: Nearshore reef habitats in the photic zone. **Distribution**: Ningaloo Coast to Lacepede Islands. **Major nesting sites**: Montebello Islands, Barrow Island, Muiron Islands and North West Cape. **Internesting habitat**: Generally within 10 km of nesting beaches (Waayers *et al.*, 2011). **Nearest BIA**: Internesting, foraging, mating and nesting on the Montebello Islands during summer, with a 20 km internesting buffer. Foraging on the string of islands between Cape Preston and Onslow. A migration corridor also occurs along the Dampier Archipelago. These BIAs overlap the EMBA. **Nearest habitat critical for the survival of green turtles:** The Operational Area is about 50 km from the nearest internesting buffer around Montebello Islands.
Loggerhead turtle	**Breeding**: Approximately September to March. **Nesting**: Late October to late March. Peak period from late December to early January.	Carnivorous – feeding mainly on molluscs and crustaceans.	**Preferred habitat**: Nearshore and island coral reefs, bays and estuaries in tropical and warm temperate latitudes. **Distribution**: Shark Bay to North West Cape and as far north as Muiron Islands and Dampier Archipelago. **Major nesting sites**: Principally from Dirk Hartog Island, along the Gnarloo and Ningaloo Coast to North West Cape and the Muiron Islands. There have been occasional records from Varanus and Rosemary islands in the Pilbara. Late summer nesting recorded for Barrow Island, Lowendal Islands and Dampier Archipelago. **Internesting habitat**: Limited data about Australian loggerhead turtles; however, literature indicates internesting habitat for this species is generally within 20 km of nesting beaches (CoA, 2017). **Nearest BIA**: Internesting buffer around the Montebello Islands (peak late December to early January) with a 20 km internesting buffer and nesting on the Rosemary Island. These BIAs overlap the EMBA.
Leatherback turtle	No confirmed nesting activity in WA.	Carnivorous – feeding mainly in the open ocean on jellyfish and other soft-bodied invertebrates.	**Preferred Habitat**: Nearshore, coastal tropical and temperate waters may be encountered within the NWMR, but noted that there are no known nesting sites within the NWMR.

Turtle species	Key seasons within the NWMR	Diet	Key habitats
Hawksbill turtle	**Breeding**: Approximately October to January. **Nesting**: All year round with peak in September to January.	Mainly sponges – also seagrasses, algae, soft corals and shellfish.	**Preferred Habitat**: Nearshore and offshore reef habitats. **Distribution**: Shark Bay north to Dampier Archipelago. **Major nesting sites**: The most significant rookery in WA is at Rosemary Island. Other rookeries include Varanus Island in the Lowendal group, some islands in the Montebello group and along the Ningaloo Coast (Limpus, 2009). **Internesting habitat**: Limited data about Australian hawksbill turtles; however, literature indicates internesting habitat for this species is generally within 20 km of nesting beaches (CoA, 2017). **Nearest BIA**: Internesting buffer around the Montebello Islands in spring and early summer (peak October) with a 20 km internesting buffer. Montebello also has BIAs for nesting, foraging and mating. These BIAs overlap the EMBA. **Nearest habitat critical for the survival of hawksbill turtles:** The Operational Area is about 52 km from the nearest internesting buffer around Montebello Islands.
Flatback turtle	**Breeding**: Peak between December and February. **Nesting**: November to March with peak period in December and January.	Carnivorous – feeding mainly on soft bodied prey such as sea cucumbers, soft corals and jellyfish.	**Preferred Habitat**: Nearshore and offshore sub-tidal and soft bottomed habitats of offshore islands. **Distribution:** Shark Bay north to Dampier Archipelago. **Major nesting sites**: The largest nesting sites of the Pilbara region are Barrow Island and the mainland coast (Mundabullangana Station near Cape Thouin and smaller nesting sites at Cemetery Beach in Port Hedland and Bell's Beach near Wickham). Other significant rookeries include Thevenard Island, the Montebello Islands, Varanus Island, the Lowendal Islands, and islands of the Dampier Archipelago. **Internesting habitat**: Up to 70 km from nesting beaches (Waayers *et al.*, 2011; Whittock *et al.*, 2014). Satellite tracking of flatback turtle nesting populations at Barrow Island indicates this species travels to the east of Barrow Island, towards WA mainland coastal waters, between nesting events. **Nearest BIA**: Internesting buffer around Montebello Islands in summer with an 80 km internesting buffer, which overlaps the Operational Area. The Montebello Islands also have BIAs for nesting, foraging and mating. These BIAs overlap the EMBA. **Nearest habitat critical for the survival of flatback turtles:** The Operational Area is about 10 km from the nearest internesting buffer around Montebello Islands.



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 4-11 Marine turtle BIAs

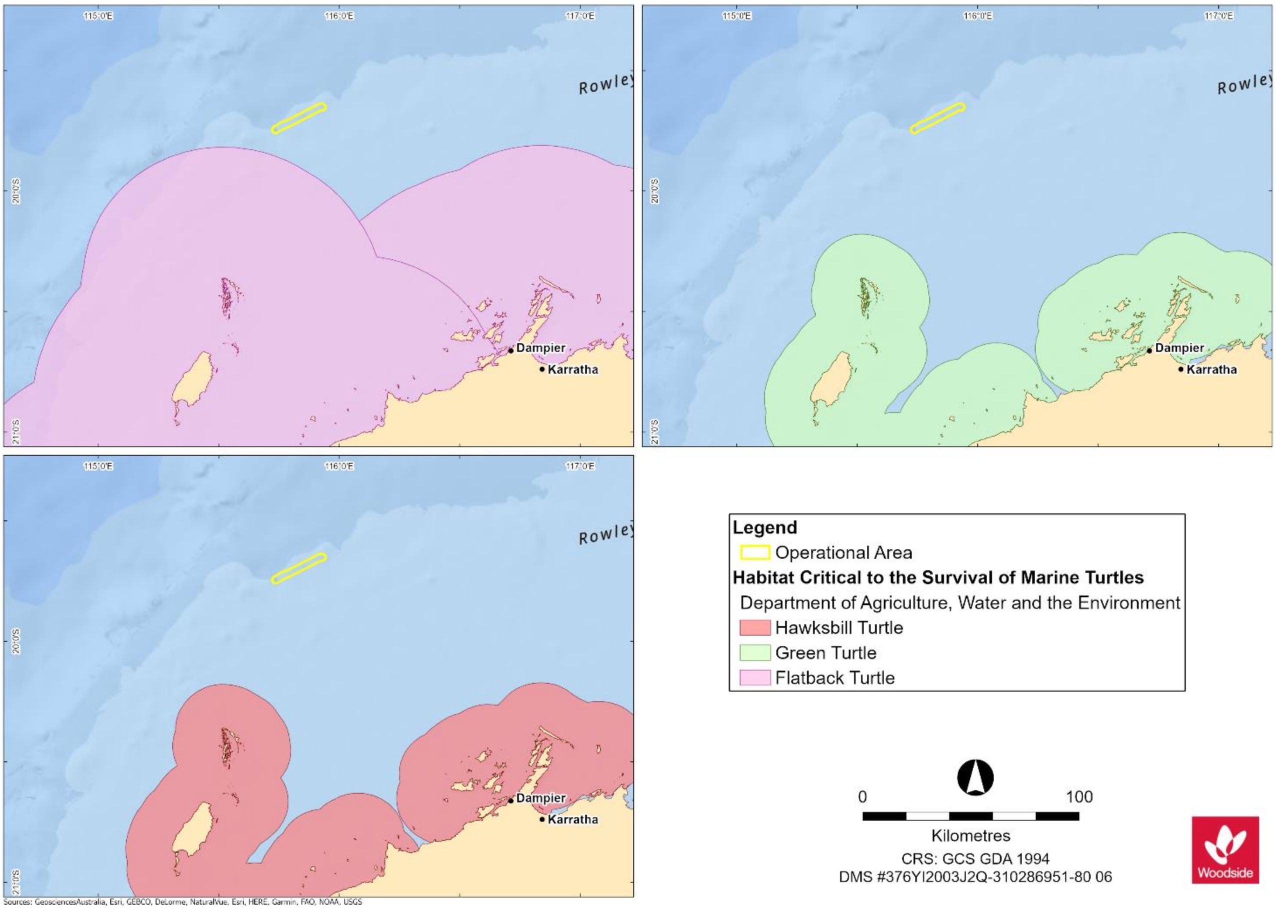


Figure 4-12 Habitat critical to the survival of marine turtles

Post-nesting migratory routes for green, hawksbill and flatback turtles recorded for the NWMR (Barrow Island and mainland sites) (Chevron Australia Pty Ltd, 2015) indicated no overlap with the Operational Area. Green, flatback and hawksbill turtles travelling from nesting sites to foraging grounds generally travelled east or south of Barrow Island, around or through the Dampier Archipelago and along the coast towards foraging grounds to the north (north of Broome). The hawksbill turtle is an exception as it tends to travel south to the coastal island chain south of Barrow Island (Chevron Australia Pty Ltd, 2015). Tracking data indicates the three marine turtle species recorded for the NWMR, which travel and forage in coastal waters that are relatively shallow (Chevron Australia Pty Ltd, 2015), are:

- hawksbill turtles – less than 10 m deep
- green turtles – less than 25 m deep
- flatback turtles – less than 70 m deep.

4.4.2.6 Fishes

Sharks

<u>Great white shark</u>

The great white shark was identified as potentially occurring within the Operational Area. The species typically occurs in temperate coastal waters between the shore and the 100 m depth contour; however, adults and juveniles have been recorded diving to depths of 1000 m (Bruce *et al.*, 2006; Bruce, 2008). They are also known to make open ocean excursions of several hundred kilometres and can cross ocean basins (Weng *et al.*, 2007a, b). Although great white sharks are not known to form and defend territories, they are known to return on a seasonal/regular basis to regions with high prey density, such as pinniped colonies (Bruce, 2008).

Given the migratory nature of the species, its low abundance, broad distribution in temperate waters across southern Australia and absence of preferred prey (pinnipeds), great white sharks are unlikely to occur within the Operational Area but may occur in the southern waters of the EMBA.

Shortfin mako

The shortfin mako shark is a pelagic species with a circum-global, wide-ranging oceanic distribution in tropical and temperate seas (Mollet *et al.*, 2000), and was identified as potentially occurring within the Operational Area. The shortfin mako is commonly found in water with temperatures greater than 16 °C and can grow to almost 4 m. Tagging studies indicate shortfin makos spend most of their time in water less than 50 m deep but with occasional dives up to 880 m (Abascal *et al.*, 2011; Stevens *et al.*, 2010). Little is known about the population size and distribution of shortfin mako sharks in WA; however, it is possible they may transit the Operational Area and EMBA.

Longfin mako

The longfin mako is a widely distributed, but rarely encountered, oceanic shark species. The longfin mako was identified as potentially occurring within the Operational Area. The species can grow to just over 4 m long and is found in northern Australian waters, from Geraldton in WA to at least Port Stephens in New South Wales, and is uncommon in Australian waters relative to the shortfin mako (Bruce, 2013; DEWHA, 2010). There is very little information about these sharks in Australia, with no available population estimates or distribution trends. Longfin mako sharks may occur in the Operational Area and EMBA.

Whale shark

The DAWE has defined a BIA for foraging whale sharks (post aggregation at Ningaloo) centred on the 200 m isobath, with a key foraging period estimated from July to November (Commonwealth of Australia, 2015d; **Figure 4-13**). This area extends northward from the Ningaloo aggregation area and partially overlaps with the south east portion of the Operational Area. Anecdotal evidence from sightings data collected from the Woodside offshore facilities on the NWS indicate whale sharks are present on the NWS in the months of April, July, August, September and October, corresponding with the whale shark's seasonal migration to and from Ningaloo Reef. However, the numbers of individual whale sharks that transit through the Operational Area is expected to be low, based on the number of whale sharks aggregating at Ningaloo and on the different migration paths that the sharks may follow (see below).

Whale sharks aggregate annually to feed in the waters off the Ningaloo Coast from March to July, with the largest numbers recorded in April and May (Sleeman *et al.* 2010). However, seasonal aggregation can be variable, with individual whale sharks recorded at other times of the year and year round (Reynolds *et al.* 2017) The population (comprising individuals that visit the reef at some point during their lifetime) has been estimated to range between 300 and 500 individuals; the, number visiting Ningaloo Reef in any given year is expected to be somewhat smaller (Meekan *et al.* 2006). Timing of the whale shark migration to and from Ningaloo coincides with the coral mass spawning period, when there is an abundance of food (krill, planktonic larvae and schools of small fish) in the waters adjacent to Ningaloo Reef. At Ningaloo Reef, whale sharks stay within a few kilometres of the shore and in waters about 30–50 m deep (Wilson *et al.* 2006).

After the aggregation period, the distribution of the whale sharks is largely unknown. Tagging, aerial and vessel surveys suggest that the group disperses widely, up to 1800 km away. Satellite tracking has shown that the sharks may follow three migration routes from Ningaloo (Meekan and Radford, 2010; Wilson *et al.*, 2006):

- north-west, into the Indian Ocean
- directly north, towards Sumatra and Java
- north-east, passing through the NWS Province traveling along the shelf break and continental slope.

These tagging studies provided the justification for a foraging BIA for whale sharks and the Operational Area overlaps with this BIA, as shown in **Figure 4-13**. Though the BIA has been defined as a foraging area for whale sharks, it is more likely to be a migration pathway with whale sharks undertaking opportunistic foraging. It is expected that whale sharks may traverse through the Operational Area during their migrations to and from Ningaloo Reef. However, whale shark presence within the area is expected to be of a relatively short duration and not in significant numbers, given the main aggregations are recorded in coastal waters, particularly the Ningaloo Reef edge (Department of Conservation and Land Management 2005).

Anecdotal evidence from sightings made from Woodside's offshore platforms on the NWS indicate whale sharks are present in April, July, August, September and October, corresponding to the whale shark's migration to and from Ningaloo.

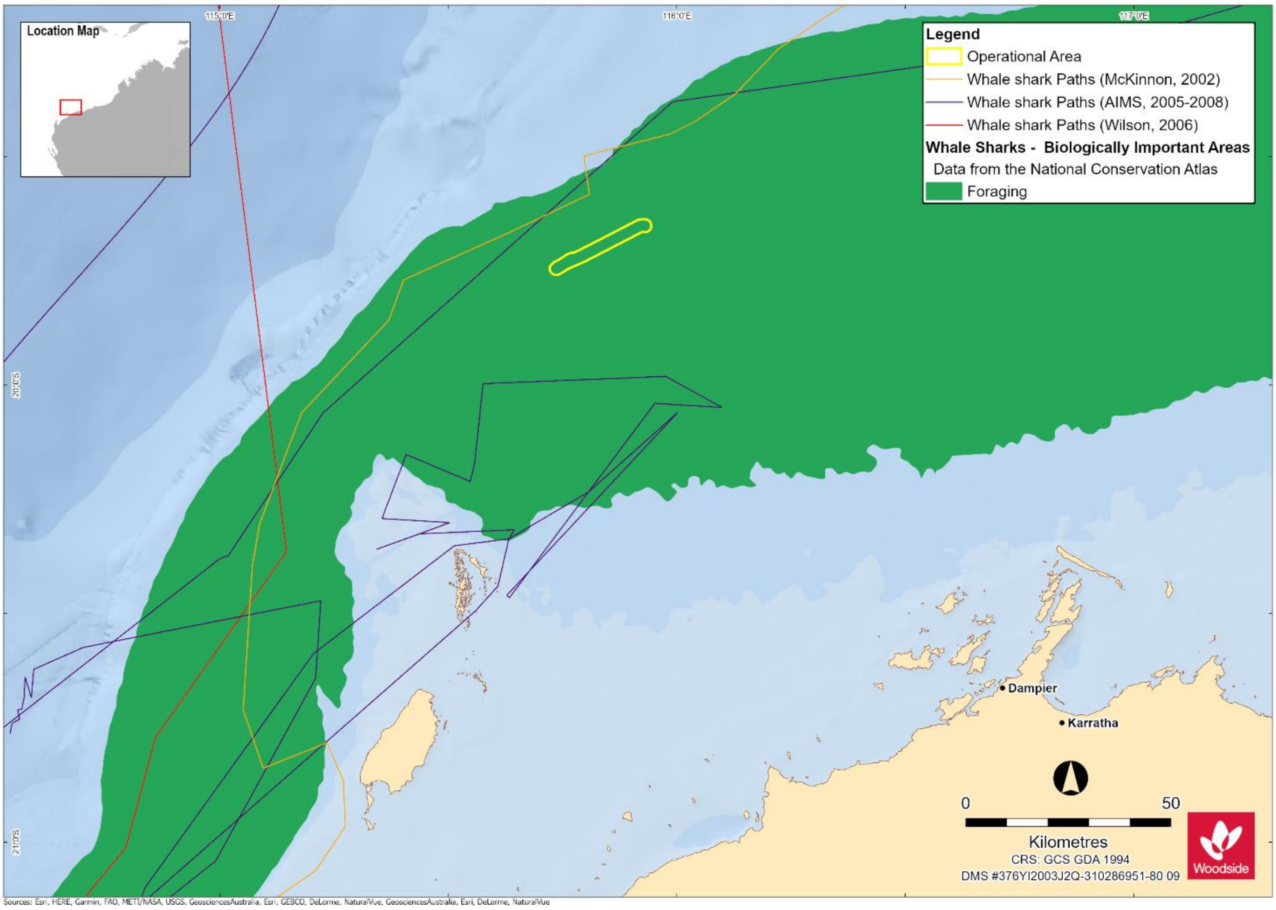


Figure 4-13: Whale shark BIAs within the EMBA and satellite tracks of whale sharks tagged between 2002 and 2008

Oceanic whitetip shark

The oceanic whitetip shark is found globally in deep open oceans, with a temperature greater than 18 °C. The oceanic whitetip shark was identified as potentially occurring within the Operational Area. This species was once extremely commonly and widely distributed, however, recent studies by Baum & Myers (2004) suggest that its numbers have declined drastically. It is found worldwide between 45°N and 43°S latitude. The shark spends most of its time in the upper layer of the ocean, to a depth of up to 150 m, and prefers offshore deep ocean areas. Mating season is in early summer in the southwest Indian Ocean. Oceanic Whitetip sharks may occur in the Operational Area and EMBA.

Grey nurse shark (West Coast Population)

The grey nurse shark distribution in Australian waters is described as found mostly in inshore regions in cool, temperate to sub-tropical waters and there are two separate, genetically distinct grey nurse shark populations - one on the east and one on the west coast (refer to references cited in the Recovery Plan for the Grey Nurse Shark (Commonwealth of Australia, 2014). The range of the west coast population is less well known that the east coast population, however records indicate that the species is widely distributed from the North West Shelf (including coastal waters in Exmouth Gulf), south to coastal waters in the Great Australian Bight (refer to Commonwealth of Australia, 2014). Furthermore, Hoschke and Whisson (2016) documented the first grey nurse shark aggregation site in Western Australia at the Point Murat Navy Pier.

More recently, sightings of grey nurse sharks have been confirmed on oil and gas subsea infrastructure (including wellheads) on the North West Shelf (with one record at 135 m depth), (McLean et al. 2018). As the Yodel and Capella wellheads are located in a water depth of ~135 m, grey nurse shark may occur in both the Operational Area and the wider EMBA.

Scalloped hammerhead

The scalloped hammerhead has a circum-global distribution in tropical and sub-tropical waters. As the scalloped hammerhead rarely ventures into or across deep ocean waters, the species shows strong genetic population structuring across ocean basins, but ranges quite widely over shallow coastal shelf waters (Threatened Species Scientific Committee, 2018). Consequently, there is very little structuring from the eastern to western extents within Australia and it is likely to be a shared stock with Indonesia (Chin *et al*., 2017).

Within Western Australian waters, the scalloped hammerhead extends around the north of the continent and then south to about Geographe Bay, though it is rarely recorded south of the Houtman Abrolhos Islands (Threatened Species Scientific Committee, 2018). Scalloped hammerheads are mobile animals that range widely over shallow coastal shelf waters, but rarely venture into or across deep ocean waters.

The species was identified as potentially occurring within the Operational Area and the EMBA; however, given the habitat preferences of the scalloped hammerhead, it is unlikely to be present in the Operational Area or deeper waters of the EMBA, but may occur in shallow coastal shelf waters of the EMBA.

Rays

Giant manta ray

The giant manta ray is broadly distributed in tropical waters of Australia and was identified as potentially occurring within the Operational Area. The species primarily inhabits near-shore environments along productive coastlines with regular upwelling, but they appear to be seasonal visitors to coastal or offshore sites including offshore island groups, offshore pinnacles and seamounts (Marshall *et al.*, 2011). The Operational Area is not located in or adjacent to any known key aggregation areas for the species (e.g. feeding or breeding). However, the Ningaloo Coast, about 268 km south-west of the Operational Area and within the EMBA, is an important area for giant manta rays in autumn and winter (Preen *et al.*, 1997). Occurrence of giant manta rays within the Operational Area and EMBA is likely to be infrequent, and restricted to individuals transiting the area.

Reef manta ray

The reef manta ray is commonly sighted inshore, within a few kilometres of land, but is also found around offshore coral reefs, rocky reefs and seamounts (Marshall *et al.*, 2009). In contrast to the giant manta ray, long-term sighting records of the reef manta ray at established aggregation sites suggest that this species is more resident in tropical waters and may exhibit smaller home ranges, philopatric movement patterns and shorter seasonal migrations than the giant manta ray (Deakos *et al.*, 2011; Marshall *et al.*, 2009). A resident population of reef manta rays has been recorded at Ningaloo Reef (about 268 km from the Operational Area and within the EMBA), and the species has been shown to have both resident and migratory tendencies in eastern Australia (Couturier *et al.*, 2011). The reef manta ray may infrequently occur in continental shelf waters of the Operational Area while transiting between suitable habitats within the EMBA.

Sawfishes

Narrow sawfish

The narrow sawfish occurs from the northern Arabian Gulf to Australia and north to Japan. The species inhabits inshore and estuarine waters and offshore waters up to depths of 100 m (D'Anastasi *et al.*, 2013) and are most commonly found in sheltered bays with sandy bottoms. They are not currently listed as threatened but are commonly caught as bycatch, and constituted over half of sawfish bycatch in the Northern Prawn Fishery in 2013 (Morgan *et al.*, 2010) (this fishery does not overlap the EMBA). The species was identified as potentially occurring within the Operational Area and EMBA. Given their water depth and habitat preference, narrow sawfish are unlikely to occur within the Operational Area and would be infrequently encountered only within the shallower waters of the EMBA.

Green sawfish

The green sawfish was once widely distributed in coastal waters along the northern Indian Ocean, although it is believed that northern Australia may be the last region where significant populations exist (Stevens *et al.*, 2005). Within Australia, green sawfish are currently distributed from about the Whitsundays in Queensland, across northern Australian waters to Shark Bay in WA (CoA, 2015b). Preferred habitat for green sawfish includes shallow coastal waters and tidal creeks (Chevron Australia Pty Ltd, 2014). Despite records of the species in deeper offshore waters, green sawfish typically occur in the inshore fringe with a strong association with mangroves and adjacent mudflat habitats (CoA, 2015b; Stevens *et al.*, 2005). Movements within these preferred habitats are correlated with tidal movements (Stevens *et al.*, 2008).

The Multi-species Recovery Plan for Sawfish and River Sharks (CoA, 2015b) indicates 'known to occur' distribution includes offshore waters of the NWS, with 'known' pupping areas in coastal waters north of Port Hedland to Roebuck Bay and pupping 'likely to occur' south of Port Hedland, Exmouth Gulf and North West Cape. The species was identified as potentially occurring within the Operational Area and the EMBA; however, given the habitat preferences of the green sawfish, they are unlikely to be present in the Operational Area or deeper waters of the EMBA, but may occur in coastal areas of the EMBA.

Pelagic bony fishes

Southern bluefin tuna

Adult southern bluefin tuna in Australian waters range widely from northern WA to the southern region of the continent (Caton, 1991; CCSBT, 2009; Honda *et al.*, 2010). Juveniles of one to two years of age inhabit inshore waters in WA and South Australia (Honda *et al.*, 2010). The southern bluefin tuna is highly migratory, occurring globally in waters between 30 to 50ºS, though the species is mainly found in the Eastern Indian Ocean and in the south-west Pacific Ocean.

When moving to spawning grounds, southern bluefin tuna are recorded as favouring temperatures between 19 to 21 ºC, and adjusting their depth of swimming to the vertical temperature distribution. Distinct diurnal diving patterns were observed with adjustment of water depth to maintain constant ambient light levels over a 24 hour period. During this migration, individuals may spend up to 84% of their time within the Australian Fishing Zone (AFZ) (Patterson *et al*., 2008). The species was identified as potentially occurring within the Operational Area and the EMBA.

4.4.2.7 Birds

Seabirds and/or Migratory Shorebirds

The Operational Area may be occasionally visited by migratory and oceanic birds, but do not contain any emergent land that could be used as roosting or nesting habitat. The closest emergent facility is the Goodwyn platform, located at the eastern end of the Operational Area. One BIA, a breeding area for wedge-tailed shearwaters, overlaps the Operational Area and is discussed further in the relevant species section below. The NWMR lies within the East Asian-Australasian flyway for migratory birds; species migrating between East Asia and Australia may be present between late spring and early autumn. Eight species of birds considered to be MNES were identified as potentially occurring within the Operational Area, including:

- red knot (*Calidris canutus*) – Endangered
- eastern curlew (*Numenius madagascariensis*) – Critically endangered
- Australian fairy tern (*Stemula nereis*) – Vulnerable
- Christmas Island white-tailed tropicbird, golden bosunbird (*Phaethon lepturus fulvus*) - Endangered
- common sandpiper (*Actitis hypoleucos*) – Migratory
- common noddy (*Anous stolidus*) – Migratory
- sharp-tailed sandpiper (*Calidris acuminata*) – Migratory
- pectoral sandpiper (*Calidris melanotos*) – Migratory
- lesser frigatebird (*Fregata ariel*) – Migratory
- streaked shearwater (*Calonectris leucomelas*) – Migratory
- great frigatebird (*Fregata minor*) – Migratory
- wedge-tailed shearwater (*Ardenna pacifica*) - Migratory
- streaked shearwater (*Calonectris leucomelas*) – Migratory.

Based on the results of two survey cruises and other unpublished records, Dunlop *et al.* (1988) recorded the occurrence of 18 species of seabirds over the NWS Province. These included a number of species of petrel, shearwater, tropicbird, frigatebird, booby and tern, as well as the silver gull. Of these, eight species occur year-round, and the remaining ten are seasonal visitors. From these surveys, it was noted that seabird distributions in tropical waters were generally patchy, except near islands. Migratory shorebirds may be present in or fly through the region between July and December, and again between March and April as they complete migrations between Australia and offshore locations (Bamford *et al*., 2008; CoA, 2015c). The EMBA includes shoreline habitats, the Ningaloo Coast hosts seabird and migratory shorebird habitat. Note that no Ramsar wetlands were identified within the Operational Area or EMBA.

Red knot

The red knot migrates long distances from breeding grounds in high northern latitudes, where it breeds during the boreal summer, to the southern hemisphere during the austral summer. Both Australia and New Zealand host significant numbers of red knots during their non-breeding period (Bamford *et al.*, 2008). The species is unlikely to occur in the Operational Area or EMBA, aside from individuals occasionally transiting through during migrations, due to the lack of emergent habitat.

Eastern curlew

The eastern curlew is Australia's largest shorebird and a long-haul flyer. The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back in Australia in August to feed on crabs and molluscs in intertidal mud flats (Bamford *et al.*, 2008). No critical habitats for the eastern curlew have been identified in the Operational Area or EMBA and their presence is likely to be restricted to them transiting through the area during their seasonal migration periods.

Australian fairy tern

The Australian fairy tern is a small fish-eating bird, about 22 to 27 cm long. Within Australia, the fairy tern occurs along the coasts of Victoria, Tasmania, South Australia and WA; occurring as far north as the Dampier Archipelago near Karratha. The fairy tern nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The bird roosts on beaches at night (Higgins and Davies, 1996). The species is unlikely to occur in the Operational Area but may occur in the EMBA with breeding BIA to the south (**Figure 4-14**).

Christmas Island white-tailed tropicbird

The white-tailed tropicbird (Christmas Island) is endemic to Christmas Island, which is its only known breeding location. It is widely distributed across the island (Christmas Island National Park, 2013) and roosts and forages over the Indian Ocean. Both adults and juveniles appear to disperse widely and have been recorded south and south-east of Christmas Island (Marchant & Higgins, 1990). The subspecies mostly occurs north of 18°S, but may occur up to about 1500 km from Christmas Island, at the edge of the continental shelf off Western Australia at 21°S (Dunlop *et al.*, 1988a; 2001). The white-tailed tropicbird (Christmas Island) is oceanic, feeding on fish and cephalopods in warm tropical waters. The birds roost at sea, with only incubating or brooding adults remaining on nests on the island at night. The species is unlikely to occur in the Operational Area or EMBA considering distance from Christmas Island, aside from individuals occasionally transiting through for foraging purposes.

Common sandpiper

The common sandpiper is a small, migratory sandpiper with a very large range through which it performs annual migrations between breeding grounds in the northern hemisphere (Europe and Asia) and non-breeding areas in the Asia-Pacific region (Bamford *et al.*, 2008). In Australia, the species congregates in large flocks and forages in shallow waters and tidal flats between spring and autumn. Specific critical habitat in Australia has not been identified due to the species' broad distribution (Bamford *et al.*, 2008). The presence of the common sandpiper within the Operational Area and EMBA is likely to be restricted to when they transit through during seasonal migration periods.

Common noddy

The common noddy is the largest species of noddy found in Australian waters. The species is widespread in tropical and subtropical areas beyond Australia. This seabird typically forages in coastal waters around nesting sites, taking prey such as small fish, but may occur long distances out to sea. Nesting occurs broadly across tropical and subtropical Australia in coastal areas, particularly on islands such as the Houtman Abrolhos island group (Burbidge and Fuller, 1989) (within the EMBA; 951 km from the Operational Area). The common noddy is thought to perform seasonal movements, with some nesting sites abandoned during the non-breeding season (which is protracted between spring and autumn). A foraging BIA (provisioning young) overlaps the EMBA at the Houtman Abrolhos Islands, 957 km south of the Operational Area. The species may occur within the Operational Area as they fly through the area.

Sharp-tailed sandpiper

Like other species of sandpiper, the sharp-tailed sandpiper is a migratory wading shorebird and performs long distance seasonal migrations between breeding grounds in the northern hemisphere and over-wintering areas in the southern hemisphere (Bamford *et al.*, 2008). The species may occur in Australia between spring and autumn. The species is unlikely to occur within the Operational Area and only infrequently in the EMBA as it transits through the areas, particularly near offshore islands.

Pectoral sandpiper

Similar to other species of sandpiper, the pectoral sandpiper breeds in the northern hemisphere during the boreal summer, before performing long distance migrations to feeding grounds in the southern hemisphere. The species occurs throughout mainland Australia between spring and autumn. It is unlikely to occur in the Operational Area and only infrequently in the EMBA as it transits through the areas.

Lesser frigatebird

The lesser frigatebird is usually seen in tropical or warmer waters around the coast of north WA, the Northern Territory, Queensland and northern New South Wales (DSEWPaC, 2012c). Within the NWMR, the lesser frigatebird is known to breed on Adele, Bedout and West Lacepede islands, Ashmore Reef and Cartier Islands (outside the EMBA) (DSEWPaC, 2012c). The lesser frigatebird feeds mostly on fish and sometimes cephalopods. All food is taken while the bird is in flight. Lesser frigate birds generally forage close to breeding colonies. A breeding BIA lies on the border of the EMBA, about 224 km east of the Operational Area. The species is unlikely to be found within the Operational Area and only infrequently at the boundary of the EMBA.

Great frigatebird

The great frigatebird has been identified as a conservation value in the NWMR. No BIAs for this species overlaps the Operational Area or EMBA. The species is unlikely to occur in the Operational Area but may occur in the EMBA.

Streaked shearwater

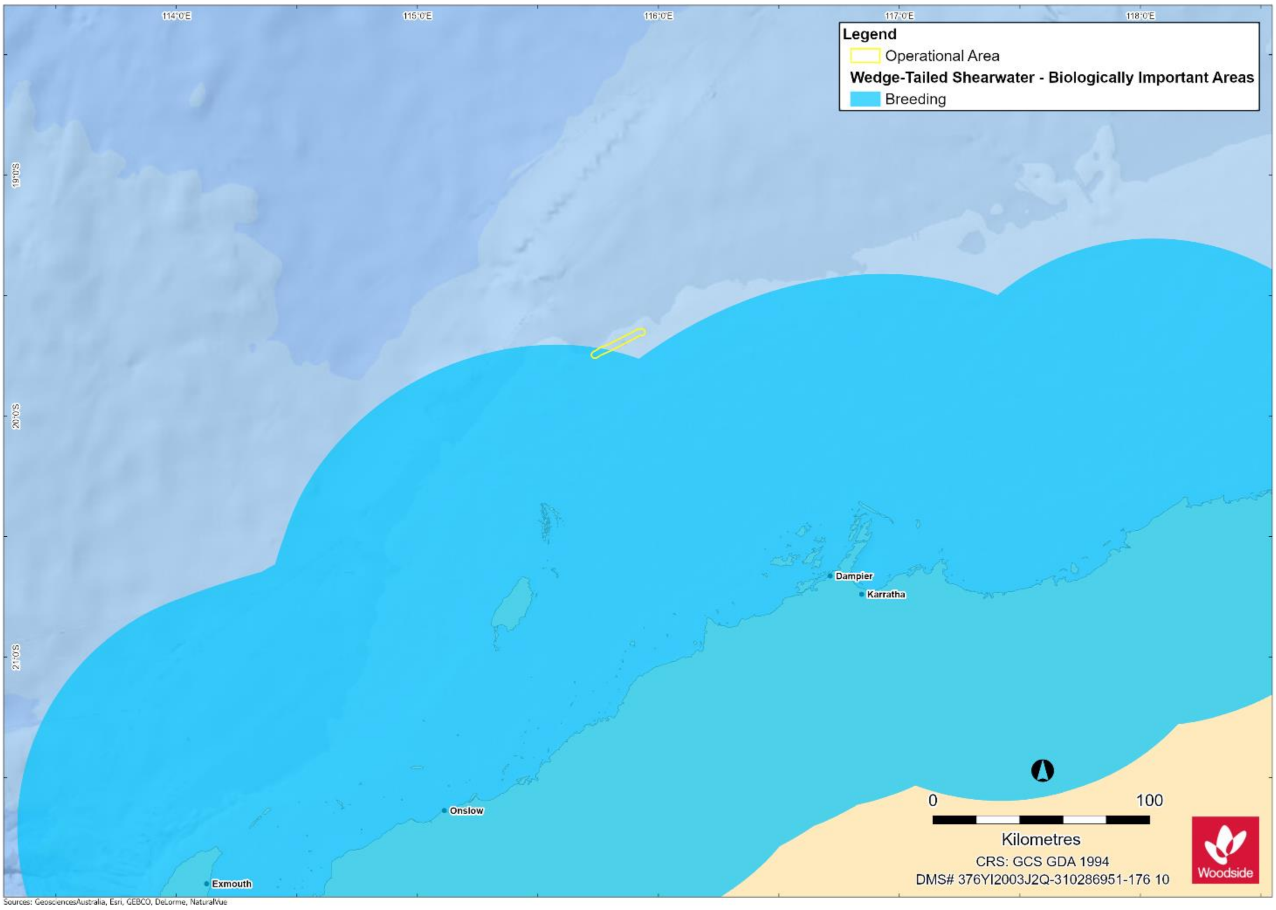
The streaked shearwater is a migratory seabird with a broad distribution in the western Pacific Ocean. The species nests on offshore islands in temperate East Asia, including Japan and the Korean peninsula. During winter months, the species migrates south, as far as northern Australia, where it occurs around islands and inshore waters. The species may occur in the Operational Area and EMBA during winter months.

Wedge-tailed shearwater

The wedge-tailed shearwater is listed as Migratory and Marine under the EPBC Act. It is a pelagic species which typically occurs in tropical and sub-tropical oceans, however, it also occurs in temperate waters (Cannell *et al.*, 2019). This species is a breeding visitor to the Pilbara, Gascoyne and Kimberley coasts and breeds on numerous offshore islands within the NWMR (Cannell *et al.*, 2019). As mentioned, the wedge-tailed shearwater has a Breeding (with foraging) BIA which overlaps the Operational Area. Despite this, the PMST did not list this species as potentially occurring within the Operational Area; this BIA is seemingly a large buffer applied to known areas of habitat use associated with the Pilbara coastline, Shark Bay breeding sites and Ashmore Reef (outside of the EMBA).

In WA, the wedge-tailed shearwater typically commences nesting in August and lays a single egg that requires an average 53-day incubation period; incubation is shared by the parents (Cannell *et al.*, 2019). A study using satellite and GPS tags was recently undertaken by Cannell *et al.* (2019) of wedge-tailed shearwaters at the Muiron Islands (within the EMBA). The study tagged thirty adult individuals incubating eggs during November 2018 and collected data regarding their foraging behaviours during incubation and then chick-rearing. The birds foraged in areas between the Muiron Islands and south of the Indonesian Archipelago, with trips ranging from 9 to 1,854 km. The birds were found to exhibit variable foraging patterns at different stages of incubation and chick-rearing within this area.

Due to the known distribution, BIAs and recent study by Cannell *et al.*, this species is, therefore, expected to occur within the both the Operational Area and EMBA as it transits between areas of known use/occupancy and forages (**Figure 4-14**).



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue

Figure 4-14: BIA for wedge-tailed shearwater.

4.5 Socio-economic and Cultural

4.5.1 Cultural Heritage

4.5.1.1 European Sites of Significance

A search of the heritage register was undertaken to determine if there are any sites of European cultural heritage significance within the Operational Area or EMBA. There are no known sites of

European cultural heritage significance overlapping the Operational Area. The Vlaming Head Lighthouse Group (Place on the State Heritage Register) was revealed from a search of the heritage register based on the EMBA. Although there may be shoreline contact, in the event of a hydrocarbon spill the Vlaming Head Lighthouse Group is located above the high water level and is unlikely to be impacted in the event of spill.

4.5.1.2 Indigenous Sites of Significance

Indigenous Australian people have a strong continuing connection with the area that extends back some 50,000 years. Woodside acknowledges this unique connection between Aboriginal peoples and the land and sea in which the company operates. Woodside also understands that while marine resources used by Indigenous people are generally limited to coastal waters for activities such as fishing, hunting and maintenance of culture and heritage, many Aboriginal groups have a direct cultural interest in decisions affecting the management of deeper offshore waters. In particular, the Yinggarda, Baiyungu and Thalanyji People have direct interest in the operation and impacts of the Petroleum Activities Program as Traditional Owners of the area overlapped by the EMBA (potential for shoreline accumulation along the Gascoyne coast near Exmouth).

There are no known Indigenous sites of significance within the Operational Area.

Within the EMBA, Ningaloo Reef, Exmouth and the adjacent coastlines have a long history of occupancy by Aboriginal communities. The longstanding relationship between Aboriginal people and the land and sea is prevalent in Indigenous culture today and Indigenous heritage places, including archaeological sites, are protected under the Aboriginal Heritage Act 1972 (WA) or EPBC Act.

Indigenous heritage places are protected under the *Aboriginal Heritage Act 1972* (WA) or the EPBC Act. The Department of Aboriginal Affairs (DAA) Heritage Inquiry System was searched for registered sites within the EMBA (**Appendix G**). Two sites were identified including:

- Vlaming Head
- 5 Mile Well (Cape Range)

Although there may be shoreline contact, in the event of a hydrocarbon spill the heritage places are located above the high water level and is unlikely to be impacted in the event of spill.

4.5.1.3 Historic Shipwrecks

Historic shipwrecks and sunken aircraft are protected and managed under the *Underwater Cultural Heritage Act 2018*. No known shipwrecks have been recorded within the Operational Area, based on a review of the Australian National Shipwrecks Database; however, there are multiple wrecks listed in the Database that are recorded as being located within proximity. Most of these are listed as having an unreliable generic location. As the subsea infrastructure associated with the Operational Area was mostly commissioned before 2012 when production commenced, and no shipwrecks were identified during or since this time in the area, it is reasonable to assume these shipwrecks are outside the Operational Area. **Table 4-8** summarises the nearest shipwreck to the Operational Area.

Table 4-8: Nearest recorded historical shipwrecks to the Operational Area (DoEE, 2019)

Vessel name	Year wrecked	Latitude	Longitude	Distance from closest point of the Operational Area (km)
McDermott Derrick Barge No. 20	1989	20.14ºS	115.953ºE	>50[1]

[1] Coordinates in Australian National Shipwrecks Database are incorrect – wreck location described as “N.E. tip of Eaglehawk Island, Dampier Archipelago

4.5.1.4 National and Commonwealth Heritage Listed Places

There are no Heritage Listed sites within or immediately adjacent to the Operational Area.

Within the EMBA, Ningaloo Coast is the only National Heritage Listed Place, it is also declared a WHA. Furthermore, Ningaloo Marine Area - Commonwealth Waters is on the Commonwealth Heritage List.

The significant values of the National Heritage and Commonwealth Heritage Listed places are outlined in **Section 4.6**.

4.5.2 Ramsar Wetlands

No Ramsar wetlands overlap the Operational Area or EMBA.

4.5.3 Fisheries – Commercial

4.5.3.1 Commonwealth and State Fisheries

A number of Commonwealth and State fisheries are located within the Operational Area, Socio-cultural EMBA and EMBA. **Table 4-9** provides a description of fisheries overlapping the Operational Area including relevant information gained through consultation with stakeholders (**Section 5**). **Figure 4-15** presents the management areas for fisheries which have been identified to have a potential interaction with activities within the Operational Area. Additional fisheries overlapping the EMBA (including socio-cultural EMBA) include:

Commonwealth fisheries:

- North-west Slope Trawl Fishery
- Western Deepwater Trawl Fishery
- Southern Tuna and Billfish Fishery

WA State fisheries:

- Nickol Bay Prawn Fishery
- Exmouth Gulf Prawn Fishery
- Gascoyne Demersal Scalefish Fishery
- West Coast Rock Lobster Fishery

Table 4-9: Commonwealth and State commercial fisheries of potential relevance to the Petroleum Activities Program

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
Commonwealth Managed Fisheries				
Southern Bluefin Tuna Fishery	✓	X	Management area:	The Southern Bluefin Tuna Fishery covers the entire EEZ around Australia, out to 200 nm from the coast. The fishery overlaps the Operational Area, Socio-cultural EMBA and EMBA
			Species targeted:	Southern bluefin tuna (*Thunnus maccoyii*)
			Fishing methods:	Pelagic longline and purse seine fishing
			Fishing depth:	Southern bluefin tuna are a pelagic species which can be found to depths of 500 m (Patterson and Dylewski 2021a). Given fishing methods, fishing would be restricted to the upper portion of the water column with no interaction with the seabed.
			Fishing effort:	Fishing mainly occurs in the Great Australian Bight during summer months, and off the New South Wales coastline during winter months (Patterson and Dylewski 2021a). The fishery has not been active in the Operational Area within the last ten years (Patterson and Dylewski 2021a). Fishing efforts for southern bluefin tuna hit its peak in Australia in 1967, with a catch of around 59,281 tonnes (CCSBT, 2019), since then, catch efforts have declined to around 4,596 tonnes for the 2019/20 season (Patterson and Dylewski 2021a).
			Active licences/vessels:	5-8 purse seine vessels since 1994/95 season, 11-24 longline vessels during the past 10 years (Patterson and Dylewski 2021a). No vessels are currently active in the Operational Area.
			Potential for interaction within the Operational Area:	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given the current distribution of fishing effort is focused in the Great Australian Bight.
Western Skipjack Tuna Fishery	✓	X	Management area:	The combined Western and Eastern Skipjack Tuna fisheries encompass the entire Australian EEZ. The Western Skipjack Tuna Fishery extends westward from the South Australian/Victorian border across the Great Australian Bight and around the west coast of Western Australian to the Cape York Peninsula. The fishery overlaps the Operational Area, Socio-cultural EMBA and EMBA.
			Species targeted:	Western skipjack tuna (*Katsuwonus pelamis*)

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
			Fishing methods:	Fishers historically used purse seine nets and pole and line.
			Fishing depth:	Western skipjack tuna are a pelagic species that can be found up to depths of 260 m (Patterson and Dylewski 2021b). Given fishing methods, fishing would be restricted to the upper portion of the water column with no interaction with the seabed.
			Fishing effort:	Data shows fishing effort was historically concentrated offshore of the 200 m isobath off southern WA, with some effort also recorded off the central and Pilbara coasts of WA (Patterson and Stephan, 2014; Williams *et al.*, 2017). The Skipjack Tuna Fishery is not currently active and no Australian boats have fished for skipjack tuna since 2009. The management arrangements for this fishery will be reviewed if active boats re-enter the fishery (Patterson and Dylewski 2021b).
			Active licences/vessels:	No active vessels have operated in the fishery since 2009 (Patterson and Dylewski 2021b).
			Potential for interaction within the Operational Area:	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given there have been no active vessels since 2009.
Western Tuna and Billfish Fishery	✓	X	Management area:	The Western Tuna and Billfish Fishery extends to the Australian EEZ boundary in the Indian Ocean, from Cape York in Queensland, through Western Australia to the border between Victoria and South Australia. The fishery overlaps the Operational Area, Socio-cultural EMBA and EMBA
			Species targeted:	• Bigeye tuna (*Thunnus obesus*) • Yellowfin tuna (*Thunnus albacares*) • Albacore (Thunnus alalunga) • Broadbill swordfish (*Xiphias gladius*) • Striped marlin (*Tetrapturus audux*)
			Fishing methods:	Fishers mainly use longline fishing gear to catch targeted species. Minor line (including handline, troll, rod and reel) can also be used.

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
			Fishing depth:	Fishing occurs mainly off the 200 m isobath. Given fishing methods, fishing would be restricted to the upper portion of the water column with no interaction with the seabed.
			Fishing effort:	Data shows fishing effort is concentrated offshore of the 200 m isobath off southern WA, with some effort also recorded off the central and Pilbara coasts off WA (Patterson and Stephan, 2014; Williams *et al.*, 2017). The fishery has not been active in the Operational Area within the last 10 years (Patterson and Dylewski 2021c).
			Active licences/vessels:	Since 2005, fewer than five vessels have been active in the fishery each year. Two pelagic longline vessels and one minor longline vessel in the 2019/20 season (Patterson and Dylewski 2021c).
			Potential for interaction within the Operational Area:	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given the current distribution of fishing effort is concentrated outside the Operational Area.
State Managed Fisheries				
Pilbara Demersal Scalefish Fishery (fish trawl, trap and line)	✓	✓	Management area:	The Pilbara Demersal Scalefish Fishery comprises several management units and is managed as part of the North Coast Demersal Scalefish Fisheries (NCDSF). It is located within the WA North Coast fishing bioregion, spanning from Exmouth to north of Port Hedland. The Pilbara demersal scalefish fishery is managed through area closures, gear restrictions and the use of individual effort allocations (Newman *et al.*, 2018). ***Pilbara Trawl Fishery*** The Pilbara Trawl Fishery is divided into two zones with Zone 1 comprising one management area and Zone 2 comprising six separate management areas. Since the management plan commenced operation in 1998, no fish trawl units have been allocated for use in Zone 1 and Areas 3 and 6 of Zone 2 have been designated closed to trawl fishing (Newman *et al.*, 2015b). The area between Zone 1 and Zone 2, which also extends east along the south edge of Zone 2, is open to trap fishing, however, was defined as a Schedule 5 Prohibited Trawl Fishing area when management of the fishery commenced in 1998. ***Pilbara Trap Fishery*** The Pilbara Trap Fishery covers the area from Exmouth northwards and eastwards to the 120° line of longitude, and offshore as far as the 200 m isobath.

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
	🟩	🟦		***Pilbara Line Fishery*** The Pilbara Line Fishery encompasses all of the ‘Pilbara waters’, covering the same area as the Pilbara Trap Fishery but also extending into nearshore waters and offshore to the EEZ (Newman *et al.*, 2015b). The Operational Area span management areas closed to trawl fishing, including the Schedule 5 Prohibited Trawl Fishing area (Echo Yodel subsea infrastructure). Trap and line fishing are permitted within the Operational Area.
			Species targeted:	The Pilbara Fish Trawl Fishery targets more than 50 scalefish species. Both the Pilbara Trap Managed Fishery and the Pilbara Line Fishery catch is made up of a similar number of fish species (45-50), although line fishery also includes some deeper offshore species such as ruby snapper (*Eteliscarbunulus*) and eightbar grouper (*Hyporthodus octofasciatus*). • Key species fished: • Cods (Gadus morhua) • Emperors (Lethrinus miniatus) • Goldband snapper (Pristipomoides multidens) • Red and blue spotted emperor (*Lethrinus nebulosus*) • Snappers (Lutjanidae)
	🟩	🟦	Fishing methods:	Gear used in the Pilbara Demersal Scalefish Fishery includes trawl, trap and line fishing, with trawl fishing accounting for the bulk of landings.
			Fishing depth:	There are no stated depth limits for the fishery, however, the Pilbara trawl and trap fisheries are limited to depths within the management areas and zones where they can operate. Consultation with commercial fishers has found that trap fishers strongly support leaving the Echo Yodel infrastructure *in situ* and saw no snagging risk associated with trap fishing around oil and gas infrastructure. Consultation with trawl fishers found that licence holders target pipelines and are able to do so safely, and that they had no opposition to the infrastructure being left *in situ*. Given fishing methods employed in the fishery, line fishing would be restricted to the upper portion of the water column with no interaction with the seabed.
			Fishing effort:	Current FishCube data indicates trap, trawl and line fishing regularly occurs within the Pilbara Demersal Scalefish Fishery in waters surrounding the Operational Area, and trap and line fishing may occur within the Operational Area.

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
				Based on State of the Fisheries annual reports provided by DPIRD, catch trends are seen to be increasing over the past reporting years, they are as follows: • Pilbara trawl caught 1,780 t in 2017-18, 1,529 t in 2016-17, 1,172 t in 2015-16, 1,105 t in 2014-15. • Pilbara line caught 143 t in 2017-18, 126 t in 2016-17, 97 t in 2015-16, 40 t in 2014-15. • Pilbara trap caught 573 t in 2017-18, 495 t in 2016-17, 510 t in 2015-16, 268 t in 2014-15.
			Active licences/vessels:	Ten active in 2016 (two trawl (outside Operational Area), three trap and five line fishery vessels) (Gaughan and Santoro, 2018).
			Potential for interaction within Operational Area:	Given the current distribution of fishing effort, there is a potential for interactions with the Pilbara trap fishery and Pilbara line fishery. Interactions with the Pilbara trawl fishery are not expected given the Schedule 5 Prohibited trawl fishing area over Echo Yodel subsea infrastructure.
Mackerel Managed Fishery	✓	X	Management area:	The commercial fishery extends from Geraldton to the Northern Territory border. There are three managed fishing areas: Kimberley (Area 1), Pilbara (Area 2), and Gascoyne and West Coast (Area 3). The Mackerel Managed Fishery overlaps the Operational Area.
			Species targeted:	• Spanish mackerel (Scomberomorus commerson) • Grey mackerel (*S. semifasciatus*) • Other species from the genus *Scomberomorus*
			Fishing methods:	• Near-surface trawling gear • Jig fishing
			Fishing depth:	Consultation with Western Australian Fishing Industry Council (WAFIC) has found that fishing effort occurs to a depth of up to 70 m.
			Fishing effort:	Most of the catch is taken from waters off the Kimberley coasts (Lewis and Jones, 2018), reflecting the tropical distribution of mackerel species (Molony *et al.*, 2015). Most fishing activity occurs around the coastal reefs of the Dampier Archipelago (within the EMBA) and Port Hedland area, with the seasonal appearance of mackerel in shallower coastal waters most likely associated with feeding and gonad development before spawning (Mackie *et al.*, 2003). Current FishCube data indicates the Mackerel Managed Fishery has fished in the waters surrounding the Operational Area.

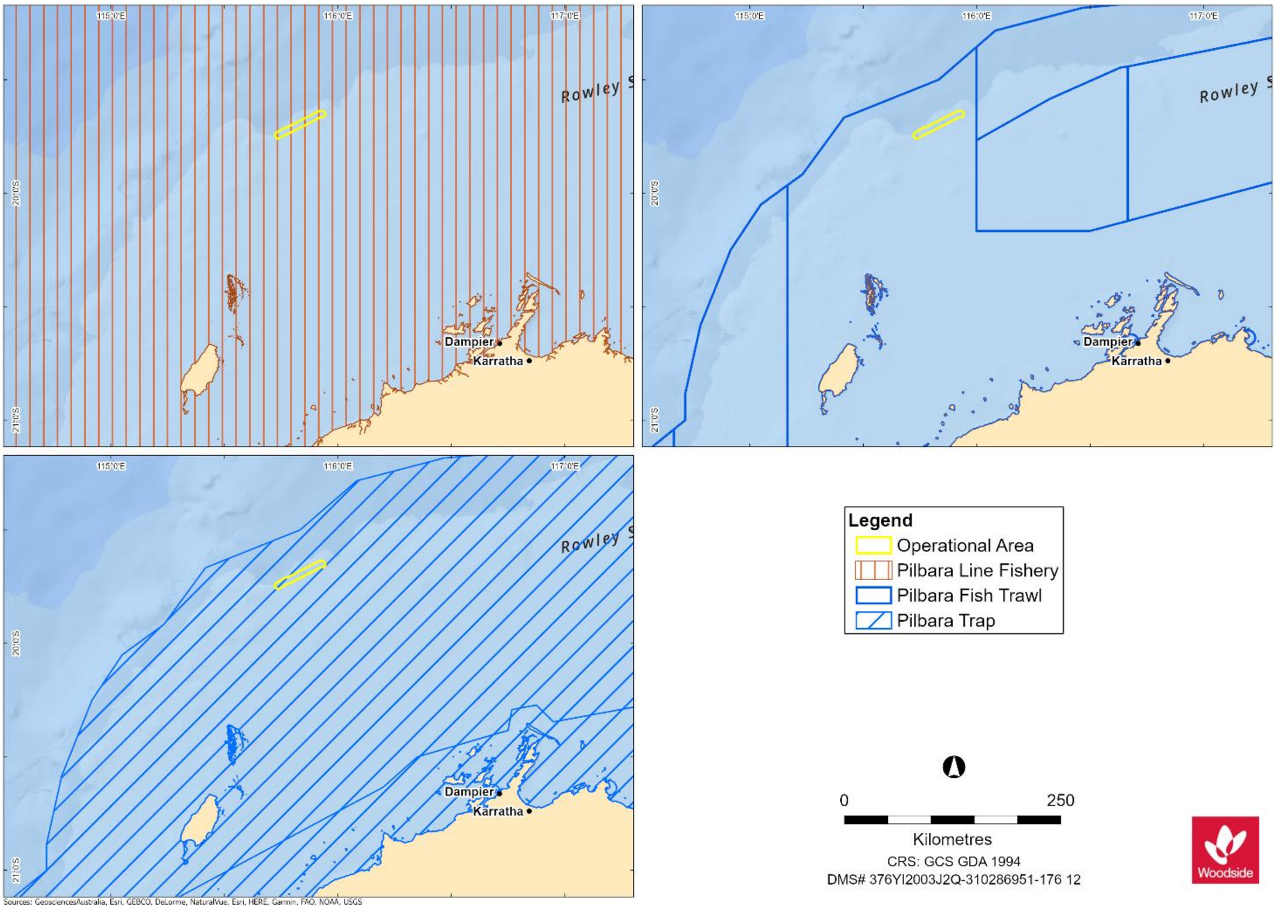
Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
				Based on State of the Fisheries annual reports provided by DPIRD, catch trends are as follows: 283 t in 2017-18, 276 t in 2016-17, 302 t in 2015-16, 322 t in 2014-15.
			Active licences/vessels:	Not stated for 2016 although 33 people were directly employed in the Mackerel Managed Fishery during the mackerel fishing season, primarily from May to November (Lewis and Jones, 2018); 11 vessels in 2014 (Molony *et al.*, 2015).
			Potential for interaction within the Operational Area:	Given the current distribution of fishing effort and consultation with the fishery, interactions with the fishery are not expected.
Marine Aquarium Managed Fishery	✓	X	Management area:	The Marine Aquarium Managed Fishery can operate in all State waters, with effort typically concentrated around the Capes region, Perth, Geraldton, Exmouth and Dampier (Newman *et al.,* 2018). The Marine Aquarium Managed Fishery overlaps the Operational Area.
			Species targeted:	Finfish, hard coral, soft coral, tridacnid clams, Syngnathiformes (seahorses and pipefish), other invertebrates (including molluscs, crustaceans, echinoderms etc.), algae, seagrasses and 'live rock'.
			Fishing methods:	The fishery is diver-based, which typically restricts effort to safe diving depths (less than 30 m).
			Fishing depth:	Less than 30 m.
			Fishing effort:	Information not available
			Active licences/vessels:	Eleven licences were active in 2016 (Newman *et al.,* 2018).
			Potential for interaction within the Operational Area:	Given the fishery is diver-based (i.e. restricted to safe diving depths), interactions with the fishery are not expected.
Onslow Prawn Managed Fishery	✓	X	Management area:	The Onslow Prawn Managed Fishery encompasses a portion of the continental shelf off the Pilbara. The Onslow Prawn Managed Fishery overlaps the Operational Area.
			Species targeted:	The fishery targets a range of penaeids (primarily king prawns).
			Fishing methods:	Trawl gear.

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
			Fishing depth:	The targeted species typically inhabit soft sediments in less than 45 m water depth.
			Fishing effort:	Total prawn catches in 2016 were about three tonnes, considerably lower than other prawn fisheries (total north coast prawn landings in 2016 were 175 tonnes) (Kangas *et al.,* 2018).
			Active licences/vessels:	One vessel (Kangas *et al.,* 2018).
			Potential for interaction within the Operational Area:	Given the depth required for fishing effort, interactions with the fishery are not expected.
Pilbara Crab Managed Fishery	✓	X	Management area:	The Pilbara Crab Managed Fishery comprises Western Australian waters off the north-western coast of WA north of 23° 34′ south latitude and west of 120° 00′ east longitude. Areas of the fishery north and east of Exmouth and nearshore are currently closed as per Schedule 2 of the Draft Management Plan for the Pilbara Crab Managed Fishery. The Operational Area is within Area A of the fishery.
			Species targeted:	Crabs of the Family Portunidae, excluding crabs of the genus Scylla.
			Fishing methods:	Traps.
			Fishing depth:	Up to 50 m deep (DPIRD, 2019).
			Fishing effort:	The capacity of the fishery is 600 traps.
			Active licences/vessels:	No information available at this time.
			Potential for interaction within the Operational Area:	Due to the limited capacity and significant spatial extent of the fishery interactions with the fishery are not expected.
South West Coast Salmon Managed Fishery	✓	X	Management area:	The South West Coast Salmon Managed Fishery operates on various beaches south of the metropolitan area and includes all Western Australian waters north of Cape Beaufort except Geographe Bay. The Operational Area overlaps the South West Coast Salmon Managed Fishery.

Fishery	Overlap with the Operational Area	Potential for interaction within the Operational Area	Description	
			Species targeted:	Australian salmon (*Arripis truttaceus*)
			Fishing methods:	Beach seine nets.
			Fishing depth:	Information not available however, species generally found in shallow waters (up to 30 metres)
			Fishing effort:	No fishing occurs north of the Perth metropolitan area, despite the managed fishery boundary extending to Cape Beaufort (WA/Northern Territory border).
			Active licences/vessels:	Six licences (DPIRD, 2019).
			Potential for interaction within the Operational Area:	Given the current distribution of fishing effort along beaches, interactions with the fishery are not expected.
Specimen Shell Managed Fishery	✓	X	Management area:	The fishery encompasses the entire WA coastline but effort is concentrated in area adjacent to the largest population centres, such as Broome, Karratha, Shark Bay, Mandurah, Exmouth, Capes area, Albany and Perth (Hart *et al.*, 2018). The Specimen Shell Managed Fishery can operate in WA State waters within the Operational Area and EMBA.
			Species targeted:	The Specimen Shell Managed Fishery targets the collection of specimen shells for display, collection, cataloguing and sale.
			Fishing methods:	Collection is predominantly by hand when diving to wading in shallow, coastal waters, though in deeper water collection is done through ROVs.
			Fishing depth:	For collection by hand, diver-based, which typically restricts effort to safe diving depths (less than 30 m). The ROVs operate at depths up to 300m (Hart *et al.*, 2018).
			Fishing effort:	Information not available
			Active licences/vessels:	Thirty-one authorisation holders in this fishery with about seven licences recording consistent activity, the number of people employed regularly in the fishery is likely to be about 11 (Hart *et al.*, 2018).
			Potential for interaction within	Given the fishery is diver-based (i.e. restricted to safe diving depths) and ROV based, interactions with the fishery are not expected.

Fishery	**Overlap with the Operational Area**	**Potential for interaction within the Operational Area**	**Description**	
			the Operational Area:	
West Australian Abalone Fishery	✓	X	Management area:	The Western Australian Abalone Fishery includes all coastal waters from the Western Australian and South Australian border to the Western Australian and Northern Territory border. The fishery is concentrated on the south coast and the west coast. The Western Australian Abalone Fishery overlaps the Operational Area.
			Species targeted:	• Greenlip abalone (*Haliotis laevigata*) • Brownlip abalone (*Haliotis conicopora*) • Roe's abalone (*Haliotis roei*)
			Fishing methods:	Divers
			Fishing depth:	Less than 30 m.
			Fishing effort:	No commercial fishing for abalone north of Moore River (Zone 8 of the managed fishery) has occurred since 2011–2012 (Strain *et al.*, 2018)
			Active licences/vessels:	22 vessels active in Roe's abalone fishery (Strain *et al.*, 2018).
			Potential for interaction within the Operational Area:	Given the fishery is diver-based (i.e. restricted to safe diving depths), interactions with the fishery are not expected.
Pearl Oyster Managed Fishery	✓	X	Management area:	Located in shallow coastal waters along the North West Shelf, and is separated into four zones. The Operational Area overlaps Zone 1.
			Species targeted:	• Pearl oysters (*Pinctada maxima*).
			Fishing methods:	Drift diving.
			Fishing depth:	Shallow coastal waters (up to ~23 m).
			Fishing effort:	Fishing recently recommenced in Zone 1 after a hiatus of several years (Hart *et al.,* 2018). The portion of the total catch in Zone 1 was minor in 2017 (less than 1%) (Hart *et al.,* 2018).

Fishery	**Overlap with the Operational Area**	**Potential for interaction within the Operational Area**	**Description**	
			Active licences/vessels:	19,699 diver hours (Hart *et al.*, 2018).
			Potential for interaction within the Operational Area:	Given the fishery is diver-based (i.e. restricted to safe diving depths), interactions with the fishery are not expected.
West Coast Deep Sea Crustacean Managed Fishery	✓	X	Management area:	The West Coast Deep Sea Crustacean Managed Fishery extends north from Cape Leeuwin to the WA/NT border in water depths greater than 150 m within the AFZ, including the Operational Area.
			Species targeted:	The fishery targets deepwater crustaceans, with the vast majority (more than 99%) of the catch landed in 2016 comprised of crystal crabs (How and Yerman, 2018). • Crystal (snow) crab (*Chaceon albus*) • Giant (king) crab (*Pseudocarcinus gigas*) • Champagne (spiny) crabs (*Hypothalassia acerba*)
			Fishing methods:	Baited pots, or traps, are operated in long-lines which have between 80 and 180 pots attached to a main line marked by a floar at each end.
			Fishing depth:	Crystal crabs occur on the continental shelf in depths between 300 and 1200 m; most of the commercial crystal crab catch is taken in depths of 500 m – 800m (How *et al.*, 2015).
			Fishing effort:	Two vessels operated in the fishery in 2016, using baited pots operated in a longline formation in the shelf edge waters, mostly in depths between 500 and 800 m (How and Yerman, 2018). Fishing effort was concentrated between Fremantle and Carnarvon.
			Active licences/vessels:	Two active in 2016 (How and Yerman, 2018).
			Potential for interaction within the Operational Area:	Given the preferred depth and that currently fishing effort is concentrated beyond the Operational Area and EMBA, interactions with the fishery are not expected.



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 4-15: Fisheries with potential for interaction within the Operational Area

4.5.3.2 Aquaculture

There are no aquaculture operations within the Operational Area as these operations are typically restricted to shallow coastal waters. Aquaculture in the broader region consists primarily of culturing hatchery reared and wild caught oysters (*Pinctada maxima*) for pearl production, which is primarily centred around Broome and the Dampier Peninsula (outside the EMBA). Leases typically occur in shallow coastal waters at depths of less than 20 m (Fletcher *et al.*, 2006). There are existing pearl aquaculture leases at the Montebello Islands, within the Flying Foam Passage in the Dampier Archipelago and within Exmouth Gulf (Fletcher *et al.*, 2017), all outside the EMBA.

Primary spawning of the pearl oyster occurs from mid-October to December. A smaller secondary spawning occurs in February and March (Fletcher *et al.,* 2006).

Other types of aquaculture leases are also found near the Mackerel Islands, Montebello Islands, Dampier Archipelago, the Exmouth Gulf and near Onslow, some within the EMBA.

4.5.4 Fisheries – Traditional

There are no traditional or customary fisheries within the Operational Area, as these are typically restricted to shallow coastal waters and/or areas with structure such as reef. However, it is recognised that Barrow Island and Montebello Islands, the closest islands to the Operational Area, have a known history of fishing when areas were occupied (as from historical records) (Department of Conservation and Land Management, 2005; Department of Environment and Conservation, 2007).

4.5.5 Tourism and Recreation

No tourist activities occur specifically within the Operational Area and, given the distance to the nearest access node from the Operational Area (more than 140 km to the Dampier boat ramp on the Burrup Peninsula), recreational fishing effort is not expected. However, it is acknowledged that there are growing tourism and recreational sectors in WA and these sectors have expanded over the last couple of decades. Growth and the potential for further expansion in tourism and recreational activities is recognised for the Pilbara and Gascoyne regions, with the development of regional centres and a workforce associated with the resources sector (SGS Economics and Planning, 2012).

Outside the petroleum industry, tourism is the largest revenue earner of all the major industries of the Gascoyne region. It contributes significantly to the local economy in terms of both income and employment. In 2016 there was an average of 341,000 visitors with a visitor spend of $304 million (Gascoyne Development Commission, 2018). The main marine nature-based tourist activities are concentrated around and within the Ningaloo world heritage area (WHA) (about 268 km south-west of the Operational Area). Activities performed include recreational fishing, game fishing, snorkelling and scuba diving and wildlife watching and encounters (including whale sharks, manta rays, humpback whales and turtles) (Schianetz *et al.*, 2009).

The Montebello Islands State Marine Park (about 61 km from the Operational Area and outside the EMBA) is the closest location for tourism, with some charter boat operators taking visitors to these islands (DEC, 2007). Recreational fishing in the Pilbara and Gascoyne regions is mainly concentrated around the coastal waters and islands and has grown considerably with the expanding regional centres, seasonal tourism and increasing residential and fly in/fly out workforce, particularly in the Pilbara region (Fletcher *et al.*, 2017). Some recreational fishing has historically occurred at Rankin Bank (about 12 km west of the Operational Area).

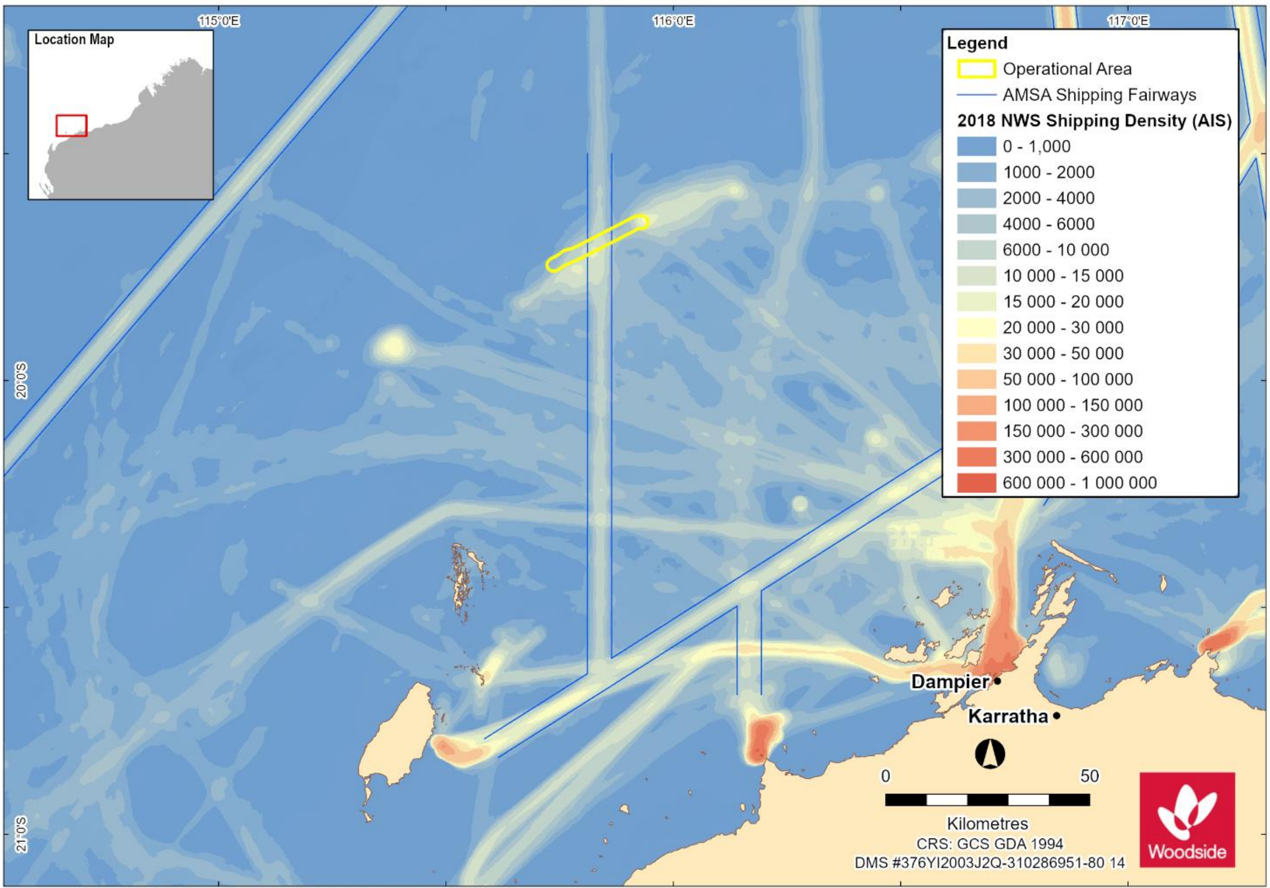
4.5.6 Shipping

The NWMR supports significant commercial shipping activity, most of which is associated with the mining and oil and gas industries.

Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways across the NWMR of WA to reduce the risk of vessel collisions with offshore infrastructure. The fairways are not mandatory but AMSA strongly recommends commercial vessels remain within the fairway when transiting the region. A shipping fairway intersects the Echo Yodel pipeline and Echo Yodel EHU, overlapping the Operational Area.

Ports in the region are nodes of increased vessel activities; active ports in the vicinity of the Operational Area include:

- Dampier (about 140 km south-east)
- Barrow Island (about 100 km south)
- Port Walcott (about 170 km south-east)
- Onslow (about 220 km south)
- Port Hedland (about 250 km south-east).



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

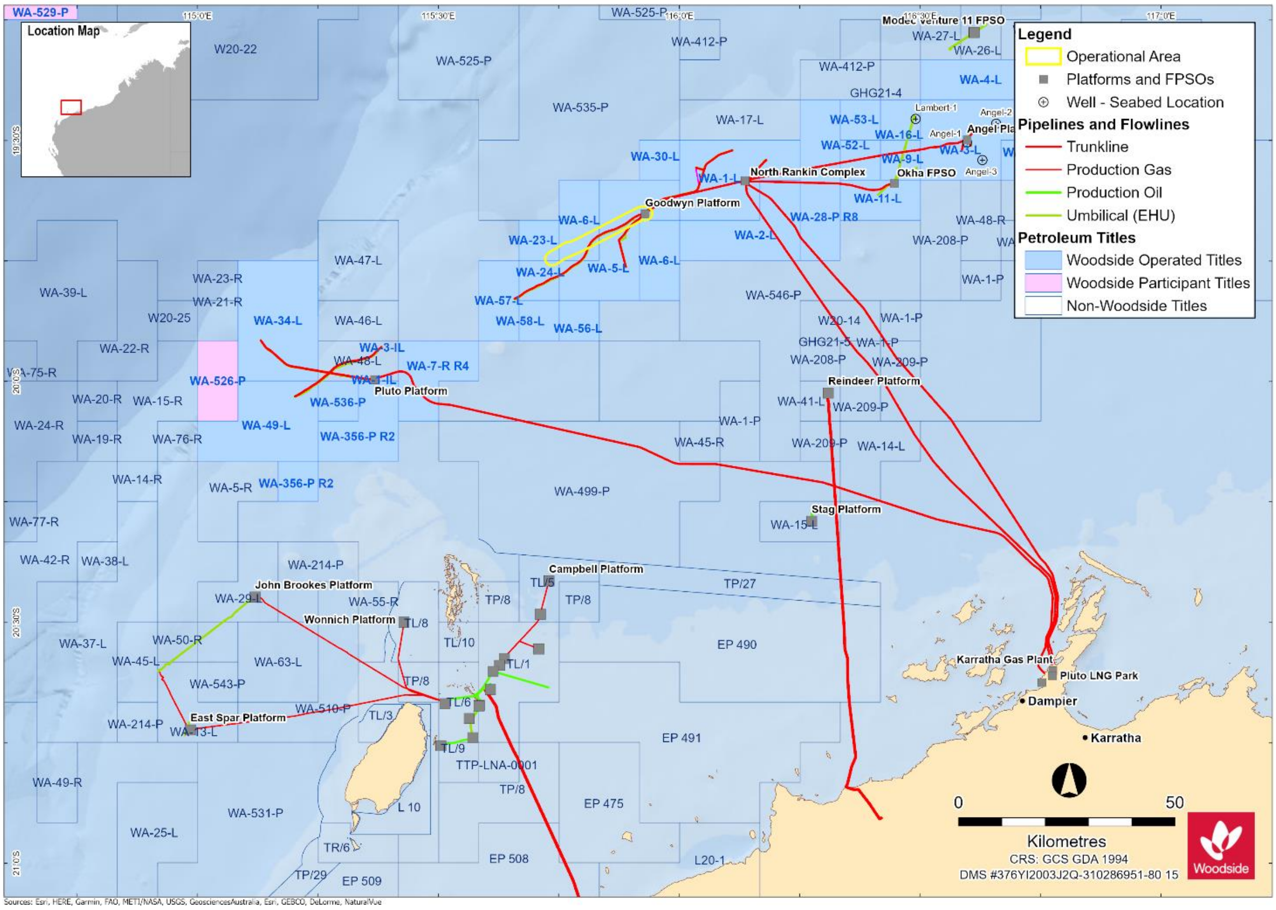
Figure 4-16: Vessel density map for the Operational Area from 2019, derived from AMSA satellite tracking system data

4.5.7 Oil and Gas Infrastructure

The Operational Area is located within an area of established oil and gas operations in the broader NWMR. **Table 4-10** lists other facilities located in proximity to the Operational Area. Several facilities (platforms and floating production, storage and offloading vessels (FPSOs) and platforms) are currently in operation in the vicinity of the Operational Area (**Table 4-10**). Two pipelines are also associated with the GWA facility and run parallel to the Echo Yodel pipeline. These are the Greater Western Flank 1 (GWF-1) and Greater Western Flank 2 (GWF-2) pipelines.

Table 4-10: Other oil and gas facilities in the vicinity of the Operational Area

Facility name and operator	Approximate distance from the Operational Area (km)	Direction
GWA Facility (Woodside)	Overlaps	North-east
NRC Platforms (Woodside)	22	North-east
Wheatstone Platform (Chevron)	40	South-west
Pluto Platform (Woodside)	46	South-west
Okha FPSO (Woodside)	54	East north-east
Angel Platform (Woodside)	72	East north-east



Sources: Esri, HERE, Garmin, FAO, METI/NASA, USGS, GeoscienceAustralia, Esri, GEBCO, DeLorme, NaturalVue

Figure 4-17: Oil and gas Infrastructure with reference to the location of the Operational Area

4.5.8 Defence

There are designated Department of Defence (DoD) practice areas in the offshore marine waters off Ningaloo and the North West Cape. This area is associated with the Royal Australian Air Force base located at Learmonth, on North West Cape, and overlaps the EMBA. However, it does not overlap the Operational Area (**Figure 4-18**).

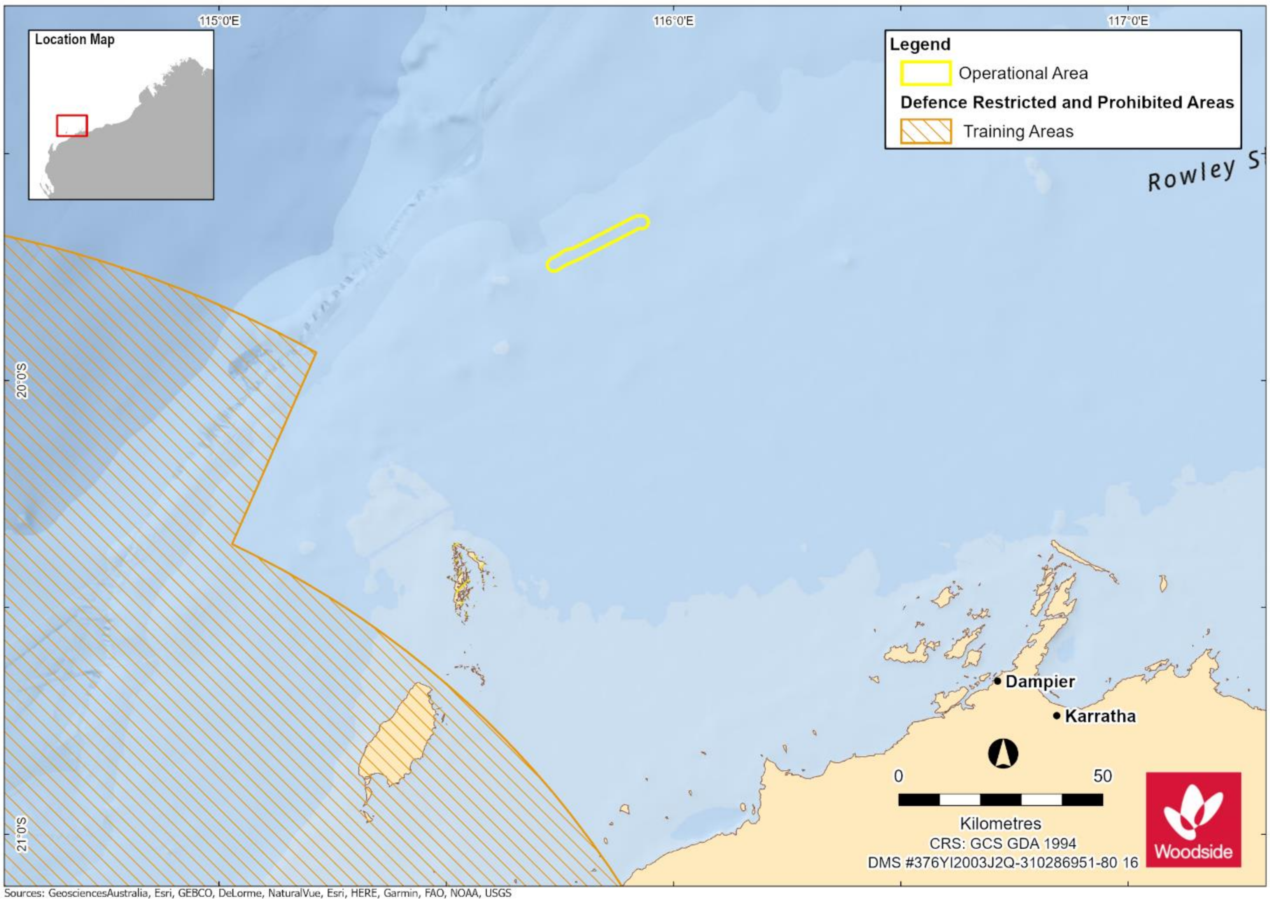


Figure 4-18: DoD Demarcated Marine Offshore Areas for military and defence practice with reference to the location of the Operational Area

4.6 Values and Sensitivities

The values and sensitivities of the Operational Area and EMBA are presented in this sub section. The offshore environment of the NWMR contains environmental assets (such as habitat and species) of high value or sensitivity, including Commonwealth offshore waters, as well as the wider regional context, including coastal waters and habitats such as the Montebello Marine Park and the associated resident, temporary or migratory marine life, including species such as marine mammals, turtles and birds.

Many sensitive receptor locations are protected as part of Commonwealth and State managed areas. They have been allocated conservation objectives (IUCN Protected Area Category) based on the Australian IUCN reserve management principles in Schedule 8 of the EPBC Regulations 2000.

Particularly, the North-West Marine Parks Network Management Plan 2018 (DNP, 2018a) provides for managing the network of AMPs in the North-West Network. The plan states that detailed implementation plans will be developed in the future to set out management actions and identify performance indicators for the North-west Network. However, the plan assigns an IUCN category to each marine park of the North-west Network, divides some marine parks into zones with their own category, and sets out the objectives for each zone. Zoning considers the purposes for which the marine park were declared, the objectives of the plan, the values of the marine park, and the requirements of the EPBC Act and EPBC Regulations. The management approach applied to activities within these zones are also described in the plan. While the Operational Area does not overlap any AMPs, four overlap the EMBA. The plan states that actions required to respond to oil pollution incidents, including environmental monitoring and remediation, in connection with mining operations authorised under the OPGGS Act, may be conducted in all zones without an authorisation issued by the Director, provided that the actions are taken in accordance with an EP that has been accepted by NOPSEMA, and the Director is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, before response action being taken.

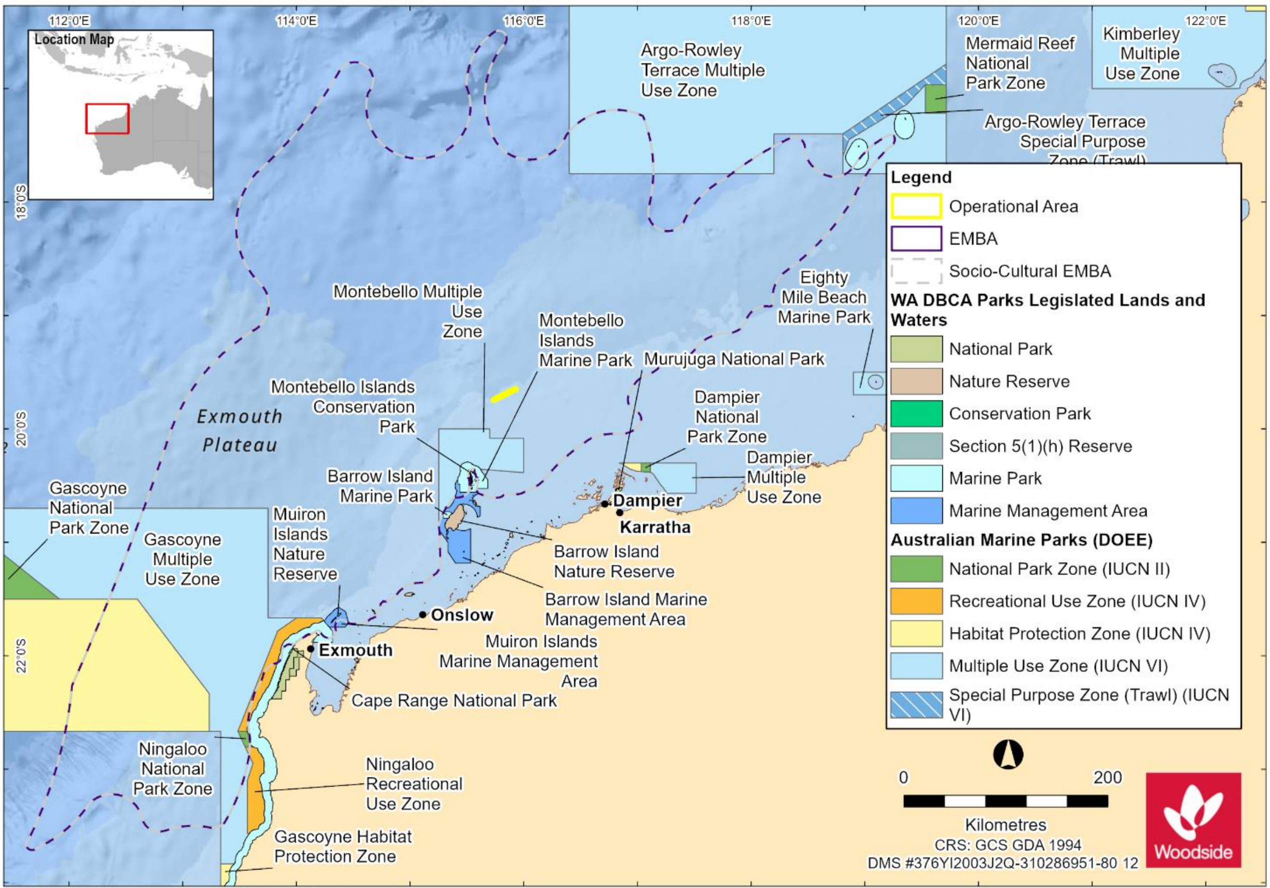
The next section outlines the values and sensitivities of the established and proposed MPAs and other sensitive areas in the EMBA (listed in **Table 4-11**). These areas are also considered in the environmental risk evaluation of planned and unplanned activities associated with the Petroleum Activities Program.

Table 4-11: Summary of established and proposed MPAs and other sensitive locations in the Operational Area and EMBA

Protected Place	Distance from the Operational Area to Values/Sensitivity boundaries (km)	IUCN Protected Area Category** Or Relevant Park Zone
Commonwealth AMPs		
Montebello AMP	27	VI
Gascoyne AMP	242	VI, IV
Ningaloo AMP	264	II
Argo-Rowley AMP	214	VI
State Marine Parks and Reserves		
Montebello Islands Marine Park/Barrow Island Marine Park/Barrow Island Marine Management Area (MMA) (jointly managed)	68	IA, II, IV, VI
Muiron Islands MMA	247	IA
Ningaloo Marine Park	265	IA, II, III
Rowley Shoals Marine Park	377	IA, II
Jurabi Coastal Park	283	N/A
KEFs		
Ancient Coastline at 125 m Depth Contour	Overlaps	N/A
Continental Slope Demersal Fish Communities	28	N/A
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	219	N/A
Glomar Shoal	68	N/A
Exmouth Plateau	140	N/A
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals	370	N/A
Commonwealth waters adjacent to Ningaloo Reef	265	N/A
Other sensitivities		
Rankin Bank	12	N/A

Protected Place	Distance from the Operational Area to Values/Sensitivity boundaries (km)	IUCN Protected Area Category** Or Relevant Park Zone
Pilbara Islands (Southern Island Group)	220	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 and South-west Marine Parks Network Management Plan 2018.*



Sources: Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 4-19: Established and proposed Commonwealth and State Marine Protected Areas in relation to the Operational Area

4.6.1 Australian Marine Parks

There are no AMPs within the Operational Area; however, there are four AMPs within the EMBA as listed in **Table 4-11**. These are described in detail below.

4.6.1.1 Montebello Australian Marine Park

The Montebello AMP is adjacent to the Montebello Islands Marine Park Barrow Island Marine Park/Barrow Island Marine Management Area, providing a contiguous marine park covering both

State and Commonwealth waters. The entire Montebello AMP, an area of 341,300 ha, is designated a multiple use zone (IUCN Category VI), allowing for long-term protection and maintenance of the AMP in conjunction with sustainable use, including oil and gas exploration activities. It is located within 27 km of the Operational Area.

Major natural values within the Montebello AMP include (DoEE, n.d.; DNP, 2018):

- habitats, species and ecological communities associated with the NWS Province
- BIAs for a range of MNES
- two historic shipwrecks: the Trial and the Tanami
- diverse social values including tourism, fishing, mining and recreation
- foraging areas adjacent to important nesting sites for marine turtles
- part of the migratory pathway of the protected humpback whale
- examples of the seafloor habitats and communities of the NWMR as well as the Pilbara (offshore) mesoscale bioregion (Heap *et al.*, 2005)
- one KEF for the region: the Ancient Coastline at 125 m Depth Contour
- shallow shelf environments with depths ranging from 15 to 150 m and protection for shelf and slope habitats, as well as pinnacle and terrace seafloor features. This includes Tryal Rocks which can emerge from the water.

4.6.1.2 Gascoyne Australian Marine Park

The Gascoyne AMP covers around 81,766 km^2, is 242 km from the Operational Area (at the closest point) and includes waters from <15 m to 6000 m deep. Conservation values identified within the park include ecosystems representative of (DoEE n.d., DNP 2018):

- foraging areas for migratory seabirds (including the wedge-tailed shearwater), hawksbill and flatback turtles and whale sharks
- a continuous connectivity corridor
- seafloor features including canyon, terrace, ridge, knolls, deep hole/valley and continental rise
- sponge gardens in the south of the park adjacent to WA coastal waters
- examples of the ecosystems of the Central Western Shelf Transition, the Central Western Transition and the NWS Province bioregions as well as the Ningaloo mesoscale bioregion

The AMP contains four KEFs for the region:

- Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula (associated enhanced productivity, aggregations of marine life and unique seafloor feature)
- Exmouth Plateau (unique seafloor feature associated with internal wave generation)
- Continental slope demersal fish communities (high species diversity and endemism; this is the most diverse slope bioregion in Australia, with >500 species recorded, of which 76 are endemic to the area)
- Commonwealth waters adjacent to Ningaloo Reef – an area where the Leeuwin and Ningaloo currents interact resulting in enhanced productivity and aggregations of marine life.

The park boundary is adjacent to the existing Commonwealth portion of the Ningaloo AMP.

4.6.1.3 Ningaloo Australian Marine Park

The Ningaloo AMP covers 2435 km² and is about 10 km north of Exmouth and 264 km from the Operational Area. It is contiguous with the Western Australian Ningaloo Marine Park. The Ningaloo AMP is located about 200 km south-west of the Operational Area but within the EMBA. The Ningaloo AMP adds additional protection to the Ningaloo Reef, which lies in State waters within the State managed marine park. Water depths range from shallow water of 30 m depth to oceanic waters at 1000 m deep. Major natural values of the AMP include (DNPs, 2018):

- foraging areas adjacent to important breeding areas for migratory seabirds, whale sharks and marine turtles
- important nesting sites for marine turtles
- part of the migratory pathway of the humpback whale
- shallow shelf environments with depths ranging from 15 to 150 m, providing protection for the shelf and slope habitats, as well as pinnacle and terrace sea-floor features
- examples of the seafloor habitats and communities of the Central Western Shelf Transition.

Ningaloo AMP has international and national significance due to its diverse range of marine species and unique geomorphic features. The AMP provides essential biological and ecological links that sustain the biodiversity and ecological processes, including supplying nutrients to reef communities from deeper waters further offshore, to the Ningaloo Reef ecosystems.

4.6.1.4 Argo-Rowley Terrace Australian Marine Park

The Argo-Rowley Terrace AMP covers 146,099 km² of the AMP network, including the Commonwealth waters surrounding the Rowley Shoals (each reef managed as separate state and AMPs) and is located about 214 km from the Operational Area. The Argo-Rowley Terrace AMP encompasses water depths from about 220 to 6000 m.

The natural values of the Argo-Rowley Terrace AMP include (DNP, 2018a):

- important foraging areas for migratory seabirds and, reportedly, the loggerhead turtle
- support for relatively large populations of sharks (compared with other areas in the region)
- a range of seafloor features such as canyons, continental rise and the terrace, among others
- connectivity between the reeds of the Rowley Shoals
- linkage of the Argo Abyssal Plain with the Scott Plateau through canyons.

4.6.2 State Marine Parks and Reserves

There are no State marine parks or Reserves within the Operational Areas. There are four State marine parks or reserves within the EMBA.

4.6.2.1 Montebello Islands Marine Park/Barrow Island Marine Management Area (jointly managed)

The Montebello Islands Marine Park, Barrow Island Marine Park and Barrow Island Marine Management Area are located 68 km, 110 km and 68 km respectively from the Operational Area at their closest point and, with the Montebello AMP and Rankin Bank, are some of the closest sensitive environments to the Operational Area and within the EMBA. The marine parks and management area are jointly managed and cover a combined area of 1770 km². A sanctuary zone covers the entire 41 km² Barrow Island Marine Park. The Barrow Island Marine Management Area covers 1145 km² and includes most of the waters surrounding Barrow Island and Lowendal Islands, except for the port areas around Barrow and Varanus islands. Key conservation and environmental values within the reserves include (DEC, 2007):

- a complex seabed and island topography consisting of subtidal and intertidal reefs, sheltered lagoons, channels, beaches, cliffs and rocky shores
- pristine sediment and water quality, supporting a healthy marine ecosystem
- undisturbed intertidal and subtidal coral reefs and bommies with a high diversity of hard corals
- important mangrove communities, particularly along the Montebello Islands, which are considered globally unique as they occur in offshore lagoons
- extensive subtidal macroalgal and seagrass communities
- important habitat for cetaceans and dugongs
- nesting habitat for marine turtles
- important feeding, staging and nesting areas for seabirds and migratory shorebirds
- rich finfish fauna with at least 456 species
- historical culture of the pearl oyster (Pinctada maxima) in the reserves, producing some of the highest quality pearls in the world.

These islands support significant colonies of wedge-tailed shearwaters and bridled terns. The Montebello Islands support the biggest breeding population of roseate terns in WA. Ospreys, white bellied sea-eagles, eastern reef egrets, Caspian terns and lesser crested terns also breed in this area. Observations suggest an area to the west of the Montebello Islands may be a minor zone of upwelling in the NWMR, supporting large feeding aggregations of terns. There is also some evidence that the area is an important feeding ground for Hutton’s shearwaters and soft plumaged petrels. Barrow Island is ranked equal tenth among 147 sites in Australia that are important for migratory shorebirds. Barrow, Lowendal and Montebello islands are internationally significant sites for six species of migratory shorebirds, supporting more than 1% of the East Asian Australasian Flyway population of these species (DSEWPaC, 2012c).

The Montebello Islands Marine Park/Barrow Island Marine Park/Barrow Island Marine Management Area is contiguous with the Montebello AMP. The intertidal habitats of the Montebello/Barrow/Lowendal islands group are influenced by the passage of tropical cyclones that shape sandy beaches (RPS Bowman Bishaw Gorham, 2007). The dominant habitats on the exposed west coasts of islands in the area are sandy beaches, rocky shores and cliffs. The predominant physical habitats of the sheltered east coasts of islands are sand flats, mud flats, rocky pavements and platforms (RPS Bowman Bishaw Gorham, 2007).

4.6.2.2 Ningaloo Marine Park and Muiron Islands Marine Management Area

The Ningaloo Marine Park (State waters) was established in 1987 and stretches 300 km from the North West Cape to Red Bluff. It encompasses the State waters covering the Ningaloo Reef system and a 40 m strip along the upper shore. It is located about 265 kilometres from the Operational Area. The Muiron Islands Marine Management Area is managed under the same management plan as the Ningaloo Marine Park (CALM, 2005). It is located about 247 kilometres from the Operational Area. The Ningaloo Marine Park is part of the Ningaloo Coast WHA.

Ecological and conservation values of the Ningaloo Marine Park and Muiron Islands are summarised below. Generally, all ecological values are presumed to be in an undisturbed condition except for some localised high use areas (CALM, 2005). The ecological and conservation values include:

- the unique geomorphology has resulted in a high habitat and species diversity
- there is high sediment and water quality

- subtidal and intertidal coral reef communities provide food, settlement substrate and shelter for marine flora and fauna
- filter feeding communities (sponge gardens) are in the northern part of the North West Cape and the Muiron and Sunday islands
- shoreline intertidal reef communities provide feeding habitat for larger fish and other marine animals during high tide
- soft sediment communities are found in deeper waters, characterised by a surface film of microorganisms that provide a rich source of food for invertebrates
- macroalgae and seagrass communities are important primary producers providing habitat for vertebrate and invertebrate fauna
- mangrove communities occur only in the northern part of the Ningaloo Marine Park, are important for reef fish communities (Cassata and Collins, 2008) and support a high diversity of infauna, particularly molluscs (600 mollusc species)
- there is diverse fish fauna (about 460 species)
- foreshores and nearshore reefs of the Ningaloo coast and Muiron/Sunday islands provide internesting, nesting and hatchling habitat for several species of marine turtles including the loggerhead, green, flatback and hawksbill turtles
- whale sharks aggregate annually to feed in the waters around Ningaloo Reef, from March to July, with the largest numbers being recorded around April and May (Sleeman et al., 2010). The season can be variable, with individual whale sharks being recorded at other times of the year. Timing of the whale sharks' migration to and from Ningaloo coincides with the mass coral spawning period, when there is an abundance of food (krill, planktonic larvae and schools of small fish) in the waters adjacent to Ningaloo Reef
- seasonal shark aggregations and manta rays are commonly found in the area with a permanent population of manta rays (*Manta alfredi*) inhabiting the Ningaloo Reef. Numbers are boosted periodically by roaming and seasonal animals. Small aggregations coincide with small pulses of target prey and the spawning events of many reef inhabitants, while larger aggregations coincide with major seasonal spawning events. The number of species in the Ningaloo Reef area peaks during autumn, which corresponds to coral spawning, and during spring, which corresponds with the crab spawning event (McGregor n.d.)
- there is annual mass coral spawning on Ningaloo Reef. Synchronous, multi-specific spawning of tropical reef corals occurs during a brief predictable period in late summer/early autumn, generally seven to nine nights after a full moon on neap, nocturnal ebb tides March/April each year (Rosser and Gilmour, 2008; Taylor and Pearce, 1999)
- large coral slicks generally form over shallow reef areas in calm conditions. It is noted that there are minor spawning activities on the same nights after the February and April full moons. In some years the mass spawning event occurs after the April full moon (Simpson et al., 1993)
- marine mammals such as dugong and small cetacean populations frequent or reside in nearshore waters. Dugong numbers in Ningaloo Marine Park are considered to be in the order of about 1000 individuals, with a similar number in Exmouth Gulf (CALM, 2005). The Ningaloo/Exmouth Gulf region supports a significant population of dugongs, which is interconnected with the Shark Bay resident population (which represents less than 10% of the world's dugongs)
- it contains nesting and foraging habitat for seabirds and shorebirds. About 33 species of seabirds are recorded in the Ningaloo Marine Park (13 resident and 20 migratory) and there are five known rookeries as well as isolated rookeries on the Muiron and Sunday islands.

In addition to the ecological and conservation values, the Ningaloo Marine Park has a number of social values including cultural heritage and marine based tourism and recreation (water-sports and fishing). The Ningaloo Marine Park (State waters) is contiguous with the Ningaloo Commonwealth Marine Reserve.

The Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area outlines objectives for retaining the values of this protected area and any potential or existing threats that could impact these values.

4.6.2.3 Rowley Shoals Marine Park

The Rowley Shoals Marine Park is located about 377 km from the Operational Area and comprises two reefs of the Rowley Shoals reef system, namely Clerke and Imperieuse reefs. Only Imperieuse Reef overlaps the EMBA. This marine park is characterised by complex intertidal and subtidal reefs, diverse marine fauna and high water quality. Key conservation values associated with the park include (MPRA, 2007):

- intertidal and subtidal coral communities
- high water quality
- diverse non-coral invertebrate communities
- diverse fish fauna
- breeding habitat for seabirds
- foraging and resting habitat for migratory seabirds.

The marine park is located in the headwaters of the Leeuwin Current and is thought to provide a source of invertebrate and fish recruitment for reefs further south. This is considered regionally important (MPRA, 2007). Marine turtles are known to visit Mermaid Reef, and isolated instances of turtles nesting in the Rowley Shoals Marine Park have been recorded.

The Rowley Shoals are also identified as breeding grounds for red-tailed tropicbirds, white-tailed tropicbirds and little terns; however, numbers are generally low. For example, only a single pair of white-tailed tropic birds nest on Bedwell Island on Clerke Reef.

4.6.2.4 Jurabi Coastal Park

The Jurabi Coastal Park lies on the western side of the Cape Range peninsula and is about 283 km from the Operational Area. Key conservation values associated with the park include turtle and seabird rookeries. It is also adjacent to the Ningaloo Marine Park which is discussed in **Section 4.6.2.2**.

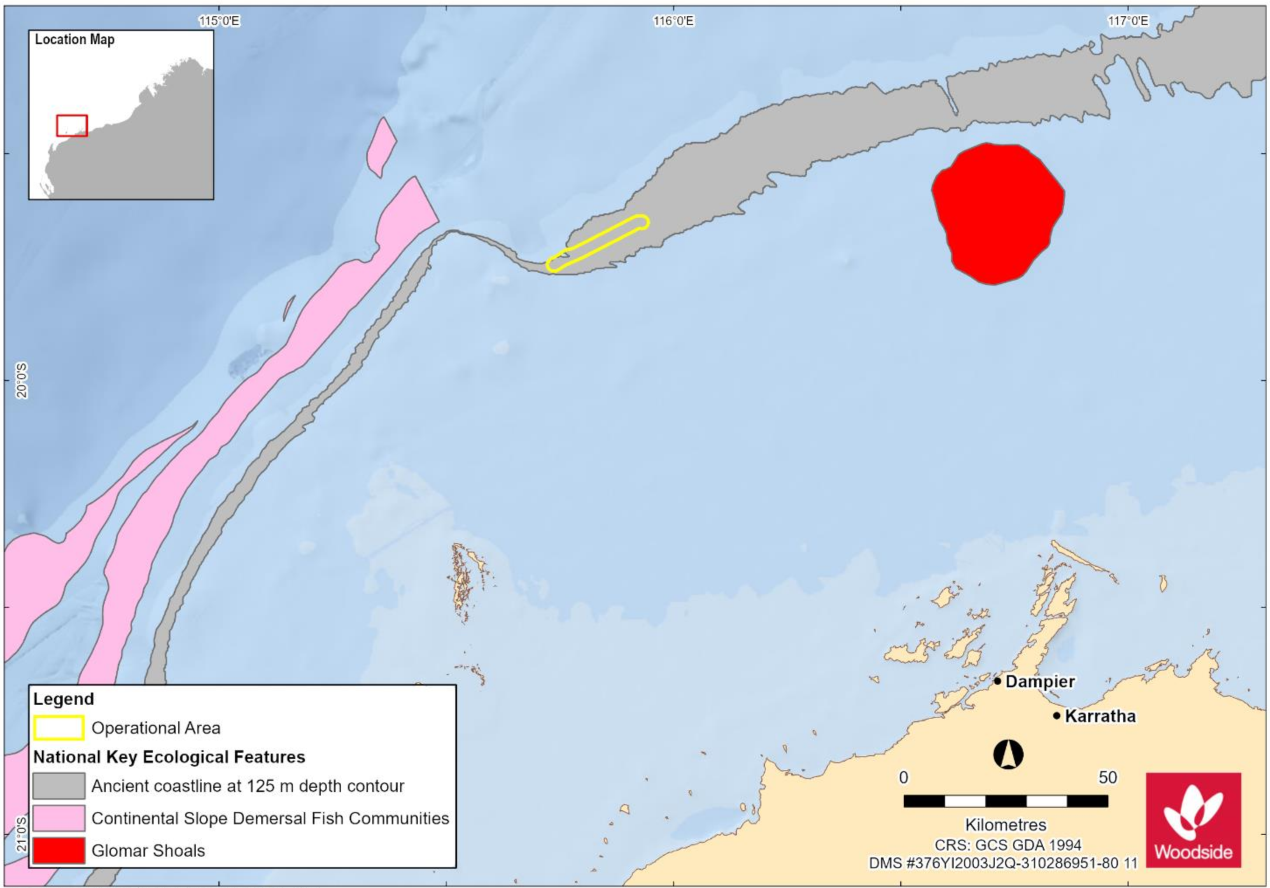
4.6.3 Key Ecological Features

KEFs are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. Whilst KEFs are not defined as MNES, the Commonwealth marine environment is a MNES under the EPBC Act. The following criteria are used to identify KEFs (DAWE, 2020d):

- a species, group of species, or a community with a regionally important ecological role (e.g. a predator, prey that affects a large biomass or number of other marine species)
- a species, group of species or a community that is nationally or regionally important for biodiversity
- an area or habitat that is nationally or regionally important for:

  - enhanced or high productivity (such as predictable upwellings – an upwelling occurs when cold nutrient-rich waters from the bottom of the ocean rise to the surface)
  - aggregations of marine life (such as feeding, resting, breeding or nursery areas), or
  - biodiversity and endemism (species which only occur in a specific area).
- a unique seafloor feature, with known or presumed ecological properties of regional significance.

One KEF was identified in the Operational Area, and six more within the EMBA using the EPBC PMST (**Appendix C**). **Figure 4-20** shows these features in relation to the Operational Area.



Sources: GeosciencesAustralia, Esri, GEBCO, DeLorme, NaturalVue

Figure 4-20: KEFs in relation to the Operational Area

4.6.3.1 Ancient Coastline at 125 m Depth Contour

The 'Ancient Coastline at 125 m Depth Contour' overlaps the Operational Area and is defined as the depth range 115 to 135 m in the NWS Province and NWS Transition provincial bioregions (**Figure 4-20**). Several steps and terraces as a result of Holocene sea level changes occur in the region, with the most prominent of these features occurring as an escarpment along the NWMR and Sahul Shelf at a water depth of 125 m, which forms the Ancient Coastline at 125 m depth contour KEF (the Ancient Coastline). The Ancient Coastline KEF passes directly below the Operational Area, extending along a line approximated by the 125 m isobath (**Figure 4-20**). The Ancient Coastline is not continuous throughout the NWMR, and coincides with a well-documented eustatic still stand at about 130 m worldwide (Falkner *et al.*, 2009).

Where the Ancient Coastline provides areas of hard substrate, it may contribute to higher diversity and enhanced species richness relative to soft sediment habitat (Falkner *et al.*, 2009). Parts of the Ancient Coastline, represented as rocky escarpment, are considered to provide biologically important habitat in an area predominantly made up of soft sediment.

The escarpment type features may also potentially facilitate mixing within the water column due to upwelling, providing a nutrient rich environment. Although the Ancient Coastline adds additional habitat types to a representative system, the habitat types are not unique to the coastline as they are widespread on the upper shelf (Falkner *et al.*, 2009).

The ancient submerged coastline is an important divide between carbonate, cemented sands and the fine, less cemented slope materials offshore. It is valued as a unique seafloor feature with ecological properties of regional significance. Parts of the Ancient Coastline, represented as rocky escarpment, are considered to provide biologically important habitat in an area predominantly made up of soft sediment. The escarpment type features may also potentially facilitate mixing within the water column due to upwelling, providing a nutrient rich environment.

4.6.3.2 Continental Slope Demersal Fish Communities

The Continental Slope Demersal Fish Communities in the region have been identified as a KEF of the NWMR (DSEWPaC, 2012a), and lies within the EMBA about 28 km from the Operational Area. The continental slope between North West Cape and the Montebello Trough has been identified as one of the most diverse slope assemblages in Australian waters, with more than 508 fish species and the highest number of endemic species (76) of any Australian slope habitat (DEWHA, 2008). Additional features relating to the fish populations of this area are as follows:

- Continental slope demersal fish communities have been identified as a KEF of the NWMR, due to the notable diversity of the demersal fish assemblages and high levels of endemism (DSEWPaC, 2012a).
- The North West Cape region is a transition area for demersal shelf and slope fish communities between the tropical dominated communities to the north and temperate communities to the south (Last *et al.*, 2005). The benthic shelf and slope communities offshore of the North West Cape comprise both tropical and temperate fish species with a north-south gradient (DEWHA, 2008).
- The fish fauna of the North West Cape region, like the ichthyofauna of many regions, exhibits decreasing species richness with depth (Last *et al.*, 2005). Fish species diversity has been shown to be positively correlated with habitat complexity, with more complex habitats (e.g. coral reefs) typically hosting higher species richness than simpler habitats such as bare, unconsolidated muddy sediments (Gratwicke and Speight, 2005). A total of 500 finfish species from 234 genera and 86 families have been recorded within the Ningaloo Marine Park, and 393 species were identified at study sites of the Muiron Islands (Department of Conservation and Land Management, 2005). The offshore sediment habitats of the Operational Area are expected to support lower fish species richness than other shallower, more complex habitats in the coastal areas of the region.

4.6.3.3 Canyons Linking the Cuvier Abyssal Plain and the Cape Range Peninsula

The canyons that link the Cuvier Abyssal Plain with the Cape Range Peninsula lie off the north west coast of Australia, more than 219 km south-west of the Operational Areas but within the EMBA. The canyons are believed to support the productivity and species richness of Ningaloo Reef (CoA, 2012). Interactions with the Leeuwin current and strong internal tides are thought to result in upwelling at the canyon heads, thus creating conditions for enhanced productivity in the region (Brewer *et al.*, 2007). As a result, aggregations of whale sharks, manta rays, humpback whales, seasnakes, sharks, predatory fish and seabirds are known to occur in the area due to the enhanced productivity (Sleeman *et al.*, 2007).

4.6.3.4 Glomar Shoal

Glomar Shoal is about 68 km east of the Operational Areas but within the EMBA. The submerged shoals that comprise Glomar Shoal are large (768 km²), complex bathymetrical features on the outer western shelf of the West Pilbara. The largest shoal rises on all sides from 80 m depth and shallows gradually to include a plateau region situated within 40 m of the surface. The shoal is relatively shallow, with water depths reaching 22 to 28 m at the shallowest point. Together with Rankin Bank, these remote shallow water areas represent regionally unique habitats and are likely to play an important role in the productivity of the Pilbara regions (AIMS, 2014).

Glomar Shoal has been identified as a KEF of the continental shelf within the NWMR, based on its regionally important habitat supporting high biological diversity and high localised productivity (Falkner *et al.*, 2009). On a regional level, the Glomar Shoal is also known to be an important area for a number of commercial and recreational fish species (DSEWPaC, 2012a).

Glomar Shoal was surveyed by the Australian Institute of Marine Science (AIMS) in 2013 as part of a co-investment project between Woodside and AIMS to better understand the habitats and complexity of Rankin Bank and Glomar Shoal. The research included collecting continuous coverage multibeam data to produce a bathymetry dataset, underwater towed camera transects to assess benthic communities, and Baited Remote Underwater Video System (BRUVS) sampling of the fish assemblages (AIMS, 2014).

The shoal has relatively high seafloor temperatures and high biological productivity. The benthic community composition and distribution of Glomar Shoal was assessed, quantitatively, using the images from the towed video system. Results from the 2013 AIMS survey show that the benthic habitats of Glomar Shoal are characterised by sand/silt substrate and low epibenthic cover (about 53% total cover), with soft corals and sponges the most abundant fauna. The most abundant benthic organisms were plants, with turf algae present on many substrates. Hard corals at Glomar Shoal are not a major habitat type and overall abundance is very low (0.4%), with small patches of 10% cover in its shallowest regions. Corals appeared healthy, with no areas of coral mortality identified (AIMS, 2014). Overall, the benthic habitats of Glomar Shoal are considered pristine and similar to other shoals within the NWMR.

The fish abundance and diversity of the demersal fish communities of Glomar Shoal are influenced by the seabed habitat type, with genera associated with sandy habitats common, including threadfin breams (*Nerripterus* spp.) and triggerfish (*Abalisters* spp.). Species richness and abundance are influenced by habitat depth and the degree of coral cover. In general, the fish abundance and diversity of Glomar Shoal are considered comparable with other regional Australian reefs and the North West submerged shoals and banks.

4.6.3.5 Exmouth Plateau

The Exmouth Plateau is a large, mid-slope, continental margin plateau that lies off the north-west coast of Australia, located to the west of the Operational Area with its closest point about 140 km west of the Operational Area. It ranges in depth from about 800 to 3500 m and is a major structural element of the Carnarvon Basin. The plateau is bordered by the Rankin Platform and the Exmouth sub-basin of the Northern Carnarvon Basin to the east, the Argo Abyssal Plain to the north, and the Gascoyne and Cuvier Abyssal Plains to the north west and south west. The plateau is recognised as a KEF because it is an area of enhanced biological productivity that supports a range of species.

The Exmouth Plateau has a relatively uneven seabed, which includes pinnacles and canyon systems in the northern section. The canyon systems are recognised as a distinct feature and are localised areas of high biological productivity. Biological productivity on the top of the Exmouth Plateau is comparatively low due to tropical oligotrophic waters, with increased productivity identified around the plateau boundaries as a result of internal waves and upwelling. The sediments of the plateau are assumed to consist of abyssal red clays, which indicate that benthic communities are likely to include filter feeders and epifauna, including sea cucumbers, polychaetes and sea pens. Pelagic species are likely to include nekton, small pelagic fish and large predators such as billfish, sharks and dolphins. Protected and migratory species are also known to pass through the region, including whale sharks, cetaceans and marine turtles.

4.6.3.6 Mermaid Reef and Commonwealth waters surrounding Rowley Shoals

Mermaid Reef and Commonwealth waters surrounding Rowley Shoals are regionally important in supporting high species richness, higher productivity and aggregations of marine life associated with the adjoining reefs themselves (Done *et al.*, 1994). The Rowley Shoals contain 214 coral species and about 530 species of fish (Gilmour *et al.*, 2007), 264 species of molluscs and 82 species of echinoderms (Done *et al.*, 1994; Gilmour *et al.*, 2007). The reefs provide a distinctive biophysical environment in the region as there are few offshore reefs in the north-west. They have steep and distinct reef slopes and associated fish communities. In evolutionary terms, the reefs may play a role in supplying coral and fish larvae to reefs further south via the southward flowing Indonesian Throughflow. Both coral communities and fish assemblages differ from similar habitats in eastern Australia (Done *et al.*, 1994). The Mermaid Reef and Commonwealth waters surrounding Rowley Shoals is located about 370 km north-east of the Operational Area from its closest point, within the EMBA.

4.6.3.7 Commonwealth Waters Adjacent to Ningaloo Reef

The Commonwealth waters adjacent to Ningaloo Reef KEF lies adjacent to the 3 nm State waters limit along Ningaloo Reef and includes the Ningaloo AMP. See **Section 4.6.1.3** for more information about the values and sensitivities associated with this KEF. This KEF lies 265 km south-west of the Operational Area from its closest point.

4.6.4 Other Sensitive Areas

4.6.4.1 Pilbara Islands (Southern Island Group)

Within the nearshore waters between the Muiron Islands and the Dampier Archipelago are a series of islands collectively termed the Northern, Middle and Southern Island Groups. This area has been defined as the Pilbara offshore region (greater than 10 m water depth) and includes islands, shoals and rocky outcrops.

Some of the islands of the Southern Island Group overlap the EMBA including Serrurier and Bessieres islands located about 220 km south-west of the Operational Area, at the closest point. The nearshore habitats of these islands generally consist of fringing reefs on the seaward side and wide intertidal sand flats on the leeward side. Despite generally high turbidity in the area and relatively low abundance, hard coral biodiversity is high (Chevron Australia 2010). The coral community structure within this area, and others within the region, is highly temporally variable due to cyclonic activity.

The large islands of the groups provide important nesting habitat for seabirds and marine turtles (Chevron Australia 2010). In the Southern Island Group, a number of seabirds, including Caspian terns, little terns, wedge-tailed shearwaters and ospreys breed on Serrurier Island and nearby Airlie Island. Wedge-tailed shearwaters also have breeding populations on islands from the Northern Island Group. Hawksbill turtle feeding grounds occur in the Mary Anne and Great Sandy Island groups. Mary Anne Island also includes a breeding population of roseate terns. Serrurier Island also is a major nesting area for green turtles and may be a foraging area for this species.

Chevron Australia (2010) documented the key subtidal habitats of the Pilbara offshore region as:

- limestone pavement supporting dense macroalgae
- biogenic fringing coral reefs
- coral communities associated with hard substrate (shoals and rocky outcrops)
- filter feeding communities (sponges and ascidians) on sand veneered pavement
- sand/gravel plains and shoals supporting sparse foliose macroalgae.

4.6.4.2 Rankin Bank

Rankin Bank is on the continental shelf, about 12 km from the Operational Area at its closest point. While not a KEF, Rankin Bank, along with the Glomar Shoal KEF, is the only large, complex bathymetrical feature on the outer western shelf of the West Pilbara, and represents habitats that are likely to play an important role in the productivity of the Pilbara region (AIMS, 2014). Rankin Bank consists of three submerged shoals delineated by the 50 m depth contour with water depths of about 18 to 30.5 m (AIMS, 2014).

Rankin Bank represents a diverse marine environment, predominantly composed of consolidated reef and algae habitat (about 55% cover), followed by hard corals (about 25% cover), unconsolidated sand/silt habitat (about 16% cover), and benthic communities composed of macroalgae, soft corals, sponges and other invertebrates (about 3% cover) (AIMS, 2014). Hard corals are a significant component of the benthic community of some parts of the bank, with abundance in the upper end of the range observed elsewhere on the submerged shoals and banks of north-west Australia (Heyward *et al.*, 2012).

A recent study involving multibeam and towed video surveys at Rankin Bank and Glomar Shoal found coral cover at Rankin Bank comparable to that of other shallow reefs. It reported that the benthic communities at Rankin Bank (hard corals, sponges and sand) influence fish communities in the area, resulting in higher abundance and diversity of fish species associated with shallow hard coral habitats (Wahab *et al.*, 2018). Wahab *et al.* (2018) also reported that across depths, benthic taxa cover was up to 30 times greater at Rankin Bank than at Glomar Shoal, a defined KEF, and that fish communities were twice as abundant and 1.5 times as diverse than at Glomar Shoal (Heyward *et al.*, 2012).

Rankin Bank has been shown to support a diverse fish assemblage (AIMS, 2014). This is consistent with studies showing a strong correlation between habitat diversity and fish assemblage species richness (Gratwicke and Speight, 2005; Last *et al.*, 2005). The habitat surrounding Rankin Bank (less than 50 m) was mapped by AIMS on behalf of Woodside (AIMS, 2014) and hosts filter feeding communities in areas of consolidated substrate interspersed by sand.

5. STAKEHOLDER CONSULTATION

5.1 Summary

Woodside consults relevant persons in the course of preparing Environment Plans to ensure feedback informs its decision making and planning for proposed petroleum activities and builds upon Woodside’s extensive and ongoing stakeholder consultation for its offshore petroleum activities in the region. Since 2017, a comprehensive consultation process has been undertaken with relevant persons on the Echo Yodel Subsea Decommissioning EP. Relevant person consultation has been performed in four phases to progressively seek stakeholder input into decommissioning planning, including:

- **Phase 1 (high-level scoping)** – consultation activities over a 12-month period from mid-2017 seeking general views from some relevant persons on decommissioning options, as well as the long-term management implication of those options. Following consultation on Phase 1 scoping, comprehensive relevant person consultation occurred with impacted relevant persons on the selected decommissioning option.
- **Phase 2** – an independently facilitated comparative assessment workshop was held in May 2019 with stakeholders potentially active over the subsea infrastructure and most likely to be impacted by the decommissioning option. The workshop was conducted to identify stakeholders’ most preferred decommissioning option and concluded that decommissioning in situ was the favoured approach.
- **Phase 3** – consultation activities conducted to obtain relevant person feedback and comment on Woodside’s *in situ* decommissioning option as well as inform the planning of the permanent plugging for abandonment activities. In December 2020, Woodside notified relevant persons that it would revise the scope of the EP to address plugging for abandonment activities only (the Echo Yodel and Capella Plugging for Abandonment EP was accepted in March 2021). Relevant persons were also advised that following further regulator engagement on *in situ* decommissioning options, decommissioning of the subsea infrastructure, and abandonment of the wells, would be addressed in a separate EP.
- **Phase 4** –consultation activities to obtain relevant person feedback and comment on Woodside’s revised proposal to remove subsea infrastructure (this EP). The previous consultation (Phases 1-3) has been evaluated to determine relevance to the proposed activity outlined in this EP. Consultation activities referenced in this Section of the EP relate to Phase 4. Any relevant ongoing consultation from Phases 1-4 is outlined in **Table 5-3**.

5.2 Identification of Relevant Persons

Woodside has followed the requirements of sub-regulation 11A(1) of the Environment Regulations to identify relevant persons, these being:

- each Department or agency of the Commonwealth Government to which the activities to be performed under the EP, or the revision of the EP, may be relevant
- each Department or agency of a State or the Northern Territory Government to which the activities to be performed under the EP, or the revision of the EP, 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 performed under the EP, or the revision of the EP
- any other person or organisation that the Titleholder considers relevant.

Woodside’s assessment of relevant person relevance is outlined in **Table 5-1.**

5.3 Stakeholder Consultation Objectives

In support of this EP, Woodside has sought to:

- ensure all relevant persons are identified and engaged in a timely and effective manner
- develop, and make available to relevant persons, communications material that is relevant to their interests and information needs
- incorporate relevant person feedback into managing the proposed activity where practicable
- provide feedback to relevant persons about Woodside's assessment of their feedback and record all engagements
- make available opportunities to provide feedback during the life of this EP.

5.4 Stakeholder Expectations for Consultation

Relevant person consultation for this activity has also been guided by relevant person expectations for consultation on planned activities. This guidance includes:

NOPSEMA:

- *GL1721 - Environment plan decision making - June 2021*
- *GN1847 - Responding to public comment on environment plans - September 2020*
- *GN1344 - Environment plan content requirements - September 2020*
- *GN1488 - Oil pollution risk management - February 2021*
- *GN1785 – Petroleum activities and Australian Marine Parks – June 2020*
- *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – July 2020*
- *NOPSEMA Bulletin #2 – Clarifying statutory requirements and good practice consultation – November 2019*

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*

Woodside acknowledges that additional relevant persons may be identified in the course of preparing this Environment Plan. If appropriate, these relevant persons will be contacted, provided with information relevant to their interests, and invited to provide feedback about the proposed activity. Woodside will assess their feedback, respond to the relevant person, and incorporate feedback into the management of the proposed activity where practicable.

Woodside consultation arrangements typically provide stakeholders up to 30 days (unless otherwise agreed) to review and respond to proposed activities where relevant persons are potentially affected.

Woodside considers this consultation period an adequate timeframe in which relevant persons can assess potential impacts of the proposed activity and provide feedback.

Table 5-1: Assessment of Relevant Persons for the Proposed Activity

Stakeholder	Relevant persons	Reasoning
Australian Government department or agency		
Australian Border Force (ABF)	Yes	Responsible for coordinating maritime security.
Australian Fisheries Management Authority (AFMA)	No	Responsible for managing Commonwealth fisheries. No Commonwealth Fisheries are active in the Operational Areas. Woodside has provided information to AFMA, consistent with information provided to other stakeholders with an interest in Commonwealth fisheries.
Australian Hydrographic Office (AHO)	Yes	Maritime safety and responsible for Notice to Mariners.
Australian Maritime Safety Authority (AMSA) – Marine Safety	Yes	Statutory agency for vessel safety and navigation in Commonwealth waters.
Australian Maritime Safety Authority (AMSA) – Marine Pollution	Yes	Legislated responsibility for oil pollution response in Commonwealth waters. Proposed activity has a hydrocarbon spill risk, which may require AMSA response in Commonwealth waters.
Department of Defence (DoD)	No	Proposed Operational Area does not overlap defence activity areas.
Department of Agriculture, Water and Environment (DAWE) – Fisheries	Yes	Responsible for implementing Commonwealth policies and programs to support agriculture, water resources, the environment and our heritage. No Commonwealth Fisheries are active in the Operational Area. Woodside has provided information to DAWE, consistent with information provided to other stakeholders with an interest in Commonwealth fisheries.
DAWE – Biosecurity (marine pests, vessels, aircraft and personnel)	Yes	DAWE administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DAWE 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. The proposed activity has the potential impact to DAWE’s interests in the prevention of introduced marine species.
Department of Industry, Science, Energy and Resources (DISER)	Yes	Department of relevant Commonwealth Minister and is required to be consulted under the Regulations.

Stakeholder	Relevant persons	Reasoning
Director of National Parks (DNP)	Yes	Responsible for managing AMPs and therefore 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 MP, including where potential spill response activities may occur in the event of a spill (i.e. scientific monitoring).
Western Australian Government department or agency or advisory body		
Department of Biodiversity, Conservation and Attractions (DBCA), Parks and Wildlife Service	No	Responsible for managing Western Australia’s parks, forests and reserves. Planned activities do not impact DBCA’s functions, interests or activities.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department of relevant State Minister and is required to be consulted under the Regulations.
Department Primary Industry Regional Development (DPIRD)	Yes	Responsible for managing State fisheries. Potential for interaction during proposed activities with the Pilbara Line Fishery and Pilbara Trap Fishery.
Department of Transport (DoT)	Yes	Legislated responsibility for oil pollution response in State waters. Proposed activity has hydrocarbon spill risk, may require DoT response in State waters.
Commonwealth fisheries*		
Southern Bluefin Tuna Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years. Woodside does not consider planned activities to have a future risk to licence holders, 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). In addition, future interactions are not expected given the species’ pelagic distribution. Woodside has provided information to the fishery’s representative organisation – Australian Southern Bluefin Tuna Industry Association – on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be done through the relevant fishing industry associations.

Stakeholder	Relevant persons	Reasoning
Western Skipjack Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years. Woodside does not consider planned activities to present a future risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution. Woodside has provided information to the fishery's representative organisation – Commonwealth Fisheries Association and the Australian Southern Bluefin Tuna Industry Association – 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.
Western Tuna and Billfish Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years. Woodside does not consider planned activities to present a future risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution. Woodside has provided information to the fishery's representative organisation – Tuna Australia – 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.
State fisheries*		
Marine Aquarium Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years.
Onslow Prawn Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years.
Pilbara Crab Managed Fishery	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.
Pearl Oyster Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years.
Pilbara Demersal Scalefish Fishery (fish trawl, trap and line) • Pilbara Trawl Fishery	No	The Operational Area falls within Schedule 5 – permanently closed to trawling area of the Pilbara Trawl Fishery.
• Pilbara Trap Fishery	Yes	The fishery overlaps the Operational Area and DPIRD data indicates active fishing within the Operational Area.
• Pilbara Line Fishery	Yes	The fishery overlaps the Operational Area and DPIRD data indicates active fishing within the Operational Area.
South West Coast Salmon Managed Fishery	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.

Stakeholder	Relevant persons	Reasoning
Specimen Shell Managed Fishery	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.
West Australian Abalone Fishery	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.
West Australian Mackerel Managed Fishery (Area 2)	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.
West Coast Deep Sea Crustacean Managed Fishery	No	While the fishery overlaps the Operational Area, no potential for interaction with the fishery was identified.
Industry –		
BP Developments	Yes	Adjacent title holder.
Santos WA Northwest PL	Yes	Adjacent title holder.
Industry representative organisation		
Australian Petroleum Production and Exploration Association (APPEA)	Yes	Represents the interests of oil and gas explorers and producers in Australia.
Commonwealth Fisheries Association (CFA)	No	Represents the interests of commercial fishers with licences in Commonwealth waters. No Commonwealth Fisheries are active in the Operational Area. Woodside has provided information to the CFA 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.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	No	Represents the interests of the Southern Bluefin Tuna Fishery. The Fishery is not active in the Operational Area. Woodside has provided information ASBTIA 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,
Pearl Producers Association (PPA)	No	Represents the interests of the Australian South Sea Pearling industry. While proposed activities are not expected to impact the pearling industry, the PPA has previously asked to be kept informed about Woodside’s planned petroleum activities.
Tuna Australia	No	Represents the interests of the Western Tuna and Billfish Fishery. The Fishery is not active in the Operational Area. Woodside has provided information to Tuna Australia 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,

Stakeholder	Relevant persons	Reasoning
Recfishwest	Yes	Represents the interests of recreational fishers in Western Australia. Activities do not have the potential to impact recreational fishers. Woodside chose to provide consultation information to Recfishwest, in line with King Bay Fishing Club and Nickol Bay Fishing Club who were identified in Phase 1 consultation as potentially relevant stakeholders and asked to be kept informed about decommissioning plans.
Marine Tourism WA	No	Represents the interests of recreational fishers in WA. Activities do not have the potential to impact recreational fishers.
WA Game Fishing Association	No	Represents the interests of charter owners and operators in WA. Activities do not have the potential to impact game fishers.
WAFIC	Yes	Represents the interests of commercial fishers with licences in State waters. Potential for interaction with licence holders in the Pilbara Line Fishery and Pilbara Trap Fishery.
Other stakeholders		
King Bay Game Fishing Club (KBGFC)	Yes	KBGFC was identified in Phase 1 consultation as a potentially relevant stakeholder and asked to be kept informed about decommissioning planning.
Nickol Bay Sport Fishing Club (NBSFC)	Yes	NBSFC was identified in Phase 1 consultation as a potentially relevant stakeholder and asked to be kept informed about decommissioning planning.
Karratha Based tourism and dive boat operators	No	There has been no recent fishing effort in the Operational Area by charter boat operators.
Karratha Community Liaison Group	Yes	Group established in 2002 to provide a forum for local community, industry and government stakeholders and the oil and gas industry to discuss operations and community issues.
Karratha and District Chamber of Commerce and Industry (KDCCI)	Yes	Not-for-profit group that represents local businesses.
City of Karratha	Yes	Local government entity for the Karratha region. Broader interest in activities in the region
Murujuga Aboriginal Corporation	No	Approved Body Corporate for the Burrup and Maitland Industrial Estates Agreement (BMIEA). Woodside has chosen to provide information to the Corporation as an interested stakeholder.
Ngarluma Aboriginal Corporation	No	Native Title determination area is outside of the location.

Stakeholder	Relevant persons	Reasoning
Wirrawandi Aboriginal Corporation	No	Native Title determination area is outside of the location.
Wong-Goo-Tt-Oo	No	Native Title determination area is outside of the location.

** Fisheries have been identified as being relevant based on fishing licence overlap with the proposed Operational Area as well as consideration of fishing effort data, fishing methods, water depth, and future potential for fishing.* ***Section 4.5.3*** *provides a detailed assessment of Commonwealth and State fisheries within or adjacent to the Operational Area.*

5.5 Relevant Person Consultation

Consultation activities conducted for the proposed activity (Phase 4) with relevant stakeholders are outlined in **Table 5-2**.

The Consultation Information Sheet (**Appendix F**, reference 1.1) is published on the Woodside website and includes a toll-free 1800 phone number.

Table 5-2: Phase 4 stakeholder consultation activities

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
Australian Government department or agency				
ABF	On 4 October 2021, Woodside emailed Australian Border Force advising of the proposed activity (**Appendix F**, reference 1.7) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has addressed maritime security-related issues in **Section 6.8.1** of this EP based on previous offshore activities. Woodside considers it has provided sufficient information and opportunity to respond, and considers this adequately addresses stakeholder interests.
AFMA	On 4 October 2021, Woodside emailed AFMA (**Appendix F**, reference 1.19) and provided a Consultation Information Sheet, and Commonwealth fisheries map.	No feedback received	No response required	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.5.3.1** of this EP. No potential for interaction with this fishery was identified. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

AHO	On 4 October 2021, Woodside emailed AHO advising of the proposed activity (**Appendix F**, reference 1.12) and provided a Consultation Information Sheet and shipping lane map.	On 5 October 2021, the AHO responded acknowledging receipt of Woodside's email.	Woodside notes AHO acknowledgement and confirmed in accordance with feedback provided by AMSA for our activities in the area, Woodside will: • Notify the AHO no less than 4 weeks before operations commence in order to promulgate a Notice to Mariners. • Provide an update to the AHO on any material changes to planned activities.	Woodside has addressed AHO requests: • Woodside will notify the AHO no less than four working weeks before operations commence, as referenced as a PS 1.1 in this EP. • Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Australian Maritime Safety Authority (AMSA) (marine safety)	On 4 October 2021, Woodside emailed AMSA advising of the proposed activity (**Appendix F**, reference 1.20) and provided a Consultation Information Sheet, and shipping lane map.	On 5 October 2021, AMSA emailed Woodside requesting: • The AHO be contacted no less than four working weeks before operations commence for the promulgation of related notices to mariners. • AMSA's Joint Rescue Coordination Centre (JRCC) be notified at least 24–48 hours before operations commence • Provide updates to the AHO and JRCC should there be changes to the activity. • Vessels exhibit appropriate lights and shapes to reflect the nature of operations and comply with the International Rules of Preventing Collisions at Sea. AMSA provided advice on obtaining vessel traffic plots, including digital datasets and maps.	On 21 October 2021, Woodside responded confirming we will contact/notify: • The AHO no less than 4 weeks before operations commence • AMSA's JRCC at least 24-48 hours before operations commence • Provide updates to both the AHO and AMSA on any changes. Confirming vessels will exhibit appropriate lights and shapes to reflect the nature of operations and the obligation to comply with the International Rules for Preventing Collisions at Sea.	Woodside has addressed AMSA's requests: • Woodside will notify AMSA's JRCC at least 24–48 hours before operations commence for each survey, as referenced as PS 1.3 in this EP. • Woodside will notify the AHO no less than four working weeks before operations commence, as referenced as PS 1.1 in this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

AMSA (marine pollution)	On 25 October 2021, Woodside emailed AMSA (Appendix F, reference 1.20) and provided a copy of the Oil Pollution First Strike Plan (**Appendix D**).	No feedback received.	No response required.	Woodside has addressed oil pollution planning and response at **Appendix D**. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DAWE	On 28 October 2021, Woodside emailed DAWE seeking feedback on the proposed activity (**Appendix F**, reference 1.25).	No feedback received.	No response required.	No feedback provided. Woodside has consulted relevant Commonwealth fishery stakeholders including AFMA, CFA, Tuna Australia and ASBTIA. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.5.3.1** of this EP. Woodside will provide DAWE with commencement and cessation of activity notifications (**PS 1.4**). Woodside has addressed maritime biosecurity issues in **Section 6.9.8** of this EP based on previous offshore activities. Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
	On 4 October 2021, Woodside emailed DAWE advising of the proposed activity (**Appendix F**, reference 1.21) and provided a Consultation Information Sheet, and Commonwealth fisheries map.	No feedback received.	No response required.	
DISER	On 4 October 2021, Woodside emailed DISER advising of the proposed activity (**Appendix F**, reference 1.6) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.

DNP	On 4 October 2021, Woodside emailed the DNP advising of the proposed activity (**Appendix F**, reference 1.15) and provided a Consultation Information Sheet.	On 29 October 2021, the DNP responded thanking Woodside for the information provided and: • Advised it notes that planned activities do not overlap any AMPs, however noted that the subsea infrastructure is near Montebello AMP. • Noted that the EP will demonstrate it has identified and managed all impacts and risks on AMP values (including ecosystem values) to an ALARP and acceptable level and that the activity is not inconsistent with the management plan and will be outlined in the revised EP. • Referenced the NOPSEMA and Parks Australia guidance note that outlines what titleholders need to consider and evaluate for an EP. • Noted Woodside confirmed that there no hazardous chemicals remain in the treated seawater in the pipeline. • Advised that the EP needs to consider advice outlined in the Petroleum activities and AMPs Guidance Note. • Advised that DNP should be made aware of oil/gas pollution incidences which occur within a AMP or are likely to impact on a AMP as soon as possible.	On 1 November 2021, Woodside responded thanking the DNP for its feedback and confirmed that Woodside will contact the DNP if details regarding the activity change and result in an overlap with or new impact to an AMP, or for an emergency response.	Woodside has considered advice in the Petroleum activities and AMPs Guidance Note during development of this EP (**Section 5.4**). Woodside will ensure DNP is made aware of any incidences within a marine park for the activity, as per the commitment in the Oil Pollution First Strike Plan (**Appendix I**). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Western Australian Government department or agency or advisory body				

DMIRS	On 4 October 2021, Woodside emailed DMIRS advising of the proposed activity (**Appendix F**, reference 1.5) and provided a Consultation Information Sheet.	On 2 November, DMIRS responded and acknowledged the receipt of Woodside's consultation information. The response also: • Noted that the proposed activity will be assessed under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 and regulated by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). • Advised the DMIRS did not require any additional information and requested Woodside provide pre-start and cessation notifications.	Woodside responded on 12 November 2021 advising that it would provide the requested pre-start and cessation notifications.	Woodside will provide notifications to DMIRS prior to the commencement and at the end of the activity (**Section 7.8.2.1**). Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DPIRD	On 4 October 2021, Woodside emailed DPIRD advising of the proposed activity (**Appendix F**, reference 1.27) and provided a Consultation Information	No feedback received.	No response required.	Woodside has consulted relevant State fishery stakeholders including DPIRD, WAFIC and individual Licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.5.3.1** of this EP. There is potential for interactions with fishing vessels from the Pilbara Trap Limited and Pilbara Line fishery to occur. Potential impacts to these fisheries are discussed in **Section 6.8.1** and were assessed as localised, temporary displacement with no lasting effect. Woodside will notify DPIRD prior to the start date of the activity (**PS 1.2**).

				Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 29 October 2021, Woodside sent a follow up email to DPIRD seeking feedback on the proposed activity (**Appendix F**, reference 1.26).	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
DoT	On 4 October 2021, Woodside emailed the Department of Transport advising of the proposed activity (**Appendix F**, reference 1.7) and provided a Consultation Information Sheet.	On 8 October 2021, DoT responded requesting that the Department of Transport be consulted if any changes to the proposed activity result in an increased risk of a spill impacting State waters.	On 21 October 2021, Woodside replied to confirm that the Department of Transport will be consulted if there is any change to activity resulting in an increased risk of a spill impacting State waters.	Woodside provided DoT a copy of the Oil Pollution First Strike Plan and addressed oil pollution planning and response in **Appendix D**. Woodside considers this adequately addresses stakeholder interests and no further consultation is required. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 25 October 2021, Woodside emailed DoT (**Appendix F**, reference 1.23) and provided a copy of the Oil Pollution First Strike Plan (**Appendix D**).	On 29 October 2021, the DoT responded with advice that it will review the First Strike Plan and revert with any queries.	No response required.	
		On 25 November 2021, DoT further responded to Woodside's email of 25 October 2021 requesting that Woodside should provide some detail around the change in activity that has led to an increased risk for sensitive receptors. DoT noted that the Rev 0 version that they reviewed in 2020 stated that 'Hydrocarbon spill modelling results indicate no sensitive receptors have the potential to be contacted by hydrocarbons beyond 48 hours of a spill', however, Rev 0-B states that there are.	On 25 November 2021, Woodside replied to explain that the change in sensitive receptors is because the previous (2020) draft of the plan utilised different diesel modelling. Both sets of modelling volumes are 1,000 m^3 MDO but the former had not been analysed at the most up-to-date (lower) entrained thresholds and hence changing to the alternative modelling. Woodside also noted that the receptors listed in the newer First Strike Plan are not at the shoreline response threshold of 100 g/m^2 but, to be conservative, those at ~10 g/m^2 have been included as an	

			indication of where protection and deflection may potentially be deployed.	
		On 3 December, DoT responding thanking Woodside for the clarification and stating that they had no further comment.	On 3 December, Woodside replied thanking DoT for the email and their acceptance of the Echo Yodel Subsea Decommissioning First Strike Plan. Woodside stated that they will ensure that DoT is provided with a copy of the plan once approved.	
Commonwealth Fisheries				
Southern Bluefin Tuna Industry Association	On 4 October 2021, Woodside emailed Southern Bluefin Tuna Fishery license holders advising of the proposed activity (Appendix F, reference 1.16) and provided a Consultation Information Sheet, and Commonwealth fisheries map.	No feedback received.	No response required.	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.5.3.1** of this EP. No potential for interaction with this fishery was identified. Woodside considers this adequately addresses stakeholder interests and no further consultation is required
State Fisheries				
Pilbara Trap Fishery	On 27 October 2021, Woodside phoned and emailed Licence Holder Old Brown Dog Pty Ltd (**Appendix F,** reference 1.24) seeking feedback on the proposed activity.	No feedback received.	No response required.	Woodside has consulted relevant State fishery stakeholders including DPIRD, WAFIC and individual relevant Licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.5.3.1** of this EP. Woodside will provide notifications to Pilbara Trap Fishery prior to the commencement and at the end of the activity (**PS 1.3).**

				Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 4 October 2021, Woodside emailed Pilbara Trap Fishery license holders advising of the proposed activity (**Appendix F**, reference 1.13) and provided a Consultation Information Sheet, and State fisheries map.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
Pilbara Line Fishery	On 4 October 2021, Woodside emailed Pilbara Line Fishery license holders advising of the proposed activity (**Appendix F**, reference 1.13) and provided a Consultation Information Sheet, and state fisheries map.	No feedback received.	No response required.	Woodside has consulted relevant State fishery stakeholders including DPIRD, WAFIC and individual relevant Licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.5.3.1** of this EP. Woodside will provide notifications to Pilbara Line Fishery prior to the commencement and at the end of the activity (PS 1.3). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Industry				
BP Development	On 4 October 2021, Woodside emailed BP Development advising of the proposed activity (**Appendix F**, reference 1.11) and	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this

	provided a Consultation Information Sheet, and title map.			adequately addresses stakeholder interests
Santos WA Northwest PL	On 4 October 2021, Woodside emailed Santos WA North West PL advising of the proposed activity (**Appendix F**, reference 1.11) and provided a Consultation Information Sheet, and title map.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests
Industry representative organisations				
APPEA	On 4 October 2021, Woodside emailed APPEA advising of the proposed activity (**Appendix F**, reference 1.9) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests
CFA	On 4 October 2021, Woodside emailed Commonwealth Fisheries Association advising of the proposed activity (**Appendix F**, reference 1.14) and provided a Consultation Information Sheet, and Commonwealth fisheries map.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	On 4 October 2021, Woodside emailed the ASBTIA advising of the proposed activity (**Appendix F**, reference 1.16) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests
Tuna Australia	On 4 October 2021, Woodside emailed Tuna Australia advising of the proposed activity (**Appendix F**, reference 1.15) and provided a Consultation	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests

	Information Sheet, and fisheries map.			
Recfishwest	On 4 October 2021, Woodside emailed Recfishwest advising of the proposed activity (**Appendix F**, reference 1.7) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interest.
WAFIC	On 4 October 2021, Woodside emailed WAFIC advising of the proposed activity (**Appendix F**, reference 1.18) and provided a Consultation Information Sheet, and State fisheries map.	On 28 October 2021, WAFIC responded with advice that it supports the revised proposed activity to remove subsea infrastructure.	On 31 October 2021, Woodside responded to WAFIC thanking it for its feedback.	Woodside has consulted relevant State fishery stakeholders including DPIRD, WAFIC and individual relevant Licence holders. Woodside has assessed the relevancy of State fisheries issues in Section 4.5.3.1 of this EP. Woodside will provide notifications to WAFIC and relevant Fishery Licence Holders (Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of the activity (PS 1.3).
Other stakeholders				
King Bay Game Fishing Club (KBGFC)	On 4 October 2021, Woodside emailed Australian KBGFC advising of the proposed activity (**Appendix F**, reference 1.7) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests
Nickol Bay Sport Fishing Club (NBSFC)	On 4 October 2021, Woodside emailed NBSFC advising of the proposed activity (**Appendix F**, reference 1.7) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests

Karratha Community Liaison Group (CLG)	On 4 October 2021, Woodside emailed CLG members advising of the proposed activity (**Appendix F**, reference 1.4) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
• MAC	On 4 October 2021, Woodside emailed MAC as a member of the Karratha CLG advising of the proposed activity (**Appendix F**, reference 1.5) and provided a Consultation Information Sheet.	No feedback received	No feedback received	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
• NYFL	On 4 October 2021, Woodside emailed NYFL as a member of the Karratha CLG advising of the proposed activity (**Appendix F**, reference 1.6) and provided a Consultation Information Sheet.	No feedback received	No feedback received	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
Karratha District Chamber of Commerce and Industry (KDCCI)	On 4 October 2021, Woodside emailed KDCCI advising of the proposed activity (**Appendix F**, reference 1.3) and provided a Consultation Information Sheet.	No feedback received.	No response required	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.
City of Karratha	On 4 October 2021, Woodside emailed the City of Karratha advising of the proposed activity (Appendix F, reference 1.2) and provided a Consultation Information Sheet.	No feedback received.	No response required	Woodside considers it has provided sufficient information and opportunity to respond. and considers this adequately addresses stakeholder interests.

5.6 Ongoing Stakeholder Consultation

Woodside is committed to the engagements listed in **Table 5-3** based on stakeholder feedback.

Table 5-3 Ongoing stakeholder consultation

Stakeholder	Activity
AMSA	Woodside will notify AMSA’s Joint Rescue Coordination Centre 24-48 hours before operations commence (**PS 1.1**).
	Woodside will notify the AMSA no less than four working weeks before operations commence (**PS 1.3**).
DoT	Woodside will consult DoT if there is a spill impacting State waters from the proposed activity (**Appendix H**).
AHO	Woodside will notify the AHO no less than 4 weeks before operations commence (**PS 1.1**).
	Woodside will notify AHO on any material changes to planned activities.
DMIRS	Woodside will send DMIRS commencement and cessation notifications (**Section 7.8.2.1**).
Relevant fishery stakeholders	Woodside will provide relevant fishery stakeholders with commencement and cessation of activity notifications, including AFMA, DAWE, DPIRD, WAFIC, CFA and relevant Fishery Licence Holders (Western Deepwater Trawl Fishery and Pilbara Line Fishery) (**PS 1.4**).
DNP	Woodside will ensure DNP is made aware of any incidences within a marine park for the activity, as per the commitment in the Oil Pollution First Strike Plan (**Appendix I**).

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

6.1 Overview

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

6.2 Impact and Risk Analysis and Evaluation

As required by Regulations 13(5) and 13(6) of the Environment Regulations, the following analysis and evaluation demonstrates that the identified impacts and risks 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 impact assessment for planned activities has been based on the size of the Operational Area.

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

- planned activities (routine and non-routine) that have the potential for inherent environmental impacts
- unplanned events (accidents, incidents or emergency situations) with an environmental consequence, termed risks.

Within these categories, impact and risk assessment groupings are based on environmental aspects[4] such as emissions and physical presence. In all cases, the worst case risk was assumed.

The ENVID (performed in accordance with the methodology described in **Section 2**) identified 14 sources of environmental impacts and risks. A summary of the ENVID is provided in **Table 6-1**.

The impact and risk analysis and evaluation for the Petroleum Activities Program indicate that all current environmental risks and impacts associated with the individual activities are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 0** and **6.9**.

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[4] An environmental aspect is an element of the activity that can interact with the environment.

Table 6-1: Environmental risk analysis and summary

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Planned Activities (Routine and Non-routine)						
Physical presence: Interaction with other marine users from removal activities	**6.8.1**	F	Social and Cultural – no lasting effect (less than one month), localised impact not significant to areas/items of cultural significance.	-	-	Broadly acceptable
Physical presence: Disturbance to benthic habitat from removal activities and ROV operations	**6.8.2**	D, F	Environment – Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes	-	-	Broadly acceptable
Routine acoustic emissions: Generation of noise from project vessels and helicopter operations	**6.8.3**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine discharges: Project vessels	**6.8.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	-	-	Broadly acceptable
Non-routine discharges: Project fluids and Swarf	**6.8.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	-	-	Broadly acceptable
Routine atmospheric emissions: Fuel combustion and incineration	**6.8.6**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. air quality).	-	-	Broadly acceptable
Routine light emissions: External lighting on project vessels	**6.8.7**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. species).	-	-	Broadly acceptable

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Unplanned Activities (Accidents, Incidents, Emergency Situations)						
Accidental hydrocarbon release: Vessel collision	**6.9.2**	D	Environment – Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems), physical or biological attributes.	1	M	Broadly acceptable
Accidental hydrocarbon release: Bunkering	**6.9.3**	E	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	2	M	Broadly acceptable
Unplanned discharges: Deck and subsea spills	**6.9.4**	F	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	2	L	Broadly acceptable
Unplanned discharges: Release of solid hazardous and non-hazardous wastes	**6.9.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
Physical presence: Vessel collision with marine fauna	**6.9.6**	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: Dropped object resulting in seabed disturbance	**6.9.7**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
Physical presence: Accidental introduction and establishment of invasive marine species	**6.9.8**	E	Environment – No credible risk identified. Reputation and Brand – Minor, short-term impact (one to two years) to reputation and brand. Close scrutiny of asset level operations or future proposals.	0	L	Broadly acceptable

6.3 Environmental Performance Outcomes, Standards and Measurement Criteria

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

EPOs, EPSs and MC for the Petroleum Activities Program have been identified to allow the measurement of Woodside's environmental performance and the implementation of this EP to determine whether the EPOs and standards have been met.

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 **Section 2.7.2** as part of the acceptability and ALARP justification process.

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 7.8.4**).

6.4 Presentation

The environmental impact and risk analysis and evaluation (ALARP and acceptability), EPOs, standards and MC are presented in the following tabular form throughout this section. Italicised text in the following example denotes the purpose of each part of the table with reference to the relevant sections of the Environment Regulations and/or this EP.

<table>
<tr><th colspan="15">Context
<Description of the context for the impact/risk. Regulation 13(1, 13(2) and 13(3)></th></tr>
<tr><td>Description of the Activity – Regulation 13(1)</td><td colspan="7">Description of the Environment – Regulations 13(2)(3)</td><td colspan="7">Consultation – Regulation 11A</td></tr>
<tr><td colspan="15">Impacts/Risks Evaluation Summary – Summary of ENVID outcomes</td></tr>
<tr><td rowspan="2">Source of Impact/Risk
Regulation 13(1)</td><td colspan="7">Environmental Value Potentially Impacted
Regulations 13(2)(3)</td><td colspan="7">Evaluation
Section 2.7 and Section 2.8</td></tr>
<tr><td>Soil and Groundwater</td><td>Marine Sediment</td><td>Water Quality</td><td>Air Quality (incl Odour)</td><td>Ecosystems/Habitat</td><td>Species</td><td>Socio-economic</td><td>Decision Type</td><td>Impact/Consequence</td><td>Likelihood</td><td>Current Risk Rating</td><td>ALARP Tools</td><td>Acceptability</td><td>Outcome</td></tr>
<tr><td>Summary of source of risk/impact</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><th colspan="15">Description of Source of Impact/Risk</th></tr>
<tr><td colspan="15">Description of the identified impact/risk including sources or threats that may lead to the risk or identified event. Regulation 13(1).</td></tr>
<tr><th colspan="15">Impact/Risk Assessment</th></tr>
<tr><td colspan="15">Discussion and assessment of the potential impacts/risks to the identified environment value(s). Regulation 13(5)(6).
Potential impacts/risks to environmental values have been assigned and discussed based on Woodside's Environmental Consequence Definitions for Use in Environmental Risk Assessments (Table 2-3).</td></tr>
</table>

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[5]	***Benefit in Impact/Risk Reduction***[6]	***Proportionality***	***Control Adopted***
ALARP Tool Used – Section2.7.2 and Section 2.8.1				
Summary of control considered to ensure the impacts and risks are continuously reduced to ALARP. *Regulation 13(5) (c)*	*Technical/logistical feasibility of the control.* *Cost/sacrifice required to implement the control (qualitative measure).*	*Qualitative commentary of impact or risk that could be averted or environmental benefit gained if the cost/ sacrifice is made and the control is adopted.*	*Proportionality of cost/sacrifice versus environmental benefit. If proportionate (benefits outweigh costs), the control will be adopted. If disproportionate (costs outweigh benefits), the control will not be adopted.*	*If control is adopted.* *Reference to Control # provided.*
ALARP Statement: *Made based on the environmental risk assessment outcomes, use of the relevant tools appropriate to the decision type (**Section 2.7** and* **Figure 2-4***) and a proportionality assessment. Regulation 10A(b).*				

Demonstration of Acceptability
Acceptability Statement: *Made based on applying the process described in **Section 2.8.2**, taking into account internal and external expectations, risk to environmental thresholds and use of environment decision principles. Regulation 10A (c)*

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO# S: *Specific performance which addresses the legislative and other controls that manage the activity and against which performance by Woodside in protecting the environment is measured.* M: *Performance against the outcome is measured by measuring implementation of the controls via the MC.* A: *Achievability/feasibility of the outcome demonstrated via discussion of feasibility of controls in ALARP demonstration. Controls are directly linked to the outcome.* R: *The outcome is relevant to the source of risk and the potentially impacted environmental value.* T: *The outcome states the timeframe during which the outcome will apply or by which it will be achieved*.	**C#** *Identified control adopted to ensure the impacts and risks are continuously reduced to ALARP.* *Regulation 13(5)(c)*	**PS#** *Statement of the performance required of a control measure.* *Regulation 13(7)(a)*	**MC#** *Measurement criteria for determining whether the outcomes and standards have been met.* *Regulation 13(7) (c)*

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[5] Qualitative measure.

[6] Measured in terms of reduction of likelihood, consequence and current risk rating.

6.5 Cumulative Impacts

Existing subsea infrastructure within the Operational Area is described in **Section 3.7.2.1**; the closest petroleum facilities are listed in **Section 4.5.7**.

The Petroleum Activities Program includes SIMOPs with the Woodside operated GWA facility during removal activities as project vessels may be required to work within the 500 m petroleum safety zone around the GWA platform.

While the Yodel-3 and Yodel-4 wells covered in the accepted Echo Yodel Plugging and Abandonment EP have been permanently plugged and final well infrastructure removal activities are planned to occur prior to commencement of subsea decommissioning activities covered under this EP, there is a potential for these activities to also occur concurrently. However, given the duration of activities no cumulative impacts are expected.

Cumulative impacts associated with SIMOPS and the potential for subsea activities to occur at the same time as the Petroleum Activities Program have been included in the risk and impact assessments, where relevant.

Woodside will implement a SIMOPS management plan to identify and manage any cumulative impacts and risks appropriately.

6.6 Indirect Impacts Outside of the Operational Area

For the proposed Echo Yodel Subsea Decommissioning, the potential 'indirect' environmental impacts and risks evaluated are those associated with onshore waste disposal from waste generated in the Operational Area. Due to the nature and scale of these potential indirect environmental impacts and risks, and the existing regulatory frameworks to manage them, the relevant EPS, MC and EPOs demonstrating these indirect impacts/risks are managed to ALARP and acceptable levels are outlined in **Section 6.9.5**.

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

The ENVID identified sources of environmental risk/impact that were assessed as not being applicable (not credible), or outside the scope of this EP (refer **Section 2.5**). These are described in **Section 6.7.1** and **6.7.2**.

6.7.1 Shallow/Nearshore Activities

The Petroleum Activities Program is located in water depths greater of between 125 m and 140 m and at a distance about 35 km from the nearest landfall (North West Cape). Consequently, risks associated with shallow/near shore activities such as vessel anchoring and risks of grounding were assessed as not credible.

6.7.2 Impacts and Risks Covered Under the GWA EP

During the Petroleum Activities Program there is potential for activities to occur within or adjacent to the 500 m exclusion zone of the operating GWA facility or near other live subsea infrastructure overlapping the Operational Area. Risks associated with this include damage to live infrastructure from dropped objects or anchor drag and vessel collision with either the GWA facility, riser or GWA project vessels. Both of these scenarios could result in a loss of hydrocarbons to the environment.

The worst-case credible hydrocarbon release scenarios from these risks have been defined and assessed in the GWA Operations EP (currently under assessment). The EP provides a description and assessment of impacts and risks, as well as management controls and response capabilities.

The spill scenarios are therefore not addressed further in this EP. Additional controls for prevention of dropped objects on live infrastructure or vessel collisions with the GWA facility or GWA vessels as a result of the Petroleum Activities Program are outlined in **Section 6.9.2** and **Section 6.9.7**.

6.8 Planned Activities (Routine and Non-routine) for Removal Activities

6.8.1 Physical Presence: Interaction with other Marine Users from Removal Activities

Context		
Project vessels – **Section 3.10**	Socio-economic environment – **Section 4.5**	Stakeholder consultation – **Section 5**

Impacts Evaluation Summary

Source of Impact	Context						Evaluation						
	Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/Habitat*	*Species*	*Socio-Economic*	*Decision Type*	*Impact*	*Likelihood*	*Current Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Interaction with other users – proximity of project vessels causing interference with or displacement to third party vessels (commercial fishing and commercial shipping)						X	A	F	-	-	GP	Broadly Acceptable	EPO 1

Description of Source of Impact

Presence of Vessels

The Petroleum Activities Program will require a number of vessels to be present in the Operational Area during activities associated with recovery and removal of the pipeline, EHU and associated infrastructure. Depending on the method employed, removal and recovery of this subsea infrastructure is expected to take up to 8 months (**Section 3.5**) and may occur over multiple campaigns.

Project vessels are described in **Section 3.10**. If required, one general supply vessel will be present in the Operational Area on standby while the other(s) may transit in and out of the Operational Area for emergency and routine operations (e.g. supply and personnel transfers). The presence of these vessels in the Operational Area presents an opportunity for interaction with third-party marine users.

Impact Assessment

Potential Impacts to Socio-Economic Environment

Interactions with Commercial Fishing Activities

The Operational Area overlaps three Commonwealth and ten State managed fisheries. However, only the Pilbara Demersal Scalefish Managed Fisheries (Pilbara Trawl, Trap and Line) are considered to be active in the vicinity of the Operational Area. The Operational Area is located in water depths ranging from about 125 to 140 m, the shallower extent of which is within the depth range where typical fishing effort occurs for the Pilbara Line Fishery. However, the Operational Area is prohibited to trawling, so there is no risk of activities impacting trawling.

During recovery and removal, activities in the Operational Area may restrict the use of the area by the fisheries, and any other commercial fisheries that have been identified as having potential (but unlikely) to use the Operational Area. However, because vessels will be in the area for a short period of time (about 6 months), and because the fisheries' areas extend beyond Operational Area, impacts during removal activities will be temporary with no lasting effect.

In observance of good seamanship, all project vessels will avoid any close and/or disruptive engagement with any commercial fishing activity.

Displacement of Recreational Fishing

Recreational fishing is unlikely to occur in the Operational Area due to its depth and distance from shore. Stakeholder consultation did not identify any recreational fishing activities that could be impacted by the activity.

Recreational fishing in the region is concentrated around the coastal waters and islands of the NWMR, such as the Montebello Islands (about 68 km from the Operational Area). If recreational fishing effort occurred within the Operational Area while activities are being performed, displacement as a result of the Petroleum Activities Program would be minimal and relate only to the areas occupied by project vessels.

Therefore, the potential impact is considered to be negligible and with no lasting effect.

Displacement to Commercial Shipping

The presence of project vessels could potentially cause temporary disruption to commercial shipping. Shipping in the area is mainly related to the resources industry. The potential impacts associated with this Petroleum Activities Program may include displacement of vessels as they make slight course alterations to avoid the vessel(s). This is particularly relevant to the construction vessels which will be conducting removal activities along the EHU and pipeline, which traverses a shipping fairway.

Interference with Existing Oil and Gas Infrastructure

Interactions with operators of other nearby facilities have the potential to occur, particularly with the GWA facility. The project vessels may be required to enter the exclusion zone around the GWA facility during EHU and pipeline removal activities. This will be for a limited duration and timing will be coordinated with the GWA facility as per existing SIMOPS procedures.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that physical presence of the vessel’s interference with other marine users will be localised, with no lasting impact to shipping, commercial/recreational fishing interests and existing oil and gas infrastructure users (i.e. Social and Cultural Impacts – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No controls identified.				
Good Practice				
Notify AHO of activities and movements no less than four working weeks prior to 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 relevant government departments, fishing industry representative bodies and licence holders 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 1.2**
Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities 24 - 48 hours before operations commence.	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**
Notify relevant stakeholders for activities and movements that	F: Yes.	Communication of the Petroleum Activities Program to other	Benefits outweigh cost/sacrifice.	Yes **C.1.4**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
commence more than a year after EP acceptance.	CS: Minimal cost. Standard practice.	marine users ensures they are informed and aware, thereby reducing the likelihood of interference with other marine users.	Control is also Standard Practice.	
Remove Echo Yodel subsea infrastructure by end 2026	F: Yes. CS: Moderate cost.	Removal of umbilical, pipeline and associated infrastructure eliminates any long term potential interactions with other marine users including commercial fishers associated with leaving infrastructure *in situ.* However removal of infrastructure also eliminates any potential benefit such as additional hard substrate for commercial fish species to these other marine users.	Benefits outweigh cost/sacrifice.	Yes **C 2.1**
Leave Echo Yodel subsea infrastructure *in situ*	F: Yes. CS: Minimal cost.	Leaving the infrastructure *in situ* would eliminate any potential temporary vessel interactions with other marine users. The infrastructure would also retain artificial habitat that provides habitat for commercial species in an area that may potentially be fished in the future. However, potential safety risks from leaving infrastructure would remain, in particular for trawlers should the area reopen to trawling. Leaving the infrastructure would also potentially have additional impacts (plastics left in marine environment).	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Engineered Solution				
No additional controls 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; **Section 2.7.1**), Woodside considers the adopted controls appropriate to manage the impacts of the physical presence of the project vessels during removal activities. 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, the physical presence of the project vessels during removal activities may result in temporary impacts with no lasting effect (<1 month) to commercial fishing, recreational fishing, shipping and oil and gas. The adopted controls are considered consistent with industry good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders, AMSA, DPIRD, and AHO identified during impact assessment and stakeholder consultation. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Marine users aware of the Petroleum Activities Program.	**C 1.1** Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date.	**PS 1.1** Notification to AHO of activities and movements to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).	**MC 1.1.1** Consultation records demonstrate that AHO has been notified prior to commencement of an activity to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).
	C 1.2 Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of activities.	**PS 1.2** DAWE, DPIRD, WAFIC, and Pilbara Line licence holders notified prior to commencement and upon completion of activities.	**MC 1.2.1** Consultation records demonstrate that DAWE, DPIRD, WAFIC, and Pilbara Line licence holders have been notified prior to commencement and upon completion of activities.
	C 1.3 Notify AMSA JRCC of activities and movements 24 to 48 hours before operations commence.	**PS 1.3** Notification to AMSA JRCC 24-48 hours prior to the scheduled commencement date.	**MC 1.3.1** Consultation records demonstrate that AMSA JRCC has been notified prior to commencement of the activity within required timeframes.
	C 1.4	**PS 1.4**	**MC 1.4.1**

	Notify relevant stakeholders for activities and movements that commence more than a year after EP acceptance.	Relevant stakeholders will be notified no less than four working weeks prior to scheduled activity commencement date (**Table 5-2**).	Records demonstrate relevant stakeholders have been notified.
EPO 2 Echo Yodel umbilical, pipeline and associated infrastructure removed	**C 2.1** Remove Echo Yodel umbilical, pipeline and associated infrastructure by end of 2026.	**PS 2.1** Echo Yodel umbilical, pipeline and associated infrastructure will be removed.	**MC 2.1.1** Post-activity seabed survey demonstrates Echo Yodel umbilical, pipeline and associated infrastructure have been removed.

6.8.2 Physical Presence: Disturbance to Benthic Habitat from Removal Activities and ROV Operations

Context	
Infrastructure removal activities – **Section 3.9** ROV Operations – **Section 3.11.1**	Biological environment – **Section 4.4** Values and sensitivities – **Section 4.6**

Impacts Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Disturbance to seabed from removal activities				X			A	D	-	-	GP PJ	Broadly Acceptable	NA
Disturbance to seabed from ROV operations				X			A	F	-	-			

Description of Source of Impact

Infrastructure Removal

Various removal methods may need to be employed for the recovery of the pipeline as described in **Section 3.8**. The EHU is planned to be removed in two sections, the main EHU and the infield EHU and recovered to a vessel together with the UTAs, IUTB, control jumpers, as described in **Section 3.9.2**.

Removal of the Echo Yodel pipeline, EHU and associated infrastructure, will require sediment to be displaced from around and under the base of the infrastructure to allow the infrastructure to be removed. Sand relocation will be undertaken via water jetting using an ROV or, in the case of the pipeline, a mass flow excavator could potentially be used (**Section 3.9.1.4**). For all infrastructure except the pipeline, seabed disturbance will generally be confined to the footprint of the infrastructure and up to 1 m around the infrastructure. For the pipeline, while all the recovery methods will require some sediment disturbance, the cut and recover method will require the largest extent of pipeline deburial and is estimated to be a maximum of 1100 m3 of localised sediment displacement along the 23 km of pipeline. The disturbance will be confined to a few metres either side of the pipeline.

Removal of the infrastructure itself will also remove the artificial habitat and associated organisms that have formed since installation of the infrastructure.

ROV

The use of the ROV during the Petroleum Activities Program may result in temporary seabed disturbance and suspension of sediment, causing increased turbidity as a result of working close to, or occasionally on, the seabed. ROV used close to or on the seabed is limited to that required for effective and safe subsea activities. The footprint of a typical ROV is about 2.5 m × 1.7 m. The disturbance as a result of ROV operation will be significantly less than that occurring from infrastructure removal.

Impact Assessment

Potential Impacts to Ecosystems/Habitats

Benthic Habitats

Removal of the infrastructure and ROV operations are likely to result in localised, physical modification to the seabed and localised disturbance to soft sediments. The artificial habitats created by the infrastructure will also be permanently removed.

The Operational Area overlaps a section of the Ancient Coastline at 125 m Depth Contour KEF. The Operational Area is expected to consist primarily of fine carbonate sediments, which are typical of the broader NWMR but may have areas of hard substrate which is typical of the Ancient Coastline KEF. The seabed in the Operational Area has been confirmed as soft sediment habitat (Section 4).

Physical impacts from the Petroleum Activities Program are expected to be for the most part confined to sediment burrowing infauna associated with the soft sediment seabed and surface epifauna invertebrates, particularly filter feeders, inhabiting the infrastructure which will be removed. Removal activities at the Echo Yodel pipeline and EHU may therefore temporarily disturb soft sediment habitats and associated fauna. These impacts are expected to be localised and mainly restricted to the footprint of the infrastructure and surrounding area, with spatial extent of impacts likely to be higher for the pipeline which may extend tens of metres out .

A turbidity survey undertaken for Chevron's Wheatstone project undertaken during pipeline trenching in water depths of 130 m – 150 m concluded that a turbid plume may be evident up to 70 m from the trenching operations depending on environmental conditions. However, within 2 hours of ceasing trenching operations, the turbidity level was observed to return to, or very close to background levels (Chevron, 2014). Considering the widespread representation of the infauna communities within the Operational Area and the broader NWMR, significant impacts to these communities are not expected.

The removal of the infrastructure will also directly impact and remove the associated epifauna invertebrates. As detailed in Section 4.4.1.4, the pipeline and EHU in particular provide deepwater epibenthic habitat for filter-feeders including deepwater corals, crinoids (featherstars), Gorgonocephalidae (basket stars), hydroids, true anemones and sponges. In turn these provide habitat for various species of fish, including commercially important fish species. None of the species are considered of conservation significance. However, monitoring over time has shown trends in reduction of abundances and diversity of fish and epibenthic species likely as a result of the continued burial of the pipeline and EHU and reduction in surface area for epibenthic habitats to establish (Bond and Taylor, 2019). Over a long duration the pipeline and EHU will either self-bury and/or degrade to a degree that this artificial habitat would be lost. While the removal of the infrastructure would result in the immediate loss of epibenthic habitat, some of the associated fish and more mobile species would likely be able to migrate to other habitats, including nearby artificial habitats created by other oil and gas infrastructure in the locality (**Section 4.5.7**). The impact from the removal of artificial habitats are expected to be localised, minor and short-term.

ROV activities near the seafloor may result in slight and short-term impacts to deepwater biota, as a result of elevated turbidity and the clogging of respiratory and feeding parts (turbidity) of filter feeding organisms. Impacts as a result of ROV activities are expected to be localised with no lasting effect.

Based on the above impact assessment, impact to the seabed of the Operational Area including the Ancient Coastline KEF are expected to be localised (within tens of metres of the infrastructure) and short-term. The Petroleum Activities Program is highly unlikely to impact other sensitive areas in the surrounding region, such as Rankin Bank and Montebello AMP, considering their distance from the Operational Area (12 km and 27 km respectively).

Impacts to marine reptiles - flatback turtles

A flatback turtle interesting BIA overlaps the Operational Area. However, as discussed in Section **4.4.2.5,** suitable internesting habitat flatback turtles as defined as water 0 to 16 m deep and within 5 to 10 km of the coastline, while unsuitable internesting flatback habitat was defined as waters more than 25 m deep and more than 27 km from the coastline. Hence, it is highly unlikely that significant numbers of flatback turtles will be in the offshore, deep waters of the Operational Area. The Operational Area would not represent suitable habitat for the species and any disturbances to the seabed is unlikely to impact foraging or other habitat for the species.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, seabed disturbance from the Petroleum Activities Program will result in no greater than localised, minor short-term impacts to natural benthic habitat and communities (i.e. Environment Impact – F to D).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
Environmental monitoring of the seabed prior to and following the Petroleum Activities Program to assess any impacts to seabed.	F: Yes. CS: Significant. Monitoring of the seabed, particularly the deep waters of the Operational Area, would have significant additional costs to obtain and analyse data with the spatial	Environmental monitoring would not result in any additional information about the seabed above what is provided by previous surveys. Therefore, no	Control grossly disproportionate. Monitoring will not reduce the consequence or likelihood of any impacts to the seabed, and the cost associated with the level of	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	resolution to accurately assess changes to the seabed habitat.	additional reductions in likelihood or consequence would occur.	monitoring required to accurately assess any impacts greatly outweighs the benefits gained. Although adoption of this control could be used to verify EPOs, alternative controls identified also allow demonstration that the environmental outcome has been met based on the nature of the activity (i.e. predictable impacts) and relatively low sensitivity of the area.	
Professional Judgement – Eliminate				
Do not remove infrastructure	F: Yes. CS: lower cost than removal (i.e. no cost associated with leaving infrastructure *in situ*).	Leaving infrastructure *in situ* would eliminate the impacts to the seabed and removal of artificial habitat associated with removal activities. The infrastructure retained would provide habitat for commercial fish species in the short to medium term before it either becomes completely buried or degrades and the habitat value is lost.	There are some impacts associated with long-term degradation of the infrastructure should it be left in place. Given regulator and other stakeholder concerns over the presence of the infrastructure being left *in situ*, the benefit of removing the infrastructure outweighs the potential impacts.	No
Avoid removal activities during flatback turtle interesting periods	F: Yes. CS: Increased costs if multiple campaigns are required to remove all infrastructure	Avoiding the flatback turtle interesting period would reduce the likelihood to impact the species as a result of sediment disturbances.	The likelihood of impacting flatback turtles is very low considering the Operational Area is not considered suitable interesting habitat. Avoiding the interesting period is unlikely to substantially decrease the potential for the species to be impacted. Disproportionate. The cost/sacrifice outweighs the benefit gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Do not use ROV close to, or on, the seabed.	F: No. The use of ROVs (including work close to or occasionally landed on the seabed) is critical, as the ROV is the main tool used to guide and manipulate equipment during infrastructure removal activities. ROV usage is already limited only to that required to conduct the work effectively and safely. Due to visibility and operational issues, ROV work on or close to the seabed is avoided unless necessary. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls 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, **Section 2.7.1**), Woodside considers the adopted controls appropriate to manage the impacts of benthic habitat disturbance from infrastructure removal, preparation activities and ROV operations. 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, disturbance to benthic habitats from infrastructure removal activities and ROV operations may result in minor and short-term effects (1 to 2 years) to habitat (but not affecting ecosystems function), physical and biological attributes of deepwater natural benthic habitats which is not unique to the broader region. The adopted controls are considered consistent with industry good practice and professional judgement. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

6.8.3 Routine Acoustic Emissions: Generation of Noise from Infrastructure Removal Activities, Project Vessels and Helicopter Operations

Context	
Project vessel based activities – **Sections 3.10** Removal activities - **Section 3.8**	Biological environment – **Section 4.4**

Impacts Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Generation of acoustic signals from project vessels during normal operations					X		A	F	-	-	LCS GP PJ	Broadly Acceptable	EPO 3
Generation of acoustic signals from DP systems on project vessels					X		A	F	-	-			
Generation of acoustic signals from cutting equipment					X		A	F					
Generation of atmospheric noise from helicopter transfers within Operational Area.					X		A	F	-	-			
Noise generated from acoustic surveying					X		A	F	-	-			

Description of Source of Impact

The project vessels will generate noise both in the air and underwater, due to the operation of thrusters' engines, subsea activities, 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 (rms SPL)) under very calm, low wind conditions, to 120 dB re 1µPa (rms SPL) under windy conditions (McCauley, 2005).

Project Vessels and Operation of Dynamic Positioning Systems

Project vessels may maintain DP for varying durations during the Petroleum Activities Program, depending on the activity being undertaken. The main source of noise from a DP vessel relates to using DP thrusters while the vessel is maintaining position. McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa at 1 m (SPL rms) from a support vessel holding station in the Timor Sea and McPherson and Quijano (2021) indicates source levels for the Skandi Hercules, a vessel similar to the one that will be used for the cut and recovery method (the Skandi Singapore), to be 181 re 1 µPa at 1 m (SPL rms). It is expected that similar noise levels will be generated by project vessels used for this Petroleum Activities Program.

Positioning Equipment

For DP operations, two (2) seabed transponder arrays will be required for station keeping. Each array will consist of 4-5 medium frequency transponders spaced approximately 150m from location. All transponders will be active for all operations and emit sound at a set frequency. Transponders typically emit pulses of medium frequency sound, generally within the range 21 to 31 kHz. The estimated SPL would be 180 to 206 dB re 1 µPa at 1 m (Jiménez-Arranz *et al.*, 2017). Transmissions are not continuous but comprise short (3–40 millisecond) 'chirps'.

Subsea IMR Activities

Acoustic surveying may be required during as-found and as-left surveys to identify seabed features as well as any remaining infrastructure that requires removal. Acoustic surveys such as MBES and SSS generate a higher frequency acoustic signal, which attenuates more rapidly underwater compared to lower frequencies. Additionally, sound sources generated closer to the seabed have a lower received noise level in the horizontal direction due to seafloor scattering and absorption.

Cutting of pipeline

Additional noise from the cutting of the pipeline is likely to be generated. Cutting will be required for all pipeline recovery method options, though the cut and recovery method will require the highest number of cuts and longest duration. The pipeline will be cut using diamond cutting method.

The literature, both published and grey, available to quantify the underwater sound fields from cutting tools (e.g. diamond wire saws, or other cutting technologies), is very limited.

Pangerc *et al.* (2016) described the underwater sound measurement data during an underwater diamond wire cutting of a 32" conductor (10m above seabed in ~80m depth) and found that at lower frequencies, the operation was generally indistinguishable above the background noise, however, the sound that could be associated with the diamond wire cutting was primarily detectable above the background noise at the higher acoustic frequencies (above around 5 kHz). The background noise levels were substantially higher at lower frequencies, while it is likely that the spectra of the noise from the cutter peaks at higher frequencies, which has been approximated between 2.5 and 20 kHz. In another study, the US Navy measured underwater sound levels when the diamond saw was cutting caissons for replacing piles at an old fuel pier at Naval Base Point Loma and reported an average SPL for a single cutter at 136.1-141.4 dB re 1 µPa at 10 m, as reported in Fairweather Science (2018).

Helicopter Transfers

Helicopter activities may occur in the Operational Area, including the landing and take-off of helicopters on the vessel helidecks. Sound emitted from helicopter operations is typically below 500 Hz (Richardson et al., 1995). The peak received level diminishes with increasing helicopter altitude, but the duration of audibility often increases with increasing altitude. Richardson et al. (1995) reports that helicopter sound is audible in air for four minutes before it passed over underwater hydrophones, but detectable underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m depth. Noise levels reported for a Bell 212 helicopter during fly-over was reported at 162 dB re 1 µPa and for Sikorsky-61 is 108 dB re 1 µPa at 305 m (Simmonds et al., 2004).

Impact Assessment

Potential Impacts to Protected Species

Receptors

The Operational Area is located in waters about 125 m to 140 m deep. The fauna associated with this area will be predominantly pelagic species of fish, with seasonal potential presence of migratory species such as turtles, whale sharks and cetaceans. Noise interference is a key threat to a number of migratory and threatened cetaceans and marine turtles identified as occurring within the Operational Area.

The Operational Area overlaps BIAs for flatback turtles (internesting), whale sharks (foraging) and wedge-tailed shearwaters (breeding and foraging). Flatback turtles nest in the region between October and March, however, given water depths and distance from shore, the area does not constitute foraging or internesting habitat. Satellite tracking of flatback turtle nesting populations (Barrow Island and mainland sites) indicates this species travels to the east of Barrow Island between nesting events, within WA mainland coastal waters less than 70 m deep (Chevron Australia Pty Ltd, 2015). Whale sharks will be present between March and November and wedge-tailed shearwaters between August and April. Due to the lack of nesting habitat for wedge-tailed shearwaters in proximity to the Operational Area, only a low density is expected even during peak nesting periods. Foraging adult seabirds may occur within the Operational Area. During the breeding period, foraging adult wedge-tailed shearwaters were observed travelling up to around 1,000 km from the breeding colony (Cannell et al., 2019). Although the breeding and foraging BIA overlapping the Operational Area is defined as the area within around 70-80 km from the Montebello Islands, wedge-tailed shearwaters on the NWS have been observed foraging beyond the breeding and foraging BIA. Based on the large area where foraging is known to occur, the Operational Area does not represent a significant portion of the known foraging area for the wedge-tailed shearwaters. Cetaceans, such as pygmy blue whales and humpback whales, and other marine turtle species may also be present within the Operational Area seasonally; however, no BIAs or other important areas for these species overlap the Operational Area.

Potential Impacts of Noise

Elevated underwater noise can affect marine fauna, including cetaceans, fish, turtles, 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.

Sound Propagation Calculations

Increasing the distance from the noise source usually results in the level of noise reducing, due primarily to the spreading of the sound energy with distance. The way that the noise spreads (geometrical divergence) will depend upon several factors such as water column depth, pressure, temperature gradients, and salinity, as well as surface and bottom conditions.

Cetacean Thresholds

The thresholds for non-impulsive sources of noise that could result in a response for cetaceans are outlined in **Table 6-2**. These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (National Marine Fisheries Service [NMFS], 2014).

Table 6-2: PTS and TTS onset thresholds

Hearing group	**PTS onset thresholds (received level)**		**TTS onset thresholds (received level)**		**Behavioural response**	
	Impulsive	*Non-impulsive*	*Impulsive*	*Non-impulsive*	*Impulsive*	*Non-impulsive*
Low-frequency cetaceans	L_{pk}, flat: 219 dB L_E, LF, 24h: 183 dB	L_E, LF, 24h: 199 dB	L_{pk}, flat: 213 dB L_E, LF, 24h: 168 dB	L_E, LF, 24h: 179 dB	L_p 160 dB	L_p 120 dB
High-frequency cetaceans	L_{pk}, flat: 202 dB L_E, HF, 24h: 155 dB	L_E, HF, 24h: 198 dB	L_{pk}, flat: 196 dB L_E, HF, 24h: 140 dB	L_E, HF, 24h: 178 dB	L_p 160 dB	L_p 120 dB

Source: NMFS (2014); Southall et al. (2019).

Marine Turtles

The Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017) notes there is limited information available on the impact of noise on marine turtles and that the impact of noise on turtle stocks may vary depending on whether exposure is short (acute) or long-term (chronic). Turtles have been shown to respond to low frequency sound, with indications that they have the highest hearing sensitivity in the frequency range 100–700 Hz (Bartol and Musick, 2003). Finneran et al. (2017) presented revised thresholds for PTS and TTS onset in marine turtles from continuous (non-impulsive) noise, considering frequency weighted SEL (**Table 6-3**). No numerical thresholds have been developed for onset of behavioural responses in marine turtles from continuous sources (e.g. vessel noise).

Table 6-3: PTS and TTS onset thresholds for non-impulsive noise on turtles

PTS onset thresholds (received level)	**TTS onset thresholds (received level)**
Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 $\mu Pa^2 \cdot s$)	
220	200

Source: Finneran et al. (2017).

Fish

In 2006, the Working Group on the Effects of Sound on Fish and Turtles was formed to continue developing noise exposure criteria for fish and turtles, work begun by a NOAA panel two years earlier. The Working Group developed guidelines with specific thresholds for different levels of effects for marine faunal groups (Popper et al. 2014).

Table 6-4 lists the relevant effects guidelines from Popper et al. (2014) for shipping and continuous noise. Some evidence suggests that fish sensitive to acoustic pressure show a recoverable loss in hearing sensitivity, or injury when exposed to high levels of noise (Scholik and Yan 2002, Amoser and Ladich 2003, Smith et al. 2006); this is reflected in the SPL thresholds for fish with a swim bladder involved in hearing.

Table 6-4: Guidelines for vessel noise exposure for fish and turtles, adapted from Popper *et al.* (2014).

Type of animal	**Mortality and potential mortal injury**	**Impairment**			**Behaviour**
		Recoverable injury	***TTS***	***Masking***	
Fish: No swim bladder (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish:	(N) Low (I) Low	(N) Low (I) Low	(N) Moderate (I) Low	(N) High (I) High	(N) Moderate (I) Moderate

Swim bladder not involved in hearing (particle motion detection)	(F) Low	(F) Low	(F) Low	(F) Moderate	(F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	(N) Low (I) Low (F) Low	170 dB SPL for 48 h	158 dB SPL for 12 h	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N – tens of metres from source), intermediate (I – hundreds of metres from source), and far (F – thousands of metres from source).

Noise Modelling

In the event that the cut and recover method is used to recover the pipeline, project vessels may be active in the Operational Area for up to six months (compared to two months if the reverse reel lay or reverse S-lay methods are used). This recovery option would therefore have the longest duration of noise generated and increased likelihood of noise impacts on sensitive marine fauna that may occur within the impact area.

McPherson and Quijano (2021) modelled and characterised vessel and diamond saw sound fields for another project located on the North West Shelf at 166.2 m depth with similar geological profiles to those found in the Operational Area. The vessel assessed (Skandi Hercules: 12,900 kW installed thruster power) also had similar characteristics to the vessel that would likely be used for the cut and recovery method and had similar operational requirements.

Based on the similarities in the environment and vessel modelled in McPherson and Quijano (2021) and those proposed in this EP, the results in McPherson and Quijano (2021) have been used to assess the potential noise impacts from the Petroleum Activity for the cut and recover method.

Cut and Recover Vessel and Subsea Cutting Noise Impacts

Source levels for noise generated by the project vessels on DP during the cut and recover method is expected to be in the range of 181-184 dB re 1 µPa at 1 m. The majority of the acoustic energy from the vessel is emitted within the 250 Hz decidecade band while the energy corresponding to the cutting operation peaks at the 10 kHz band, with a broadband ESL 10 dB lower than that of the vessel.

Table 6-5 summarises the largest radial distances to thresholds for criteria corresponding to behavioural response, impairment (TTS) and injury (PTS) in low- and high-frequency cetaceans, turtles, and fish. The largest distance is 1.75 km, corresponding to the threshold for behavioural response to continuous noise in marine mammals.

The McPherson and Quijano (2021) modelling showed the sound field to be dominated by the vessel on DP. At close range (<0.05 km from the modelled site) the addition of the diamond wire cutter does not change the distance to SPL thresholds, compared to the scenario with the vessel alone. At longer ranges the impact of the wire cutter remains minimal, for instance it increases the Rmax range to the 120 dB re 1 µPa threshold from 1.71 km to 1.75 km.

Table 6-5: Summary of the largest distances to threshold for the various fauna groups

Criteria	Group	Threshold	R_{max} (km)
Southall *et al.* (2019) (PTS)	LF-cetaceans	199 dB re 1 µPa^2·s (Weighted SEL$_{24h}$)	0.05
Southall *et al.* (2019) (TTS)		179 dB re 1 µPa^2·s (Weighted SEL$_{24h}$)	0.51
Finneran *et al.* (2017 (PTS)	Turtles	220 dB re 1 µPa^2·s (Weighted SEL$_{24h}$)	<0.02
Finneran *et al.* (2017 (TTS)		200 dB re 1 µPa^2·s (Weighted SEL$_{24h}$)	0.05
NOAA (2019) (Behaviour)	LF and HF-cetaceans	120 dB re 1 µPa (SPL)	1.75
Popper *et al.* (2014) (TTS)	Fish	158 dB re 1 µPa (SPL)	0.02

Regarding distances to PTS and TTS, note that SEL24h is a cumulative metric that reflects the dosimetric effect of noise levels within 24 h based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. However, this is an unlikely worst-case scenario. More realistically, marine mammals, fish, and sea turtles would not remain in the same location for 24 h, but rather a shorter period, depending upon their behaviour and the source's proximity and movements. Therefore, a reported radius for SEL24h criteria does not mean that marine fauna 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 h.

Considering the overlap or proximity of the BIAs to the Operational Area, it is likely there may be increased numbers of individuals of whale sharks during migratory periods, however, only transient individuals of flatback turtles are expected, even during internesting periods. Currently, there are no thresholds relevant to whale sharks. It is expected that the potential effects of noise on whale sharks will be the same as for other pelagic fish species without fish bladders, resulting in minor and temporary behavioural change such as avoidance. As outlined above, marine turtles are not expected to be in the area in high numbers even during nesting and internesting periods. Therefore, impacts to marine turtles and whale sharks from project vessels are expected to be negligible or of no lasting effect.

Cetaceans may be seasonally present in the Operational Area, though limited to individuals infrequently transiting through the area. Interactions between pygmy blue whales and humpback whales with vessels typically results in avoidance behaviour, with whales generally moving away from vessels (Bauer 1986; Stamation et al., 2010). Because the Operational Area is about 29 km from the pygmy blue whale migration BIA and 29 km from the humpback whale migration BIA, no impacts are predicted to occur from project vessel noise on individuals using these areas. In summary, potential impacts to pygmy blue whales, humpback whales and other cetaceans from predicted noise levels are expected to be limited to behavioural impacts within a localised area around vessels with no lasting effect.

Other fauna associated with the Operational Area will be predominantly pelagic species of fish, with migratory species such as whale sharks and rays transiting through the Operational Area; these species may be similarly affected by noise from project vessels.

Reverse Reel Lay and Reverse S-lay Vessels Noise Impacts

The vessels that may be required for the reverse reel lay and reverse S-lay recovery methods (e.g. the *Seven Oceans* and *DLV 2000*) are larger than the one that would be used for the cut and recover method (installed thruster power *Seven Oceans*: 15,850 kW; *DLV 2000*: 25,500 kW). Existing modelling for larger pipelay vessels with almost double the power (55,000 kW), in deeper water (worse case), resulted in a maximum range of 14.5 km above the continuous noise behavioural response threshold (Connell, S.C *et al.*, 2022). The use of either vessels would be of shorter duration (maximum two months) reducing the likelihood of impacts to transient species such pygmy blue whales, humpback whales and other cetaceans. Furthermore, considering the Operational Area does not overlap any BIAs for these species and the increased noise is unlikely to reach threshold levels within the BIAs more than 29 km away, it is considered noise impacts would be similar to those assessed for the cut and recover method.

Positioning Equipment Noise

Transponders used for positioning have the potential to cause some temporary behavioural disturbance to marine fauna; however, noise levels will be well below injury thresholds. Based on empirical spreading loss estimates measured by Warner and McCrodan (2011), received levels from ultra-short baseline transponders are expected to exceed the cetacean behavioural response threshold for impulsive sources out to about 42 m. Given the short-duration chirps and the mid frequencies used by positioning equipment, the acoustic noise from transponders is unlikely to have any substantial effect on the behavioural patterns of marine fauna. Therefore, potential impacts from transponder noise are likely to be restricted to temporary and localised avoidance behaviour of individuals transiting through the Operational Area, and therefore are considered localised with no lasting effect.

Subsea IMR Activities

JASCO (2013) conducted noise modelling for five low energy survey instruments off the coast of California. One of these instrument types are comparable to acoustic survey equipment. All equipment types were modelled in the sandy bottom environment, similar to that of the Operational Area. Although the bathymetry, salinity, water temperature and sub-seafloor sediment type may differ, given the similarities in equipment type and seafloor habitat, the modelling is considered comparable for the nature and scale of the low energy IMR survey equipment.

The modelling reported distances to specific threshold levels for different types of marine mammals. Where applicable M-weighted Rmax (the distance to the farthest occurrence of the threshold level) estimates were used. Since receptors identified in Section 4.6 include a greater range of species, unweighted Rmax, was used for species where M-weighted estimates were not appropriate, which is considered conservative. The distance at which the 160 dB re 1 µPa (rms SPL) behavioural threshold was reached was 290 m.

Potential behavioural response impacts may include:

1. Cetaceans: Potential behavioural disturbance from the acoustic survey activities for cetaceans, likelihood of PTS or TTS is not considered credible, given individuals would need to be directly next to the noise source for prolonged duration and vessels are not point sources (i.e. sound is distributed from multiple locations of the vessel over a large area).
2. Fish: Potential masking and behavioural disturbance at near and intermediate range; likelihood of PTS or TTS is considered not to be credible given fish would move away from the source and the activities noise sources are all higher in frequency (12 - 700 kHz) therefore they are outside the range of fish hearing (2-4 kHz). Site attached fish (e.g. some species of demersal fish) are not expected to be exposed to underwater noise above impact thresholds given water depths in the area where these fish may be more prevalent.

3. Marine turtles: Likelihood of potential masking and behavioural disturbance or PTS or TTS is considered not to be credible given the source frequency of proposed equipment (12 -700 kHz) is well outside the known hearing frequency range of turtles (0.1 - 0.7 kHz).

Helicopter Noise Impacts

Helicopter engines and rotor blades are recognised as a source of noise emissions, which may result in behavioural disturbance to marine fauna. Water has a very high acoustic impedance contrast compared to air, and the sea surface is a strong reflector of noise energy (i.e. very little noise energy generated above the sea surface crosses into and propagates below the sea surface (and vice versa) – most of the noise energy is reflected). The angle at which the sound path meets the surface influences the transmission of noise energy from the atmosphere through the sea surface; angles ±>13° from vertical being almost entirely reflected (Richardson *et al.*, 1995). Given this, and the typical characteristics of helicopter flights within the Operational Area (duration, frequency, altitude and air speed), the opportunity for underwater noise levels that may result in behavioural disturbance are considered to be not credible. Note that helicopter noise during approach, landing and take-off is more likely to propagate through the sea surface due to the reduced air speed and lower altitude. However, helicopter noise during approach, landing and take-off will be mingled with underwater noise generated by the facility hosting the helipad (e.g. thruster noise from project vessels etc). Additionally, approach, landing and take-off are relatively short phases of the flight, resulting in little opportunity for underwater noise to be generated.

Given the standard flight profile of a helicopter transfer, maintenance of a more than 500 m horizontal separation from cetaceans (as per the EPBC Regulations), and the predominantly seasonal presence of whales within the Operational Area, interactions between helicopters and cetaceans resulting in behavioural impacts are considered to be highly unlikely. In the highly unlikely event that cetaceans are disturbed by helicopters, responses are expected to consist of short-term behavioural responses, such as increased swimming speed; the consequence of such disturbance is considered to have no lasting effect and be of no significance.

While unlikely, turtles may be present in low numbers within the Operational Area, particularly during internesting periods, and may be exposed to helicopter noise when on the sea surface (e.g. when basking or breathing). Typical startle responses occur at relatively short ranges (tens of metres) (Hazel *et al.*, 2007) and, as such, startle responses during typical helicopter flight profiles are considered to be remote. In the event of a behavioural response to the presence of a helicopter, turtles are expected to exhibit diving behaviour, which is of no lasting effect.

The Operational Area may be occasionally visited by migratory and oceanic birds but do not contain any emergent land that could be used as roosting or nesting habitat. The closest emergent land located about 68 km from the Operational Area (Montebello Islands). One BIA, a breeding and foraging area for wedge-tailed shearwaters, overlaps the Operational Area (August to April). However, there are no nesting sites such as islands within or in proximity to the Operational Area. Given the expected low density of seabirds within the Operational Area due to a lack of roosting or nesting habitat, the relative infrequency of helicopter flights and lack of lasting effect of potential behavioural responses to helicopter noise, impacts would be unlikely, localised and temporary, and result in no lasting effect.

Summary of Potential Impacts to Environmental Value(s)

It is considered that noise generated by the project vessels, cutting of pipeline and helicopters will result in no greater than localised, short-term impacts to marine fauna with no lasting effect (i.e. Environmental Impact – F)

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[7]: • Project vessels will not travel faster than six knots within	F: Yes. CS: Minimal cost.	Implementation of these controls will not significantly reduce negligible impacts to marine fauna from underwater noise given outcomes of impact assessment.	Disproportionate. The cost/sacrifice outweighs the benefit gained. However, control has been adopted to minimise vessel collisions with	Yes **C 13.1**

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[7] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability; e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. - Project vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). - If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. - Project vessels will not travel faster than eight knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.			marine fauna in **Section 6.9.6**.	
No additional controls identified.				
Good Practice				
The use of dedicated Marine Fauna Observers (MFOs) on project vessels for the duration of the Petroleum Activities Program to watch for whales and provide direction on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes. However, project vessel bridge crews already maintain a constant watch during operations. CS: Additional cost of MFOs.	Given that project vessel bridge crews already maintain a constant watch during operations, additional MFOs would not further reduce the likelihood of an individual being within close proximity of the acoustic source during start-up or during operations.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Eliminate				
Eliminate generation of noise from the project vessels	F: No. The generation of noise from these sources cannot be eliminated due to operating requirements. Note that project vessels operating on DP may be a safety critical requirement. CS: Inability to conduct the Petroleum Activities Program. Loss of project.	Not considered, control not feasible.	Not considered, control not feasible.	No

Implementing a shutdown zone around acoustic surveying for the following fauna: • whales • marine turtles • whale sharks.	F: Yes. However, as equipment is underwater at the seabed, effective implementation of zones is challenging from topside observation. CS: Moderate. Requires the provision of a dedicated suitably trained crew member to undertake Marine Fauna Observations.	Negligible. No credible impact predicted to these species from acoustic surveying.	The source levels and frequency range of these devices are outside the estimated frequency hearing range of identified protected species (whales, turtles and whale sharks), so costs are considered disproportionate to benefits.	No
Professional Judgement – Substitute				
Management of project vessel noise by varying the timing of the Petroleum Activities Program to avoid migration periods.	F: Yes. CS: increased costs and schedule impacts due to vessel availability constraints and potential for multiple campaigns required over a longer overall period.	Implementation of these controls will reduce potential impacts to migratory fauna from underwater noise. However, noise impacts from the activities are already considered minor.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Engineered Solution				
No additional controls identified.				

ALARP Statement

On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the potential impacts from project vessels, acoustic survey activities and helicopter operations noise emissions to be ALARP in their current risk state. 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 the generation of noise from project vessels, acoustic survey activities, cutting of pipeline, positioning transponders and helicopter operations may result in negligible impacts to species with no lasting effect. BIAs within the Operational Area include the flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. Relevant recovery plans and conservation advice have been 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 (**Section 6.10**).

The adopted controls are considered consistent with industry good practice and professional judgement. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	***Controls***	***Standards***	***Measurement Criteria***

EPO 3 No impacts to marine fauna from noise emissions with a consequence level greater than F[8] during the Petroleum Activities Program.	**C 13.1** Refer **Section 6.9.6**	**PS 13.1.1** Refer **Section 6.9.6**	**MC 13.1.1** Refer **Section 6.9.6**

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[8] Defined as ‘No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptor’.

6.8.4 Routine Discharges: Project Vessels

Context	
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**

Impacts Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Routine discharge of sewage, grey water and putrescible wastes to marine environment from project vessels		X			X		A	F	-	-	LCS PJ	Broadly Acceptable	EPO 4
Routine discharge of deck and bilge water to marine environment from project vessels		X			X		A	F	-	-			
Routine discharge of cooling water or brine to the marine environment from project vessels		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 m^3 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 some project vessels such as support vessels will have considerably less persons on board.
- Routine/periodic discharge of relatively small volumes of bilge water. Bilge tanks receive fluids from many parts of the project vessels. Bilge water can contain water, oil, detergents, solvents, chemicals, particles and other liquids, solids or chemicals.
- Variable water discharge from project vessel decks directly overboard or via deck drainage systems. Sources could include rainfall events and/or deck activities such as cleaning/wash-down of equipment/decks.
- Cooling water from machinery engines or mud cooling units and brine water produced during the desalination process of RO to produce potable water onboard the project vessels.

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 6.9.**

Impact Assessment
Potential Impacts to Water Quality and Marine Fauna
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 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. Additional 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 (routine and non-routine) 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. Routine and non-routine discharges are expected to be intermittent in nature for the duration of the Petroleum Activities Program. Therefore, cumulative impacts to water quality within the Operational Area are expected to be localised with no lasting effect. It is possible that marine fauna transiting the localised area may come into contact with these discharges (e.g. marine turtles, pygmy blue whales, whale sharks, as they traverse the Operational Area, **Section 4**). However, given the localised extent of cumulative impacts from multiple discharges within the Operational Area, significant impacts to marine fauna are not expected.
Summary of Potential Impacts to Environmental Value(s)
Given the adopted controls, it is considered that routine or non-routine discharges described will be limited to localised contamination not significant to environmental receptors, with no lasting effect. (i.e. Environment Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 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 likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.1**
Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class) which includes the following requirements:	F: Yes. CS: Minimal cost. Standard practice.	No reduction in likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.2**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class • a sewage treatment plant approved by AMSA or an issuing body • a sewage comminution and disinfection 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 project vessel is proceeding (more than four knots), to avoid discharges in environmentally sensitive areas.				
Where there is potential for loss of primary containment of oil and chemicals on the project vessel, deck drainage must be collected via a closed drainage system	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	Yes **C 4.3**
Marine Order 91 – Marine pollution prevention – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water before discharge: • Machinery space bilge/oily water shall have International Maritime Organisation (IMO) approved oil filtering equipment (oil/water separator) with an online monitoring device to measure OIW content to be less than 15 ppm before discharge. • IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capable of	F: Yes. CS: Minimal cost. Standard practice.	No reduction in likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.4**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
recirculating if 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. • If machinery space bilge discharges cannot meet the oil content standard of less than 15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore. • Valid International Oil Pollution Prevention (IOPP) Certificate.				
Good Practice				
No additional controls identified.				
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
Storage, transport and treatment/disposal onshore of sewage, greywater, putrescible and bilge wastes.	F: Not feasible. Would present additional safety and hygiene hazards resulting from the storage, loading and transport of the waste material. Distance of activity offshore also makes the implementation of this control not feasible. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Engineered Solution				
No additional controls 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, **Section 2.7.1**), Woodside considers the adopted controls appropriate to manage the impacts of planned (routine and non-routine) discharges from the project vessels. 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, routine and non-routine discharges from the project vessels may result in localised impacts with no lasting effect (<1 month) to water quality and species. BIAs within the Operational Area include flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and meet the requirements of Australian Marine Orders. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 4 No impact to water quality greater than a consequence level of F[9] from discharge of sewage, greywater, putrescible wastes, bilge and deck drainage to the marine environment during the Petroleum Activities Program.	**C 4.1** Marine Order 95 – Marine pollution prevention – garbage (as appropriate to vessel class) which requires putrescible waste and food scraps be passed through a macerator, so they are able to pass through a screen with no opening wider than 25 mm.	**PS 4.1** Project vessels compliant with Marine Order 95 – Marine pollution prevention – garbage.	**MC 4.1.1** Records demonstrate project vessels are compliant with Marine Order 95.
	C 4.2 Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class) which includes the following requirements: • a valid ISPP Certificate, as required by vessel class • a sewage treatment plant approved by AMSA or an issuing body • a sewage comminution and disinfection 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 support vessel is proceeding (more than four knots), to avoid	**PS 4.2** Project vessels compliant with Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class).	**MC 4.2.1** Records demonstrate project vessels are compliant with Marine Order 96 (as appropriate to vessel class).

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[9] Defined as ‘F - No lasting effect (less than one month). Localised impact not significant to areas or items of cultural significance)’.

	discharges in environmentally sensitive areas.		
	C 4.3 Where there is potential for loss of primary containment of oil and chemicals on the project vessel, deck drainage must be collected via a closed drainage system.	**PS 4.3** Contaminated drainage contained, treated and/or separated before discharge.	**MC 4.3.1** Records demonstrate project vessel has a functioning bilge/oily water management system that is compliant Engineering Standard.
	C 4.4 Marine Order 91 – Marine pollution prevention – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water before discharge: • Machinery space bilge/oily water shall have IMO approved oil filtering equipment (oil/water separator) with an online monitoring device to measure OIW content to be less than 15 ppm before discharge. • IMO approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capable of recirculating if 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. • If machinery space bilge discharges cannot meet the oil content standard of less than 15 ppm without dilution or be treated by an IMO approved oil/water separator, they will be contained on-board and disposed of onshore. • Valid IOPP Certificate.	**PS 4.4** Discharge of machinery space bilge/oily water meet oil content standard of less than 15 ppm without dilution.	**MC 4.4.1** Records demonstrate discharge specification met for project vessels.

6.8.5 Non-routine Discharges: Project Fluids and Swarf

Context	
Infrastructure removal activities – **Section 3.9**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**

Impacts Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Non-routine discharge of operational fluids from the EHU during removal activities		X		X	X		A	F	-	-	GP	Broadly Acceptable	EPO 5
Non-routine discharge of operational fluids from the Echo Yodel pipeline and associated infrastructure during removal activities		X		X	X		A	F	-	-			
Non-routine discharge of cleaning chemicals during marine growth removal activities.		X		X	X		A	F	-	-			
Non-routine discharge of plastic swarf during pipeline recovery		X		X	X		A	F	-	-			

Description of Source of Impact

During removal activities operational fluids contained in the EHU will be discharged to the marine environment. The EHU contains approximately 18 m^3 MEG and 21 m^3 hydraulic fluid. Discharge of the fluids within the EHU will occur gradually given the recovery of the EHU will be undertaken in sections with a gap between recovery of each section. As the EHU as-left condition is at ambient seabed pressure, during disconnection prior to recovery there will an initial release of fluids (MEG/HW443) until equilibrium pressure is reached. Once equilibrium is achieved, the remaining fluids will be gradually released. The full inventory of the fluids will be discharged to the water column from the ends of the EHU while each section is being recovered and either spooled onto reels or cut into sections on the back deck of the offshore support vessel.

During the removal activities operational fluids contained in the Echo Yodel pipeline will be discharged to the marine environment. The pipeline contains approximately 1515 m^3 of treated seawater with the ends capped. The seawater was treated with Hydrosure 0 3670R at 1000 ppm. Discharge of the fluids within the pipeline will occur gradually during recovery operations. As the pipeline as-left condition is at ambient seabed pressure, during disconnection prior to recovery there will an initial release of treated seawater until equilibrium pressure is reached. Once equilibrium is achieved, the remaining fluids will be gradually released. The full inventory of the fluids will be discharged to the water column from the pipeline while sections are being recovered. All recovery methods will result in the release of the fluids to the marine environment.

Swarf (also known as chips, turnings, filings, or shavings) are pieces of metal and plastic (from pipeline coatings) debris or waste generated from the cutting activities to support pipeline recovery. Subsea cut and recover is expected to generate the largest amount of swarf given the number of cuts required, with reverse reel lay and reverse s-lay generating smaller quantities. During the cut and recover method, a cutting tool (either large shearers or diamond wire saw) will be used to cut the pipeline into 11-12 m sections on the seabed. The sections will then be recovered to a vessel. Each cut will result in the release of coating particles from a 20 mm section of the plastic coatings (i.e. the width of the cut itself).

Release of larger fragments of pipeline coating during reverse reel lay or reverse s-lay pipeline recovery are not expected, however the risk of unplanned discharges from release of pipeline coating during recovery is assessed in **Section 6.9.5.**

Up to 10,000 L of cleaning chemicals such as citric acid may be used during the storage of the recovered pipeline and other infrastructure on board the vessel to manage odour from decaying marine growth that may not have been able to be completely removed during the physical cleaning process (**Section 3.9.1.5**). Some residual spray from the chemical application may enter the vessel drainage system and be discharged to sea.

Impact Assessment

Potential Impacts to Water Quality

Pelagic and benthic habitats in the Operational Area are considered to be of low sensitivity (no known significant benthic habitat or infauna habitat). Although the Ancient Coastline at 125 m Depth Contour KEF overlaps with the Operational Area, the values and sensitivities of this KEF occur on a broad scale outside of the Operational Area.

There is potential for protected species to occur within the area, in particular whale sharks and flatback turtles, which both have BIAs within the Operational Area. On the basis that the activities are of short duration, the majority of the discharges are localised and in deep water. Given the transient nature of species within the Operational Area, no impacts are expected to these species.

All chemicals that may be discharged to the marine environment were or will be selected and approved as per the Chemical Selection and Assessment Environment Guideline (**Section 3.13.1**). Therefore, any chemicals selected and potentially released are expected to be of low toxicity and biodegradable. Discharges from the pipeline and EHU will be staggered overtime given the recovery activities are planned to occur in different campaigns. Further, during recovery activities, the discharge of fluids will occur gradually. For the EHU fluids are expected to gradually be released over the ~50 days of recovery operations and for pipeline recovery, depending on the method, fluids will be released gradually over ~2-6 months. Therefore, the amount of fluids discharged will be taken over time and gradually, allowing for rapid dilution and dispersion.

Any swarf particles of plastic coating released during pipeline cutting are expected to float to the sea surface, where the relatively high levels of UV radiation will accelerate the breakdown of the material into smaller pieces. These microplastics are expected to be widely dispersed by ocean currents and will be available for ingestion by zooplankton and fishes. This process will occur over long timeframes and at a slow rate. Given the very small quantity of material released this could result in a negligible decline in water quality when compared to other inputs of microplastics in the region.

Given the quantities and type of non-routine planned discharges, the gradual discharge of fluids, low toxicity and high dispersion in the open, offshore environment, coupled with the low sensitivity of the receiving environment, any impacts on the marine environment are expected to be localised with no lasting effect.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that the routine and non-routine discharge of subsea fluids and swarf will not result in a potential impact greater than negligible impacts to water quality, ecosystems and species with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				

Good Practice				
Fluids and additives planned to be used and intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	F: Yes. CS: Minimal cost. Standard practice.	Environmental assessment of chemicals will reduce the consequence of impacts resulting from discharges to the marine environment, by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for the safe execution of activities and therefore no reduction in likelihood can occur.	Benefits outweigh cost/sacrifice.	Yes **C 5.1**
Chemical reviews will be performed on all previously approved chemicals to confirm potential chemical impacts are reduced to ALARP.	F: Yes. CS: Minimal cost. Standard practice.	Regular reviews will ensure chemicals selected for the activity remain ALARP.	Benefits outweigh cost/sacrifice.	Yes **C 5.2**
Activity will be conducted in a way that prevents fluids from being discharged to the marine environment	F: No, it is not technically possible to recover fluids prior to removal activities, nor is it technically possible to recover infrastructure without releasing fluids. CS: Not applicable	Preventing fluids from being discharged to the marine environment will avoid the impact.	Control is not technically feasible and therefore costs outweigh benefits.	No
Onshore disposal of operational fluids contained in the pipeline and EHU	F: Yes, will require a subsea installation flushing unit to be installed either on a vessel or on GWA to enable collection of fluids contained in the EHU and pipeline. Recovered fluids will need to be transported in suitable containers for onshore discharge. CS: Moderate.	Preventing fluids from being discharged to the marine environment will avoid the impact. However, given fluids contained within the EHU and pipeline are of low toxicity and biodegradable and the environment surrounding the infrastructure is considered low sensitivity, predicted impacts on the marine environment are expected to be localised with no lasting effect. Any reduction in impact achieved from this control is expected to be negligible.	Grossly disproportionate. Implementation of the control requires cost sacrifice for negligible environmental benefit. The cost/sacrifice outweighs the benefit gained.	No

Reduce recovery rate of pipeline and EHU to further reduce the release of operational fluids	F: Yes. CS: Moderate. Additional vessel time in field required as recovery rate is reduced.	Reducing the amount and concentration of fluids discharged to the marine environment over time will reduce the impact as it will allow the fluids to dilute and disperse. The EHU and pipeline will be recovered in separate campaigns thereby limiting the volume of discharges occurring in the operational area at one time. Further staggering of discharges during recovery operations, by reducing the recovery rate of the pipeline or EHU, is not required as the EHU and pipeline are at ambient seabed pressure so it is expected that during recovery, the fluid will release slowly over time. Further, the sensitivity of the receiving environment is considered low and therefore, any reduction in impact achieved from this control is expected to be negligible.	Grossly disproportionate. Implementation of the control requires cost sacrifice for minimal environmental benefit.	No
Collection of plastic swarf discharges by booms from a general support vessel	F: No. It is not technically feasible to recover swarf discharges with booms given the size of the particles and the rapidly dispersing nature of the ocean currents, particularly in the instance of the cut and recover method where swarf discharges will occur subsea. CS: Not applicable	Recovering swarf following cutting will avoid the discharge, however given the small quantity and rapid rate of dispersion any reduction in impact achieved from this control is expected to be negligible.	Control is not technically feasible and therefore costs outweigh benefits.	No
No chemicals will be used for the cleaning of marine growth	F: Yes. CS: Minimal cost.	Preventing fluids from being discharged to the marine environment will avoid the impact.	Odour from decaying marine growth present on the pipeline temporarily stored on the vessels for extended duration may present a safety risk for personnel. Costs outweigh benefits.	No
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				

Professional Judgement – Engineered Solution

No additional controls 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, **Section 2.7.1**), Woodside considers the adopted controls appropriate to manage the impacts of fluids, chemicals and swarf. 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, non-routine discharge of fluids, chemicals and swarf may result in negligible impact to water quality, ecosystems and species. The adopted controls are considered consistent with industry good practice. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	*Controls*	*Standards*	*Measurement Criteria*
EPO 5 No impact to water quality or marine biota greater than a consequence level of F[10] from discharging fluids during the Petroleum Activities Program.	**C 5.1** Fluids and additives planned to be used and intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	**PS 5.1** All chemicals (excluding legacy chemicals that may be present in the wellbore which have been assessed in **Section 6**) intended or likely to be discharged to the marine environment reduced to ALARP using the chemical assessment process.	**MC 5.1.1** Records demonstrate chemical selection, assessment and approval process selected chemicals is followed.
	C 5.2 Chemical reviews will be performed on all previously approved chemicals to confirm potential chemical impacts are reduced to ALARP.	**PS 5.2** Acceptability of previously approved chemicals are re-evaluated to ensure ALARP and alternatives are considered.	**MC 5.2.1** Records demonstrate chemical review performed.

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[10] Defined as 'No lasting effect (less than one month) or negligible. Localised impact not significant to areas or items of cultural significance)'.

6.8.6 Routine Atmospheric Emissions: Fuel Combustion and Incineration

Context	
Project vessels – **Section 3.10**	Physical environment – **Section 4.3**

Impacts Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Internal combustion engines and incinerators on project vessels			X				A	F	-	-	LCS PJ	Broadly Acceptable	EPO 6

Description of Source of Impact
Atmospheric emissions will be generated by the project vessels from internal combustion engines (including all equipment and generators, which may be diesel powered and/or LNG powered) and incineration activities (including onboard incinerators) during the Petroleum Activities Program. Emissions will include SO_2, NO_x, ozone depleting substances, CO_2, particulates and volatile organic compounds (VOCs).
Impact Assessment
Potential Impacts to Air Quality
Fuel combustion and incineration have the potential to result in localised, temporary reduction in air quality. Potential impacts include a localised reduction in air quality, generation of dark smoke and contribution to greenhouse gas emissions. Given the short duration and exposed location of the project vessels (which will lead to the rapid dispersion of the low volumes of atmospheric emissions), the potential impacts are expected to have no lasting effect, with no cumulative impacts when considered in the context of existing or future oil and gas operations in the region.
Summary of Potential Impacts to Environmental Value(s)
Given the adopted controls, it is considered that fuel combustion and incineration will not result in a potential impact greater than a temporary decrease in local air quality and/or water quality standards, with no lasting effect and no significant impact to environmental receptors (i.e. Environment Impact – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[11]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 97 – Marine pollution prevention – air pollution), which details requirements for:	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed may slightly reduce the	Control based on legislative requirements –	Yes **C 6.1**

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[11] Qualitative measure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[11]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
- International Air Pollution Prevention (IAPP) Certificate, required by vessel class - use of low sulphur fuel when available - Ship Energy Efficiency Management Plan, where required by vessel class - onboard incinerator to comply with Marine Order 97.		likelihood of air pollution.	must be adopted.	
Good Practice				
No additional controls identified				
Professional Judgement – Eliminate				
Do not combust fuel.	F: No. There are no project 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				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls 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, **Section 2.7.1**), Woodside considers the adopted controls are considered good oil-field practice/industry best practice, and appropriate to manage the impacts of fuel combustion and incineration. 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, routine atmospheric emissions from fuel combustion and incineration may result in localised impacts to air quality with no lasting effect (<1 month). The adopted controls are considered consistent with industry legislation, codes and standards and meet the requirements of Australian Marine Orders. Therefore, Woodside considers the adopted controls appropriate to manage the impact to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 6 Fuel combustion emissions during the Petroleum Activities Program are restricted to those necessary to perform the activity.	**C 6.1** Marine Order 97 (Marine pollution prevention – air pollution) which details requirements for: - IAPP Certificate, required by vessel class	**PS 6.1** Project vessels compliant with Marine Order 97 (Marine pollution prevention – air pollution) to restrict emissions to those necessary to perform the activity.	**MC 6.1.1** Marine Assurance inspection records demonstrate compliance with Marine Order 97.

	• use of low sulphur fuel when available • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator complies with Marine Order 97.	Vessel marine assurance process conducted before contracting vessels, to ensure suitability and compliance with vessel combustion certification/ Marine Order requirements.	

6.8.7 Routine Light Emissions: External Lighting on Project Vessels

Context	
Project vessels – **Section 3.10**	Physical environment – **Section 4.3**

Impacts Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
External light emissions onboard project vessels					X		A	F	-	-	GP PJ	Broadly Acceptable	EPO 7

Description of Source of Impact

Routine light emissions include light sources that alter the ambient light conditions in an environment. Project vessels 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. Project 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 project vessels that may be required for the Petroleum Activities Program are outlined in **Section 3.10**. External lighting is located on vessel decks, with most external lighting directed towards working areas such as the main decks. These areas are typically <20 m above sea level. Indicative timing for activities are provided in **Section 3.5** and may occur throughout the year.

Lighting from project 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 characteristics of vessel lighting (including height above sea level) and environmental conditions (e.g. cloud cover).

Impact Assessment

Potential Impacts to Protected Species

Receptors that have important habitat within a 20 km buffer 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 (Commonwealth of Australia, 2020).

Light emissions can affect fauna in two main ways:

1. *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 phase 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.
2. *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 act to override natural cues leading to disorientation.

The fauna within the Operational Area is predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, whales and migratory seabirds. There is no known critical habitat within the Operational Area for EPBC listed species, nor does the Operational Area overlap ‘habitat critical for the survival of the species' for marine turtles, although there is overlap with BIAs for flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding and foraging. Given the low abundance of fauna expected to occur within the Operational Area, impacts from light emissions are considered to be highly unlikely.

As described in **Table 4-4**, internesting buffer 'habitat critical for the survival of the species' for flatback, green, loggerhead and hawksbill turtles are located ~15 km, ~50, ~230 km and ~50 km, respectively, from the Operational Area. However, as outlined below, internesting adult female turtles are not impacted by artificial light emissions, and it is more relevant to consider separation distances between light sources and nesting habitat critical for turtles——the nesting locations as identified in Table 6 of the marine turtle Recovery Plan (Commonwealth of Australia, 2017).

At the closest point, the Operational Area is located:

- >68 km from the nearest nesting locations for green turtles on Montebello Island
- >250 km from the nearest nesting locations for loggerhead turtles on Muiron Islands
- >68 km from the nearest nesting locations for hawksbill turtles on Montebello Island
- >68 km from the nearest nesting locations for flatback turtles on Montebello Island.

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).

As described above, the nearest turtle nesting locations to the Operational Area are on Montebello Island (~ 68 km) and the risk of significant numbers of dispersing hatchlings becoming attracted to direct light or sky glow from project vessels is not considered credible. This is supported by the findings of a desktop lighting impact assessment for the Scarborough Project, conducted by Pendoley Environmental (PENV, 2020). At a range of >68 km, the density of dispersing hatchlings is expected to be low and very few individuals will be at risk of attraction. For any isolated individuals potentially attracted to light spill from project vessels/MODU, following sunrise, any effect of these light sources on hatchlings will be eliminated allowing dispersal behaviour to resume.

Any impacts to hatchling turtles from artificial light will be limited to possible short-term behavioural impacts to isolated individual hatchlings offshore, with no lasting effect to the species.

Marine Turtles – 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 project vessels are unlikely to result in displacement of, or behavioural changes to individuals in these life stages (PENV, 2020).

Artificial lighting may affect 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. As described in the "Marine Turtles - Hatchlings" section, the beaches on Montebello Island (~68 km from the Operational Area) are known turtle nesting locations, however, direct light from the project vessels will not be visible to nesting adult turtles. Furthermore, nesting females are not considered highly vulnerable to disorientation due to artificial light (PENV, 2020) and it is highly unlikely that the Petroleum Activities Program could cause disruption to sea-finding behaviour post nesting, particularly as the light source is located directly offshore in the same direction that females would be heading in anyway during normal sea-finding behaviour. 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.

The Operational Area overlaps internesting BIA for flatback turtles. Internesting flatback turtles favour depths of <25 m, and foraging flatback turtles have been found to occur in waters shallower than 140 m (Whittock *et al.*, 2016a and b). Therefore, it is considered unlikely that the deep, offshore waters at the outer extent of the BIA that overlap the Operational Area (water depths of 125m to 140 m) represent important internesting or foraging habitat. Although individual turtles migrating, mating or foraging may occur within or adjacent to the Operational Area, marine turtles do not use light cues to guide these behaviours. As such, light emissions from the project vessels are unlikely to result in more than localised behavioural disturbance to isolated transient individuals, with no lasting effect to the species.

Seabirds and Migratory Shorebirds

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 and migratory shorebirds; however, there is no emergent land that could be used for roosting or nesting habitat. The nearest shoreline is the Montebello Islands (>60 km from the Operational Area).

The most vulnerable life stages for seabirds and migratory shorebirds are nesting adults or fledglings. Nesting or fledgling seabirds and migratory shorebirds are vulnerable to artificial lighting within 20 km of the nesting location (Commonwealth of Australia, 2020). The Operational Area overlaps a foraging and breeding BIA for the wedge-tailed shearwater, and is approximately 68 km from Montebello Island, which is an important breeding site for this species. Adult shearwaters are vulnerable to artificial lighting during the breeding cycle, when returning to and leaving the nesting colony to maintain nesting sites or forage. Foraging wedge-tailed shearwaters may be attracted to sources of light emissions to feed on fish drawn to the light; however, the species feeds predominantly during the day (Catry *et al.*, 2009; Whittow 1997). Artificial light can also impact behaviour and adult nest attendance, or confuse shearwater species, resulting in injury or mortality as a result of birds colliding with structures (Cianchetti-Benedetti *et al.*, 2018; Rodriguez *et al.*, 2017). Shearwater fledglings are predominantly impacted by onshore lighting sources, which can override sea finding cues and attract fledglings further inland, preventing them from reaching the sea (Mitkus *et al.*, 2018; Telfer *et al.*, 1987).

Foraging adult wedge-tailed shearwaters may be attracted to sources of light emissions to feed on fish drawn to the light, or may be attracted to vessel light during periods of low visibility (Catry *et al.*, 2009; Whittow 1997). During the breeding period at the Muiron Islands off Exmouth Gulf (from around August to April, peak November), adult wedge-tailed shearwaters were observed taking a combination of short (1–4 days) or long (6–30 days) foraging trips from the Muiron Islands, travelling over large areas across the north west of Australia towards Indonesia (Cannell *et al.*, 2019). During the breeding period, foraging adult wedge-tailed shearwaters were observed travelling up to around 1,000 km from the breeding colony (Cannell *et al.*, 2019). Although the breeding and foraging BIA overlapping the Operational Area is defined as the area within around 70-80 km from the Montebello Islands, wedge-tailed shearwaters on the NWS have been observed foraging beyond the breeding and foraging BIA. Based on the large area where foraging is known to occur, the Operational Area does not represent a significant portion of the known foraging area for the wedge-tailed shearwaters. Therefore, impacts to wedge-tailed shearwaters are likely to be limited to short-term behavioural disturbance to isolated transient individuals. Artificial lighting from the Petroleum Activities Program is not expected to significantly impact foraging or displace seabird species from important foraging habitat.

Furthermore, as the Operational Area is more than 60 km from the nearest emergent land, artificial light from the Petroleum Activities Program is not predicted to disrupt critical breeding behaviours within important nesting habitat. Impacts to wedge-tailed shearwaters are therefore considered to be limited to negligible behavioural disturbance to isolated transient individuals, not significant to the population’s presence in important breeding and foraging habitat.

Other migratory shorebirds may be present in or fly through the region between July and December, and again between March and April as they complete migrations between Australia and offshore locations (Department of Environment, 2015). The risk associated with collision from seabirds and shorebirds attracted to the light is considered to be low, based on the intermittent and localised nature of the activities in the Operational Area, as well as the distance offshore. Impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, that is not expected to disrupt important migration patterns of migratory seabirds.

Other Marine Fauna

Lighting from ROV and project vessels during the Petroleum Activities Program may result in the localised aggregation of fish around the ROV and bottom of the project vessels. 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 marine fish are not expected to impact on any commercial fishers 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 and would only occur when the ROV is in use. Based on the short duration and localised nature of the Petroleum Activities Program, these aggregations are not expected to attract either pygmy blue whales or humpback whales. Transient individual whale sharks have been recorded feeding on these plankton aggregations, but lighting from ROV or project vessel activities is not expected to have any negative impacts on whale shark behaviour.

Summary of Potential Impacts to Environmental Value(s)

Light emissions from the project vessels will not result in an impact greater than localised and temporary disturbance to fauna in the vicinity of the Operational Area, with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Good Practice				
Where activities overlap a wedge-tailed shearwater BIA and will occur during the breeding period (August–April) the following measures will be implemented, consistent with the NLPG (2020): • extinguish outdoor/deck lights not necessary for safety and/or navigation at night • use available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • manage seabird landings appropriately and report interactions.	F: Yes, however a minimum level of lighting is required on the vessels for safety. CS: Minimal.	Negligible benefit in impact reduction for nesting adult seabirds or fledging seabirds as nearest potential nesting site is not predicted to be impacted by light. Potential for slight reduction in impact to individual foraging and migrating seabirds that may pass through the Operational Area, as identified in the NLPG.	Potential benefits outweigh the cost/sacrifice	Yes C 7.1
Professional Judgement – Eliminate				
Restrict the Petroleum Activities Program to daylight hours, eliminating the need for external work lights	F: No. Components of the Petroleum Activities Program cannot safely be completed within a 12-hour day shift. As such, the need for external lighting cannot safely be eliminated. CS: Not considered – control not feasible	Not considered – control not feasible	Not considered – control not feasible	No
Professional Judgement – Substitute				
Substitute external lighting with light sources designed to minimise impacts to seabirds, shorebirds and marine turtles: • use flashing/ intermittent lights instead of fixed beam • use motion sensors to turn lights on only when needed	F: Yes. Replacement of external lighting with lighting appropriate for turtles and seabirds is technically feasible, although is not considered to be practicable. CS: Significant cost sacrifice. The retrofitting of all external lighting on vessels would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory	Given the potential impacts to turtles, nesting seabirds and fledglings during this activity are insignificant, implementation of this control would not result in a reduction in consequence. Potential for minor reduction in impact to individual foraging seabirds that may transit the Operational	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit. The cost/sacrifice outweighs the benefit gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
- use luminaires with spectral content appropriate for the species present - avoid high intensity light of any colour	of the range of light types onboard vessels.	Area, as outlined in the NLPG.		
Vary the timing of the Petroleum Activities Program to avoid peak turtle internesting periods (December to January).	F: Yes. CS: Significant cost and schedule impacts due to delays in securing project vessels for specific timeframes.	The Operational Area has a minor overlap with the flatback turtle internesting BIA in an area not known to provide foraging habitat. Given the low potential for internesting turtles to be present within the Operational Area, the risk of potential impacts from project vessel light emissions on adult turtles is considered to be low.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit. The cost/sacrifice outweighs the benefit gained.	No
Vary the timing of the Petroleum Activities Program to avoid peak breeding and migration periods for seabirds and migratory shorebirds.	F: Yes. CS: Significant cost and schedule impacts due to delays in securing vessels for specific timeframes.	Breeding and migration periods of seabirds and migratory shorebirds that may occur within the Operational Area spans all seasons. Avoiding peak periods may be feasible and would potentially minimise the risk of impacts. However, considering the offshore location of the operational area away from any nesting areas, impacts have been assessed as minor and at worst limited to temporary behavioural disturbance to isolated individuals, that is not expected to disrupt important migration patterns of migratory seabirds.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Engineered Solution				
No additional controls 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, **Section 2.7.1**), Woodside considers the potential impacts from routine light emissions from the project vessels to be ALARP. This includes consideration of the intermittent nature of light emissions for the duration of the Petroleum Activities Program, and the requirements for external lighting for safe

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
operations. 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
Given the adopted controls, 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. BIAs within the Operational Area include the flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding and foraging BIA. 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 NLPG were taken into consideration during the impact evaluation. The Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice (**Section 6.10**). Therefore, Woodside considers standard operations appropriate to manage the impacts and risks of routine light emissions to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 7 No impacts to marine fauna from noise emissions with a consequence level greater than F[12] during the Petroleum Activities Program.	**C 7.1** Where activities overlap a wedge-tailed shearwater BIA and will occur during the breeding period (August–April) the following measures will be implemented, consistent with the NLPG (2020): • extinguish outdoor/deck lights not necessary for safety and/or navigation at night • use available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • manage seabird landings appropriately and report interactions.	**PS 7.1.1** Pre-mobilisation vessel inspections will identify vessel operational controls to minimise light to safety and/or navigation requirements.	**MC 7.1.1** Pre-mobilisation vessel inspection records include identification of vessel operational controls to minimise light to safety and/or navigation requirements.
		PS 7.1.2 Project vessels will use available block-out blinds on portholes and windows not necessary for safety and/or navigation when operating at night.	**MC 7.1.2** Project vessel contractor procedures include requirement to use available block-out blinds not necessary for safety and/or navigation when operating at night.
		PS 7.1.3 Record observed bird trappings and collisions and implement care and release steps recommended in the IAATO Guidelines to Minimize Seabirds Landing on Ships	**MC 7.1.3** Records demonstrate IAATO Guidelines implemented during trapping and collision incidents.

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[12] Defined as ‘No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptor’.

6.9 Unplanned Activities (Accidents, Incidents, Emergency Situations) for Removal Activities

6.9.1 Quantitative Spill Risk Assessment Methodology

Quantitative hydrocarbon spill modelling was undertaken by RPS, 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 OIW 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.

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 (**Sections 6.9.2** and **6.9.3**).

The characteristics of the hydrocarbons, used as the basis for the modelling studies to inform the assessment, are summarised in **Table 6-6**.

Table 6-6: Summary of hydrocarbon characteristics

Hydrocarbon Type	Density (g/cm³)	Viscosity (cP)	Component Boiling Point Percentage of Total				Aromatic (%) of whole oil <380°C (boiling point)
			Volatiles <180˚C	Semi-volatiles 180–265°C	Low volatility (%) 265–380°C	Residual (%) >380°C	
			Non-persistent			Persistent	
Marine diesel	0.829 at 25°C	4.00 at 25°C	6.0	34.6	54.4	5.0	3.0

6.9.1.1 Environment That May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling were used to assess the environmental consequence, if a credible hydrocarbon spill scenario occurred, in terms of delineating which areas of the marine environment could be exposed to hydrocarbon levels exceeding hydrocarbon threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the EMBA.

As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean transport mechanisms, the EMBA combines the potential spatial extent of the different fates. The EMBA also includes areas that are predicted to experience shoreline contact with hydrocarbons above threshold concentrations.

The EMBA covers a larger area than the area that is likely to be affected during any single spill event, as the model was run for a variety of weather and metocean conditions, and the EMBA represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelling runs. Furthermore, 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 presented for each fate. These EMBA together define the spatial extent for the existing environment, which is described in **Section 4**. Hydrocarbon contact below the defined thresholds may occur outside the EMBA and socio-cultural EMBA; however, the effects of these low exposure values will be limited to temporary exceedance of water quality triggers. The area within which this may occur in the event of a worst-case credible spill is presented in **Appendix D**: Figure 5-1.

The spill modelling outputs are presented as areas that meet threshold concentrations for surface, entrained and dissolved hydrocarbons for the modelled scenarios. Surface spill concentrations are expressed as grams per square metre (g/m^2), with entrained and dissolved aromatic hydrocarbon concentrations expressed as parts per billion (ppb). A conservative approach—adopting accepted contact thresholds that are documented to impact the marine environment—is used to define the EMBA.

Hydrocarbon thresholds are presented **Table 6-7** and described in the following subsections.

Woodside have commissioned numerous spill modelling projects across the NWS including for the *Greater Western Flank 3 and Lambert Deep Drilling and Subsea Installation EP,* November 2020, which included modelling a 1000 m^3 diesel spill in the vicinity of the Echo Yodel pipeline and EHU. In this instance this modelling was deemed appropriate to use to assess the risks of the worst case credible spill scenario for the Petroleum Activities Program because:

- the scenario is above the worst-case credible scenario from this Petroleum Activities Program
- the scenario is located within the Echo-Yodel Operational Area
- the model has comparable outputs
- the model has been done relatively recently and so uses the latest and same hydrodynamic assumptions and inputs

Table 6-7: Summary of environmental impact thresholds applied to the quantitative hydrocarbon spill risk modelling results

Hydrocarbon Type	Marine diesel	
	EMBA	Socio-cultural EMBA
Surface Hydrocarbon (g/m²)	10	1
Entrained hydrocarbon (ppb)	100	100
Dissolved aromatic hydrocarbon (ppb)	50	50
Accumulated hydrocarbons (g/m²)	100	10

Scientific Monitoring

A planning area for scientific monitoring is also described in **Section 5.7** of the Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). This planning area has been set 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 socioeconomic) 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.

6.9.2 Accidental Hydrocarbon Release: Vessel Collision

Context		
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4** Socio-economic – **Section 4.5** Values and sensitivities – **Section 4.6**	Stakeholder consultation – **Section 5**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Loss of hydrocarbons (diesel) to marine environment due to a vessel collision (e.g. between project vessels or other marine users)		X		X	X	X	A	D	1	M	LCS GP PJ	Broadly Acceptable	EPO 8

Description of Source of Risk

Background

The temporary presence of the project vessels in the Operational Area will result in a navigational hazard for commercial shipping within the immediate area. This navigational hazard could result in a third party vessel colliding with the project vessels which could result in a loss of containment from the vessel fuel tank.

Section 3.10 provides details of the project vessels expected to be used during the Petroleum Activities Program. As described below, a collision between the specialised pipe removal vessel/offshore support vessel and a third party was considered credible. The maximum volume of diesel to be lost in this scenario is assumed to be 1000 m^3 which corresponds to full loss of the largest single tank inventory of any of the project vessels expected to be used during the Petroleum Activities Program. Further justification for this spill scenario being credible is provided below.

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 2011–12 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 support vessel off Barrow Island. Two other vessel collisions occurred in 2010, one in the port of Dampier, where a 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 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 a 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. The scenarios considered damage to single and multiple fuel storage tanks in the specialised pipe removal vessel/offshore support vessel due to dropped objects and various combinations of vessel-to-vessel collisions.

A collision between the specialised pipe removal vessel/offshore support vessel and a third party was considered credible, although unlikely given the slow speeds of project vessels when relocating within the Operational Area. The maximum volume to be assumed in the assessment is therefore 1000 m^3 of marine diesel, which corresponds to rupture of the largest single tank inventory of a project vessel.

Quantitative Hydrocarbon Risk Assessment

Modelling was performed by RPS, on behalf of Woodside, to determine the fate of marine diesel released from a collision. While specific modelling was not conducted for the Petroleum Activities Program, as described above, modelling from a nearby development considered representative of a vessel collision associated with the Petroleum Activities Program. This model comprised a 1000 m^3 volume located within the vicinity of the Operational Area.

Woodside considered commissioning bespoke modelling for this Petroleum Activities Program and it was determined that the outputs would not provide a significantly different understanding of the consequences of a diesel spill. In addition, the predictions of extent, severity, and duration of diesel released are also within the assumptions and case made in Reference Case 2018:1003 – Consequence analysis of an accidental release of diesel (NERA, 2018).

The model shows that:

- spreading and weathering of the surface oil occurs rapidly due to the loss of light, volatile components and the spreading will reduce the effectiveness and available surface area for containment and recovery and surface dispersant operations, as shown in **Figure 6-1**
- response operations cannot be implemented if the safety of response personnel cannot be guaranteed. Safety circumstances that limit the execution of this control measure include volatile concentrations of hydrocarbons in the atmosphere, high winds (>20 knots), waves and/or sea states (>1.5 m waves) and high ambient temperatures.

Hydrocarbon Characteristics

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 35% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 54% should evaporate over several days (265°C < boiling point < 380°C). About 5% of the oil is shown to be persistent. The aromatic content of the oil is about 3%.

The mass balance forecast for the constant-wind case for marine diesel shows that about 41% of the oil is predicted to evaporate within 24 hours. Under these calm conditions the majority of the remaining oil on the water surface weathers at a slower rate due to comprising the longer-chain compounds with higher boiling points. Evaporation of the residual compounds slows significantly, and is then subject to more gradual decay through biological and photochemical processes.

Under the more realistic variable-wind case **Figure 6-1**, where the winds are of greater strength, entrainment of marine diesel into the water column is indicated to be significant. About 24 hours after the spill, around 72% of the oil mass is forecast to have entrained and a further 24% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<1%). The residual compounds tend to remain entrained beneath the surface under conditions that generate wind waves (about >6 m/s).

The increased level of entrainment in the variable-wind case results in a higher percentage of biological and photochemical degradation, where the decay of the floating slicks and oil droplets in the water column occurs at an approximate rate of 2.4% per day with an accumulated total of ~16% after seven days, in comparison to a rate of ~0.2% per day and an accumulated total of 1.3% after seven days in the constant-wind case. Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons decay and/or evaporate over time scales of several weeks to a few months. This long weathering duration extends the area of potential effect.

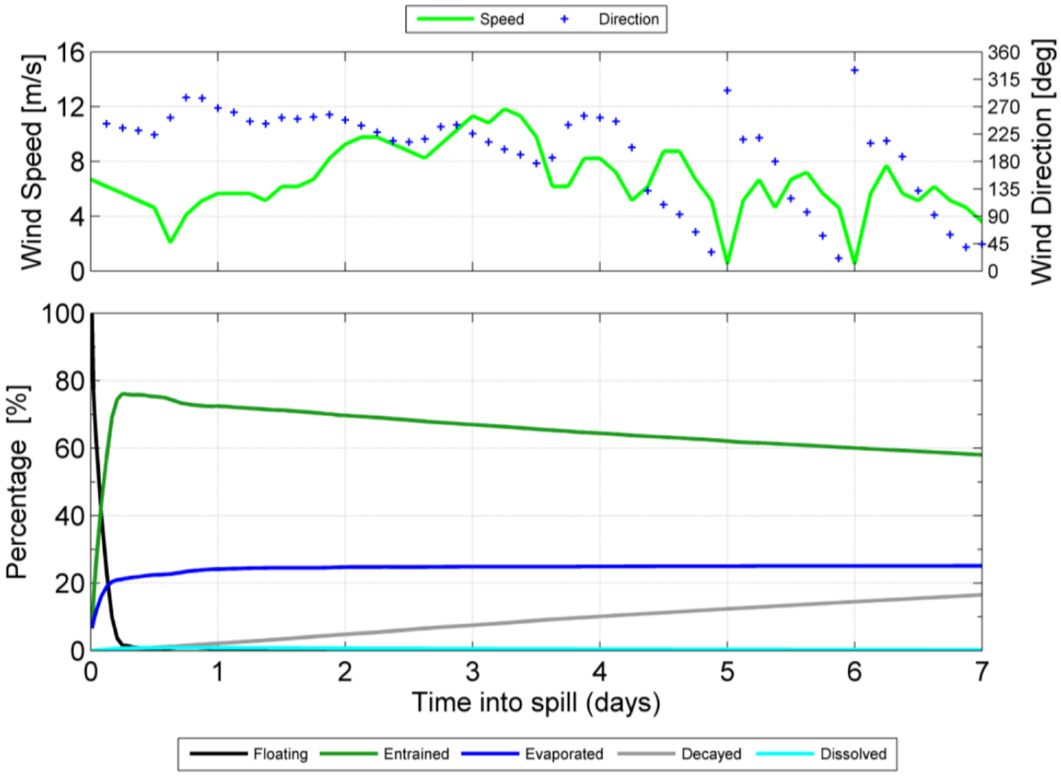

Figure 6-1: Proportional mass balance plot representing the weathering of marine diesel spilled onto the water surface as a one-off release (50 m3 over one hour) and subject to variable wind at 27°C water temperature and 25°C air temperature.

Impact Assessment

Potential Consequence 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. The EMBA therefore covers a larger area than the area that would be affected during any one single spill event, and therefore represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelling runs. The trajectory of a single spill would have a considerably smaller footprint.

As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is discussed for each fate.

Surface Hydrocarbons

Modelling for floating hydrocarbons indicate that concentrations equal to or greater than the 1 g/m^2 and 10 g/m^2 thresholds could potentially be found, in the form of slicks, up to 67 km and 54 km from the spill site, respectively. Floating hydrocarbons at concentrations equal to or greater than 1 g/m^2 are not forecast to contact any of the assessed shoreline receptors (**Table 6-8**).

Entrained Hydrocarbons

Entrained oil at concentrations equal to or greater than the 100ppb threshold is predicted to be found up to around 619 km from the spill site. Contact by entrained hydrocarbons at concentrations equal to or greater than 100 ppb is predicted at Montebello AMP (20%) as well as a few other sensitive receptors with probabilities of 5% or less (**Table 6-8**). The maximum entrained oil concentration forecast for any receptor is predicted to be 6,252 ppb at Montebello AMP.

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb threshold are predicted to be localised to around 182 km from the spill site. Contact by dissolved hydrocarbons at concentrations equal to or greater than 50 ppb is predicted at Montebello AMP (2%) as well as a few other sensitive receptors with probabilities of 1% (**Table 6-8**). The maximum dissolved oil concentration forecast for any receptor is predicted to be 169 ppb at Montebello AMP.

Accumulated Hydrocarbons No receptors are predicted to be contacted by shoreline hydrocarbons at concentrations equal to or greater than 100 g/m^2.
Summary of Potential Impacts
Table 6-8 presents contact with receptors within the full extent of the EMBA and socio-cultural EMBA; i.e. the sensitive receptors and their locations that may be exposed to condensate (surface, entrained, dissolved and accumulated) at or above the set threshold concentrations in the highly unlikely event of a diesel spill during the Petroleum Activities Program. Details of these receptors are outlined in **Section 4**. The potential biological and ecological impacts of an unplanned diesel release as a result of a vessel collision during the Petroleum Activities Program are presented in the next sections.

Table 6-8: Environment that May Be Affected – Key receptor locations and sensitivities with the summary hydrocarbon spill contact for an instantaneous release of marine diesel

Environmental Setting	Location/Name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure (WM0000PG10055394))																													Hydrocarbon contact and fate of those receptors ≥1% probability				
		Physical		*Biological*																					*Socioeconomic and Cultural*										
		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*	*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 & Gas Infrastructure (topside and subsea)*	*Surface hydrocarbon (≥1 g/m²)*	*Surface hydrocarbon (≥10 g/m²)*	*Entrained hydrocarbon (≥100 ppb)*	*Dissolved aromatic hydrocarbon (≥50 ppb)*	*Accumulated/Shoreline hydrocarbon (≥100 g/m²)*
Submerged Features	Rankin Bank	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓			1		2	1	
Offshore	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				20	2	
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			4		
	Argo-Rowley Terrace AMP	✓						✓							✓	✓			✓			✓	✓	✓		✓			✓				4		
	Muiron Islands MMA-WHA and islands	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓				4		
	Ningaloo Coast (Middlle WHA, North, North WHA, RUZ)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				1-2		
	Montebello Islands (including State marine park)	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				2	1	
	Pilbara Islands (southern islands group)	✓	✓		✓		✓		✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓				5		

Oceanic Reefs	Rowley Shoals – Imperieuse Reef State marine park	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓							1		

Summary of Potential Impacts to Protected Species	
Setting	***Receptor Group***
Offshore, Oceanic Reefs and Islands	***Cetaceans*** Cetaceans 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 (Deepwater Horizon 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 (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016). In a review of cetacean observations in relation to large-scale hydrocarbon spills, it was concluded that exposure to oil from the *Deepwater Horizon* resulted in increased mortality to cetaceans in the Gulf of Mexico (Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016), and long-term population level impacts to killer whales have been linked to the *Exxon Valdez* tanker spill (Matkin *et al.*, 2008). Geraci (1988) also identified behavioural disturbance (i.e. avoiding spilled hydrocarbons) observed in some instances for several species of cetacean, which suggests cetaceans can 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 *Deepwater Horizon* spill, cetaceans were routinely seen swimming in surface slicks offshore (and nearshore) (Aichinger Dias *et al.*, 2017). A range of cetaceans were identified as potentially occurring within the Operational Area and EMBA. In the event of a vessel collision causing a marine diesel spill, surface, entrained and dissolved hydrocarbons exceeding environmental impact threshold concentrations may drift across habitat for oceanic cetacean species. Cetacean that are resident within the EMBA may be susceptible to impacts from spilled hydrocarbons if they interact with an area affected by a spill. Such species are more likely to occupy coastal waters (refer to the Mainland and Islands section below for additional information). Suitable habitat for oceanic toothed whales (e.g. sperm whales) and dolphins (e.g. dusky dolphin and Indo-Pacific humpback dolphin) is broadly distributed throughout the region, and as such, impacts are unlikely to affect an entire population. Other species identified in **Section 4.4.2** may also have possible transient interactions with the EMBA. Physical contact of these species to hydrocarbons may have biological consequences; however, it is unlikely to affect an entire population and not predicted to impact the overall population viability. Given the nature of the hydrocarbon, it is expected to weather rapidly and remain entrained in the water column; cetaceans that may interact with spilled hydrocarbons are most likely to be subject to physical impacts. As cetaceans maintain thick skin and blubber, external exposure to hydrocarbons may result in irritation to skin and eyes. Entrained hydrocarbons may also be ingested, particularly by baleen whales which feed by filtering large volumes of water. Fresh hydrocarbons (i.e. typically in the vicinity of the release location) may have a higher potential to cause toxic effects when ingested, while weathered hydrocarbons are considered to be less likely to result in toxic effects.
	Marine Turtles Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (NOAA, 2010). Contact with entrained (or floating) hydrocarbon can 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, 2019). Given the modelling results indicated concentrations of floating hydrocarbons are not expected to exceed impact thresholds except immediately surrounding the offshore waters around the spill location, the potential for contact with this hydrocarbon phase is very low. 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 vapour which is 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 (Gagnon and Rawson, 2010), causing irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection (Gagnon and Rawson, 2010). Given the hydrocarbon is expected to weather rapidly when released to the environment, relatively fresh entrained hydrocarbons (which are typically relatively close to the release location) are considered to have the greatest potential for impact.

	Marine turtles may be present nesting within the EMBA as identified in **Section 4.4.2**. The Petroleum Activities Program will also coincide with nesting season for various marine turtle species within the EMBA. In the event of a diesel spill, there is potential that surface, entrained and dissolved hydrocarbons exceeding environmental impact threshold concentrations will be present in offshore waters. Therefore, a hydrocarbon spill may disrupt individuals, but is unlikely to reduce overall population viability.
	Seasnakes Impacts to seasnakes from direct contact with hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles and may include potential damage to the dermis and irritation to mucus membranes of the eyes, nose and throat (International Tanker Owners Pollution Federation [ITOPF], 2011). They may also be impacted when they return to the surface to breathe and inhale the toxic vapours associated with the hydrocarbons, resulting in damage to their respiratory system. In general, seasnakes frequent the waters of the continental shelf area around offshore islands and potentially submerged shoals. It is acknowledged that seasnakes may be present in the EMBA, particularly in waters less than 100 m deep including near submerged shoals; however, their abundance is not expected to be high in the deep water and offshore environment. Therefore, a hydrocarbon spill may have a minor disruption to individuals, but there is not considered to be a threat to overall population viability
	Sharks and Rays Hydrocarbon contact may affect whale sharks through ingestion (entrained/dissolved hydrocarbons), particularly if feeding. Whale sharks may transit offshore open waters when migrating to and from Ningaloo Reef, where they aggregate for feeding from March to July. A whale shark foraging BIA overlaps the EMBA. Whale sharks are versatile feeders, filtering large amounts of water over their gills, catching planktonic and nektonic organisms (Jarman and Wilson, 2004). Therefore, individual whale sharks that have direct contact with hydrocarbons within the spill affected area may be impacted. 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). As gill breathing organisms, sharks and rays may be vulnerable to toxic effects of dissolved hydrocarbons (entering the body via the gills) and entrained hydrocarbons (coating of the gills inhibiting gas exchange). 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. There are no BIAs for shark and ray species within the EMBA.
	Seabirds and Migratory Shorebirds Seabirds and migratory birds are particularly vulnerable to contact with floating hydrocarbons, which may mat feathers. This may lead to hypothermia from loss of insulation and ingestion of hydrocarbons when preening to remove hydrocarbons; both impacts may result in mortality (Hassan and Javed, 2011). The credible diesel spill scenario results in highly localised floating hydrocarbons above impact thresholds only around the release location (up to 54 km). Hence, considering the distance to any emergent features, the potential for seabird exposure to floating hydrocarbons is considered to be low. Migratory shorebirds are unlikely to interact with spilled hydrocarbons as there would be no accumulation on shorelines above impact thresholds. Offshore waters are potential foraging grounds for seabirds associated with the coastal roosting and nesting habitat. The wedge-tailed shearwater BIA overlaps with the EMBA, as provided in **Section 4.4.2.3**. However, given the relatively low likelihood of encounters between seabirds and floating hydrocarbons, impacts to seabirds in offshore waters are expected to consist of ecosystem-scale effects, such as reduced prey abundance. Impacts from a diesel spill to prey such as small pelagic fish (prey for the birds) are not expected to be significant; hence, subsequent impacts to a significant portion of seabirds are not expected. A hydrocarbon spill is unlikely to result in the disruption of a significant portion of the foraging habitat for seabirds.
Submerged Shoals	***Marine Turtles*** There is the potential for marine turtles to be present at submerged shoals such as Rankin Bank. These shoals may be contacted by dissolved and entrained hydrocarbons above impact thresholds. However, it is noted that entrained hydrocarbons reaching these shoals will be highly weathered, with the volatile and water soluble (often the most toxic) components expected to have dissipated. These shoals and banks may, at times, be a foraging habitat for marine turtles, given the coral and filter

	feeding biota associated with these areas. However, these areas are not known foraging locations and satellite tracking of individual green turtles in the nearshore environment of the NWS did not indicate any overlap of the tracked post-nesting migratory routes and the Operational Area. It is, however, acknowledged that individual marine turtles may be present at these shoals and surrounding areas. However, given the predicted minimum time to contact and the volatile and non-persistent nature of the hydrocarbons, a hydrocarbon spill is expected to result in sub-lethal effects with potential minor impacts to individuals.
	Seasnakes There is the potential for seasnakes to be present at submerged shoals such as Rankin Bank and within the shallower waters of the EMBA for entrained hydrocarbons. The potential impacts of exposure are as discussed previously in Offshore – Seasnakes. A hydrocarbon spill may have a minor disruption to individuals but there is no threat to overall population viability
	Sharks and Rays There is the potential for resident shark and ray populations to be impacted directly from hydrocarbon contact or indirectly through contaminated prey or loss of habitat. Sharks and rays present at reefs within the EMBA (e.g. Rankin Bank) may be exposed to fresh, unweathered hydrocarbons, which may have greater potential for toxic impacts. Any direct impacts are expected to be sub-lethal; however, no impacts at the population level. Pelagic sharks and rays are expected to move away from areas affected by spilled hydrocarbons. Impacts to such species are expected to be limited to behavioural responses/displacement. Shark and ray species that have associations with submerged shoals and oceanic atolls may not move in response to such habitat being contacted by spilled hydrocarbons. Such species may be more susceptible to a reduction in habitat quality resulting from a hydrocarbon spill.
	Cetaceans, Pinnipeds and Dugongs In addition to a number of whale species that may occur in nearshore waters (such as spotted bottlenose dolphins and Indo-Pacific humpback dolphins), coastal populations of small cetaceans, dugongs are known to reside or frequent nearshore waters, including the Montebello/Barrow/Lowendal Islands, which may be potentially impacted by entrained hydrocarbons exceeding threshold concentrations in the event of a vessel collision Nearshore populations of cetaceans, dugongs are known to exhibit site fidelity and are often resident populations. Therefore, avoidance behaviour may have greater impacts to population functioning. Nearshore dolphin species (e.g. spotted bottlenose dolphins) may exhibit higher site fidelity than oceanic species, although Geraci (1988) observed relatively little impacts beyond behavioural disturbance. Additional potential environment impacts may also include the potential for dugongs to ingest hydrocarbons when feeding on oiled seagrass stands or indirect impacts to dugongs due to loss of this food source due to dieback in worse affected areas. In the event of a diesel spill, there is potential that surface, entrained and dissolved hydrocarbons exceeding environmental impact threshold concentrations will be present in offshore waters. Therefore, a hydrocarbon spill may disrupt individuals, but is unlikely to reduce overall population viability.
Summary of Potential Impacts to Other Species	
Setting	***Receptor Group***
All Settings	***Pelagic and Demersal Fish*** Fish mortalities are rarely observed to occur as a result of hydrocarbon spills (ITOPF, 2011). This has generally been attributed to the possibility that pelagic fish are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the affected areas. Fish that have been exposed to dissolved aromatic hydrocarbons are able to eliminate the toxicants once placed in clean water; hence, individuals exposed to a spill are likely to recover (King *et al.*, 1996). Where fish mortalities have been recorded, the spills (resulting from the groundings of the tankers *Amoco Cadiz* in 1978) have occurred in sheltered bays. Laboratory studies have shown that adult fish can detect hydrocarbons in water at very low concentrations, and large numbers of dead fish have rarely been reported after oil spills (Hjermann *et al.*, 2007). This suggests juvenile and adult fish can avoid water contaminated with high concentrations of hydrocarbons. However, sub-lethal impacts to adult and juvenile fish may be possible, given long-term exposure (days to weeks) to PAH concentrations (Hjermann *et al.*, 2007). While modelling of the diesel spill indicates the potential EMBA for dissolved hydrocarbons is extensive, no time-integrated exposure metrics were modelled; given the oceanographic environment

	within the wider EMBA, PAH exposures in the order of weeks for pelagic fish are not considered credible. The effects of exposure to oil on the metabolism of fish appears to vary according to the organs involved, exposure concentrations and route of exposure (waterborne or food intake). Oil reduces the aerobic capacity of fish exposed to aromatics in the water and, to a lesser extent, affects fish consuming contaminated food (Cohen *et al.*, 2005). The liver, a major detoxification organ, appears to be the organ where anaerobic activity is most impacted, probably increasing anaerobic activity to facilitate the elimination of ingested oil from the fish (Cohen *et al.*, 2005). Fish are perhaps most susceptible to the effects of spilled oil in their early life stages, particularly during egg and planktonic larval stages, which can become entrained in spilled oil. Contact with oil droplets can mechanically damage feeding and breathing apparatus of embryos and larvae (Fodrie and Heck, 2011). The toxic hydrocarbons in water can result in genetic damage, physical deformities and altered developmental timing for larvae and eggs exposed to even low concentrations over prolonged timeframes (days to weeks) (Fodrie and Heck, 2011). More subtle, chronic effects on the life history of fish as a result of exposure of early life stages to hydrocarbons include disruption to complex behaviour, such as predator avoidance, reproductive and social behaviour (Hjermann *et al.*, 2007). Prolonged exposure of eggs and larvae to weathered concentrations of hydrocarbons in water has also been shown to cause immunosuppression and allows expression of viral diseases (Hjermann *et al.*, 2007). PAHs have also been linked to increased mortality and stunted growth rates of early life history (presettlement) of reef fishes, as well as behavioural impacts that may increase predation of post settlement larvae (Johansen *et al.*, 2017). However, the effect of a hydrocarbon spill on a population of fish in an area with fish larvae and/or eggs, and the extent to which any of the adverse impacts may occur, depends greatly on prevailing oceanographic and ecological conditions at the time of the spill and its contact with fish eggs or larvae. Demersal fish species are associated with a number of KEFs and AMPs within the EMBA including, the Ancient Coastline at 125 m Depth Contour KEF which provides habitat for demersal fish species. Coral reefs throughout the EMBA such as Rankin Bank (about 12 km from the Operational Area) and others further away (Ningaloo coast, Montebello AMP and islands, Gascoyne AMP, Argo-Rowley Terrace AMP, Rowley Shoals – Imperieuse Reef State MP and Pilbara Islands) also host a diverse demersal fish assemblage. Fish associated with these features may be exposed to dissolved and entrained hydrocarbons above impact thresholds.
Summary of Potential Impacts to Marine Primary Producers	
Setting	***Receptor Group***
Submerged Shoals, Oceanic Reef and Offshore Islands.	The waters overlying oceanic and other submerged reefs within the EMBA, such as those along the Ningaloo coast, Montebello AMP and islands, Gascoyne AMP, Argo-Rowley Terrace AMP, Rowley Shoals – Imperieuse Reef State MP, Rankin Bank and Pilbara Islands , have the potential to be exposed to entrained and dissolved hydrocarbons above threshold concentrations. These permanently submerged habitats represent sensitive open water benthic community receptors. For some of the deeper reefs, such as Rankin Bank, it is likely the potential for biological impact is significantly reduced when compared to the upper water column layers. However, potential biological impacts could include sub-lethal stress and, in some instances, total or partial mortality of sensitive benthic organisms such as corals, and the early life stages of resident fish and invertebrate species, particularly in shallower systems. ***Filter Feeders*** Hydrocarbon exposure to offshore filter-feeding communities (e.g. communities within the Montebello AMP where depths range between 15 m and 150 m) may occur depending on the depth of the entrained/dissolved hydrocarbons. Exposure to entrained hydrocarbons/dissolved aromatic hydrocarbons (≥100 ppb and 50 ppb respectively) has potential to result in lethal or sub-lethal toxic effects. Sub-lethal impacts, including mucus production and polyp retraction, have been recorded for gorgonians exposed to hydrocarbon (White *et al.*, 2012). Any impacts may result in localised long-term effects to community structure and habitat.
Summary of Potential Impacts to Other Habitats and Communities	
Setting	***Receptor Group***
Offshore	***Benthic Fauna Communities*** Due to the hydrocarbon spill scenario being a surface release low sensitivity benthic communities associated with the unconsolidated, soft sediment habitat and any epifauna (filter feeders) within the EMBA are not expected to be exposed to released hydrocarbons. However, areas of the EMBA with hard substrate may be impacted.

	Open Water – Productivity/Upwelling Primary production by plankton (supported by sporadic upwelling events in the offshore waters of the NWS) is an important component of the primary marine food web. Planktonic communities are generally mixed, including phytoplankton (cyanobacteria and other microalgae) and secondary consuming zooplankton, such as crustaceans (e.g. copepods), and the eggs and larvae of fish and invertebrates (meroplankton). Exposure to hydrocarbons in the water column can result in changes in species composition, with declines or increases in one or more species or taxonomic groups (Batten *et al.*, 1998). Phytoplankton may also experience decreased rates of photosynthesis (Tomajka, 1985). For zooplankton, direct effects of contamination may include toxicity, suffocation, changes in behaviour, or environmental changes that make them more susceptible to predation. Impacts on plankton communities are likely to occur in areas where entrained or dissolved aromatic hydrocarbon threshold concentrations are exceeded, but communities are expected to recover relatively quickly (within weeks or months). This is due to high population turnover, with copious production within short generation times, that also buffers the potential for long-term (i.e. years) population declines (ITOPF, 2011). The EMBA does not contain significant areas of upwelling. Any impacts on exposed planktonic communities present in the EMBA are likely to be short-term.
Key Ecological Features	***KEFs*** KEFs located within the EMBA include: • Continental Slope Demersal Fish Communities • Ancient Coastline at the 125 m depth Contour • Canyons Linking the Cuvier Abyssal Plain and the cape Range Peninsula • Glomar Shoals • Exmouth Plateau • Mermaid Reef and Commonwealth waters surrounding Rowley Shoals • Commonwealth Waters adjacent to Ningaloo Reef Although these KEFs are primarily defined by seabed geomorphological features, they are described to identify the potential for increased biological productivity and, therefore, ecological significance. The consequences of a diesel spill may impact the values of the KEFs affected (for the values of each KEF, see **Section 4.6.3**). Potential impacts include the contamination of sediments, impacts to benthic fauna/habitats and associated impacts to demersal fish populations, and reduced biodiversity as described above and below. Most of the KEFs within the EMBA have relatively broad-scale distributions and are unlikely to be significantly impacted.
Summary of Potential Impacts to Water Quality	
Setting	***Aspect***
Offshore	***Open Water – 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 entrained and dissolved hydrocarbon fates and their predicted extent. 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.
Submerged Shoals	***Open Water – Water Quality*** Water quality would be reduced due to hydrocarbon contamination that is predicted to be at or above biological effect concentrations for the surrounding marine waters over the Montebello AMP, which have the potential to be exposed to entrained hydrocarbons at or greater than 100 ppb. Entrained hydrocarbons reaching Rankin Bank and other receivers further away from the spill location (e.g. Ningaloo coast, Gascoyne AMP, Argo-Rowley Terrace AMP, Rowley Shoals – Imperieuse Reef State MP and Pilbara Islands) will be highly weathered, with the volatile and water soluble (often the most toxic) components expected to have dissipated. The waters surrounding these submerged habitats would show a reduction in quality due to hydrocarbon contamination above background and/or national/international quality standards.
Summary of Potential Impacts to Marine Sediment Quality	
Setting	***Receptor Group***
Offshore	***Marine Sediment Quality*** Given the credible spill scenario is a surface spill it is unlikely there will be significant impact to marine sediment quality.

<table>
<tr><td>Submerged Shoals</td><td><i>Marine Sediment Quality</i>
There is potential for the reduction of marine sediment quality due to contact and adherence of entrained hydrocarbons with seabed sediments of submerged shoals, such as Rankin Bank. If this was to occur, marine sediment quality would be reduced (contamination above national/international quality standards) as a consequence of hydrocarbon contamination for a small area within the immediate release site for a long to medium term. However, given the nature of the hydrocarbon, contact with submerged shoals is considered unlikely.</td></tr>
<tr><td colspan="2"><i>Summary of Potential Impacts to Air Quality</i></td></tr>
<tr><td colspan="2">A hydrocarbon release during a vessel collision has the potential to result in localised, temporary reduction in air quality. Potential impacts are expected to be a slight and temporary localised effect to ecosystems, species and/or habitats in the area.
There is potential for human health effects on workers in the immediate vicinity of atmospheric emissions. The ambient concentrations of methane and volatile organic carbons released from diffuse sources is difficult to accurately quantify, although their behaviour and fate is predictable in open offshore environments as they are dispersed rapidly by meteorological factors such as wind and temperature. Methane and VOC emissions from a hydrocarbon release in such environments are rapidly degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals.
Due to the unlikely occurrence of a vessel collision, the temporary nature of any methane or VOC emissions (from weathering of liquid hydrocarbons from a diesel spill), the predicted behaviour and fate of methane and VOCs in open offshore environments, and the significant distance from the Operational Area to the nearest shore (68 km from Montebello Islands), the potential impacts are expected to be minor and temporary.</td></tr>
<tr><td colspan="2"><i>Summary of Potential Impacts to Protected Areas</i></td></tr>
<tr><td colspan="2">The quantitative spill risk assessment results indicate that the open water environment protected within the EMBA may be affected by the released hydrocarbons. In most cases, the hydrocarbons that are predicted to reach these protected areas will be in an advanced state of weathering and at concentrations typically associated with lethal and sub-lethal impacts to only the most sensitive marine organisms. Conservation values for WHAs, AMPs and other nearby State MP and reserves located within the EMBA are provided in Section 4.
Impact on the protected areas is discussed in the sections above for the ecological values and sensitivities and below for socio-economic 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 biologically diverse environments.</td></tr>
<tr><td colspan="2"><i>Summary of Potential Impacts to Socio-economic Values</i></td></tr>
<tr><td><i>Setting</i></td><td><i>Receptor Group</i></td></tr>
<tr><td>Offshore</td><td><i>Fisheries – Commercial</i>
The spill scenario that has been modelled is unlikely to cause significant direct impacts on the target species of Commonwealth and offshore State fisheries within the defined EMBA.
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 depends on 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 <i>et al.</i>, 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 <i>et al.</i>, 2002).
A major spill would result in the temporary prohibition on fishing activities for a period of time and subsequent potential for economic impacts to affected commercial fishing operators. Additionally, hydrocarbons can foul fishing equipment such as traps and trawl nets, requiring cleaning or replacement. Of Commonwealth and State fisheries identified within the EMBA, most have either had no or limited fishing effort concentrated within the Operational Area.</td></tr>
</table>

	Offshore Oil and Gas Infrastructure In the highly unlikely event of a major spill, surface hydrocarbons may affect production from existing petroleum facilities (platforms and FPSOs). For example, facility water intakes for cooling and fire hydrants could be shut off, which could in turn lead to the temporary cessation of production activities. Spill exclusion zones established to manage the spill could also prohibit activity support vessel access as well as tankers approaching facilities on the NWS. The impact on ongoing operations of regional production facilities would be determined by the nature and scale of the spill and metocean conditions. Furthermore, decisions about the operation of production facilities in the event of a spill would be based primarily on health and safety considerations. The closest oil and gas operations are the GWA facility within the Operational Area and Pluto, North Rankin and Wheatstone platforms, all between 1 and 50 km from the Operational Area. Operation of these facilities is unlikely to be impacted by a diesel spill from a vessel collision given the relatively small EMBA.
Submerged Shoals	***Tourism and Recreation*** In the highly unlikely event of a diesel spill, a temporary prohibition on charter boat recreational fishing trips and any other marine nature-based tourism trips to the Ningaloo coast, Montebello AMP and islands, Gascoyne AMP, Argo-Rowley Terrace AMP, Rowley Shoals – Imperieuse Reef State MP, Rankin Bank and Pilbara Islands may be put into effect, depending on the trajectory of the plume, resulting in a loss of revenue for operators. However, given the EMBA only partially overlaps these receptors it's unlikely that all tourism and recreation activities would be impacted.
Receptors contacted by hydrocarbons in the event of a surface diesel spill are the Ningaloo coast, Montebello AMP and islands, Gascoyne AMP, Argo-Rowley Terrace AMP, Rowley Shoals – Imperieuse Reef State MP, Ranking Bank and Pilbara Islands (contacted within the 100 ppb and 50 ppb entrained hydrocarbon and dissolved hydrocarbon respectively) and Rankin Bank (contacted within the 1 g/m^2 surface hydrocarbon thresholds). It is noted that the toxic components in marine diesel include alkylated naphthalenes which can be rapidly accumulated by marine biota including invertebrates such as marine oysters, clams, shrimp, as well as a range of vertebrates such as finfish. Marine diesel also contains additives that contribute to its toxicity.	
Summary of Potential Impacts to Environmental Value(s)	
In the highly unlikely event of an unplanned hydrocarbon release to the marine environment due to vessel collision, combined with the adopted controls, it is considered that any potential impact to water quality would be localised, low and temporary in nature in comparison to background levels. Localised, low and temporary impacts to habitats, individuals and shipping/fishing concerns are expected. The highest environmental consequence identified for the assessment of an unplanned hydrocarbon release to the marine environment due to vessel collision, as classified in **Section 2.7.1**, is defined as D, which equates to 'minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems), physical or biological attributes'-.	

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
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	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted.	Yes **C 8.1**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
- adherence to navigation noise signals as required.				
Marine Order 21 (Safety and emergency arrangements) 2016 and Marine Order 27 (safety of navigation and radio equipment) 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 *Safety of Life at Sea* - Automatic Identification System 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 requirements to be followed reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted.	Yes **C 8.2**
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 dependant 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 8.3**
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 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 8.4**
Good Practice				
500 m exclusion zone established around vessel when removing subsea infrastructure.	F: Yes CS: Minimal cost. Standard practice.	Reduces the likelihood of interfering with other marine users.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 8.5**
Develop SIMOPS management plan where multiple campaigns occur concurrently within the Operational Area.	F: Yes. CS: Minimal cost. Standard practice.	SIMOPS management plans between Woodside operated vessels in the Operational Area will reduce the	Benefits outweigh cost/sacrifice.	Yes **C 8.6**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		likelihood of a collision occurring.		
Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date.	F: Yes. CS: Minimal cost. Standard practice.	Notification to AHO will enable them to generate navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.1**
Notify relevant government departments, fishing industry representative bodies and licence holders 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 1.2**
Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities 24 - 48 hours before operations commence.	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 1.3**
Notify relevant stakeholders for activities and movements that commence more than a year after EP acceptance.	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**
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

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
Risk Based Analysis				
A quantitative spill risk assessment was performed (refer **Section 6.9.1**).				
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 an unplanned loss of hydrocarbon as a result of vessel collision. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement An accidental hydrocarbon release as a result of a vessel collision represents a moderate current risk rating and may result in minor, short-term impact (1-2 years) on species, habitat (but not affecting ecosystems function), physical or biological attributes and communities. BIAs within the Operational Area include flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. Relevant recovery plans and conservation advice have been 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 (**Section 6.10**). 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. Therefore, Woodside considers the adopted controls appropriate to manage the risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 8 No release of hydrocarbons to the marine environment due to a vessel collision during the Petroleum Activities Program.	**C 8.1** 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 8.1** Project vessels compliant with Marine Order 30 (Prevention of collisions) 2016 (which requires vessels to be visible at all times) to prevent unplanned interaction with marine users.	**MC 8.1.1** Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 21, 27 and 30).

	C 8.2 Marine Order 21 (Safety and emergency arrangements) 2016 and Marine Order 27 (safety of navigation and radio equipment) 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 *Safety of Life at Sea* • Automatic Identification System that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety related data.	**PS 8.2** Project vessels compliant with Marine Order 21 (Safety of navigation and emergency procedures) 2016 and Marine Order 27 (safety of navigation and radio equipment) 2016 to prevent unplanned interaction with marine users.	
	C 8.3 In the event of a spill emergency response activities implemented in accordance with the OPEP.	**PS 8.3** In the event of a spill the Julimar Operations OPEP requirements are implemented (**Table 7-4**).	**MC 8.3.1** Completed incident documentation.
	C 8.4 Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	**PS 8.4.1** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-6**.	**MC 8.4.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 8.4.2 Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the OPEP, are maintained (**Table 7-5**).	**MC 8.4,2** Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available.
	C 8.5 Project vessels as required during activities to assist in third party vessel interactions (including warning to vessels approaching the 500 m exclusion zone).	**PS 8.5** Project vessels to communicate with third party vessels, prevent unplanned interaction, and to assist in emergencies, as required.	**MC 8.5.1** Records demonstrate project vessel was on standby as required as per definition or reference in Woodside's One Marine Charterers Instructions.
	C 8.6 Develop SIMOPS management plan where multiple campaigns occur	**PS 8.6** SIMOPS management plan is in place where multiple campaigns occur concurrently within the Operational Area.	**MC 8.6.1** Records indicate a SIMOPS management plan has been created.

	concurrently within the Operational Area.		
	C 1.1 See **Section 6.8.1.**	**PS 1.1** See **Section 6.8.1.**	**MC 1.1.1** See **Section 6.8.1.**
	C 1.3 See **Section 6.8.1.**	**PS 1.3** See **Section 6.8.1.**	**MC 1.3.1** See **Section 6.8.1.**
	C 1.4 See **Section 6.8.1.**	**PS 1.4** See **Section 6.8.1.**	**MC 1.4.1** See **Section 6.8.1.**
Detailed preparedness and response performance outcomes, standards and MC for the Petroleum Activities Program are presented in **Appendix D**.			

6.9.3 Accidental Hydrocarbon Release: Bunkering

Context		
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**	Stakeholder consultation – **Section 5**

Risks Evaluation Summary													
Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Loss of hydrocarbons to marine environment from bunkering/refuelling		X			X		A	E	2	M	LCS GP PJ	Broadly Acceptable	EPO 9

Description of Source of Risk

Bunkering of marine diesel to specialised pipe removal vessels/offshore support vessels is planned to occur in the Operational Area. General support vessels will preferentially refuel at port. Additionally, refuelling of helicopters using aviation jet fuel may occur onboard the project vessels.

Three 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 coupling 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 shut off fuel pumps, for a period of up to five minutes, could result in about 8 m³ marine diesel loss to the deck and/or into the marine environment.
- Partial or total failure of a bulk transfer hose or fittings during helicopter refuelling could spill aviation jet fuel to the helicopter deck and/or into the marine environment. All helicopter refuelling activities are closely supervised and leaks on the helideck are considered to be easily detectable. In the event of a leak, transfer would cease immediately. The credible volume of such a release during helicopter refuelling would be in the order of less than 100 L.

Likelihood

The likelihood of two ‘Unlikely’ corresponds to ‘Has occurred many times in the industry but not at Woodside’.

A search of the Woodside spill records indicates that, while there have been smaller releases (less than 30 L) associated with bunkering, there have been no recorded partial or total failures of bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shut off fuel pumps for a period of up to five minutes, resulting in the worst case credible scenario of an 8 m³ loss of diesel.

ITOPF Limited (IOTPF) (2018) data reports that for tanker operations during 1970 to 2017, 7% of small (more than seven tonnes) spills occurred during bunkering and 2% of medium (seven to 700 tonnes) spills. While this data is from the oil tanker industry, it has been used as an indicator of the potential for spills associated with bunkering activities. A risk assessment by AMSA of oil spills in Australian ports and waters (Det Norske Veritas, 2011) identifies transfer spills as a risk.

Quantitative Spill Risk Assessment

Woodside has commissioned RPS to model several small marine diesel spills, including surface spill volumes of 8 m³ in the offshore waters of north-west WA. The results of these models have indicated that exposure to surface hydrocarbons above the 10 g/m² 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 m³ surface spill from bunkering activities would be well within the EMBA for the vessel collision scenario detailed in **Section 6.9.1**. 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 m³ marine diesel release was not performed for this Petroleum Activities Program.

Given the physical and chemical similarities, and the relatively small credible spill volumes, marine diesel is considered to be a suitable substitute for aviation jet fuel for the purposes of this environmental risk assessment. Aviation jet fuel would behave similarly to diesel and have similar impacts and, considering small size of spill volumes likely to be contained on the helideck, this has not been modelled.

Hydrocarbon Characteristics

Refer to **Section 6.9.1** for a description of the characteristics of marine diesel, including detail on the predicted fate and weathering of a spill to the marine environment.

Impact Assessment

Potential Consequence Overview

Previous modelling studies for 8 m³ marine diesel releases, spilled at the surface as a result of bunkering activities, indicated that the potential for exposure to surface hydrocarbons exceeding 10 g/m² was confined to within the immediate vicinity (about 1 km) of the release sites. Therefore, it is considered that there is no potential for contact with sensitive receptor locations above surface (10 g/m²), entrained (100 ppb) or dissolved (50 ppb) threshold concentrations from an 8 m³ spill of marine diesel within the Operational Area.

Summary of Potential Impacts to Protected Species and Water Quality

The potential biological and ecological impacts associated with much larger hydrocarbon spills are presented in **Section 6.9.2** 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 are expected. Refer to **Section 6.9.2** for the detailed potential impacts of unplanned hydrocarbon release to the marine environment from vessel collision. 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; hence, potential impacts from bunkering are considered very minor.

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[13]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (Marine pollution prevention – oil) 2014, requires Ship Oil Pollution Emergency Plan (SOPEP)/Spill Monitoring Programme Execution Plan (SMPEP) (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	By ensuring a SOPEP/SMPEP is in place for the vessel, the likelihood of a spill entering the marine environment is reduced. Although no significant reduction in consequence could result, the overall risk is reduced.	Controls based on legislative requirements – must be adopted.	Yes **C 9.1**

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[13] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Good Practice				
Bunkering equipment controls: • All hoses that have a potential environmental risk following damage or failure shall be linked to the project vessels preventative maintenance system. • All bulk transfer hoses shall be tested for integrity before use (tested in accordance with Original Equipment Manufacturer recommendations) and recertified annually as a minimum. • 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.	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.	Yes **C 9.2**
Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • A completed PTW and/or Job Safety Assessment (JSA) shall be implemented for the hydrocarbon bunkering/refuelling operation. • Visual monitoring of gauges, hoses, fittings and the sea surface during the operation. • Hose checks 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.	Yes **C 9.3**
Mitigation: Oil spill response.	Refer to **Appendix D**.			

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[13]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
No refuelling of helicopter on project vessels	F: No. Given the distance of the Operational Area from the airports suitable for helicopter operations, and the endurance of available helicopters, eliminating helicopter refuelling is not feasible. Helicopter flights cannot be eliminated, and may be required in emergency situations. CS: Not assessed, control cannot feasibly be implemented.	Not considered, control not feasible.	Not considered, control not feasible.	No
No refuelling of project vessels in Operational Area. All project vessels brought into port to refuel.	F: No. Does not eliminate the fuel transfer risk. It is not operationally practical to transit the project vessels back to port for refuelling, based on the frequency of the refuelling requirements and distance from the nearest port (Dampier 257 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
Preferentially avoid refuelling general support vessels in the Operational Area	F: Yes, however control does not eliminate the fuel transfer risk. CS: Minimal cost given vessels will be transiting to/from port. Standard practice.	Eliminates the risk in the Operational Area. However, moves risk to another location. Potential risk of spill in port lower given dedicated facilities and bunkering conditions. PSV and support vessels will be transiting	Benefits outweigh cost/sacrifice.	Yes **C 9.4**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[13]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		to/from port therefore limited schedule impact		
Specialised pipe removal vessels refuel in port	F: No. Does not eliminate the fuel transfer risk. Specialised pipe vessels would be required to cease recovery activities to transit back to port to refuel. It is not operationally practical to transit the larger specialised pipe removal vessels back to port for refuelling, based on the frequency of the refuelling requirements and distance from the nearest port (Dampier 257 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				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls 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 a bunkering spill. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.

Demonstration of Acceptability

Acceptability Statement

An accidental hydrocarbon release during bunkering operations represents a moderate current risk rating and may result in slight, short-term impacts (>1 year) on species, habitat (but not affecting ecosystems function) or biological attributes. Relevant management plans and species recovery plans and conservation advice have been considered during the impact assessment and, given the adopted controls, the Petroleum Activities Program is not considered to be inconsistent with the overall objectives and actions of these plans.

The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements of Australian Marine Orders. Therefore, Woodside considers the adopted controls appropriate to manage the risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 No unplanned loss of hydrocarbons to the marine environment from bunkering greater than a consequence level of E[14] during the Petroleum Activities Program.	**C 9.1** Marine Order 91 (Marine pollution prevention – oil) 2014, requires SOPEP/SMPEP (as appropriate to vessel class).	**PS 9.1** Appropriate initial responses prearranged and exercised for response to a hydrocarbon spill, as appropriate to vessel class.	**MC 9.1.1** Marine Assurance inspection records demonstrate compliance with Marine Order 91.
	C 9.2 Bunkering equipment controls: • All hoses that have a potential environmental risk following damage or failure shall be placed on the project vessel's preventative maintenance system. • All bulk transfer hoses shall be tested for integrity before use (tested in accordance with Original Equipment Manufacturer recommendations and recertified annually as a minimum). • 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 9.2.1** Damaged equipment is replaced before failure.	**MC 9.2.1** Records confirm the bunkering equipment is subject to systematic integrity checks.
		PS 9.2.2 Bunkering equipment controls employed during bunkering.	**MC 9.2.2** Records confirm presence of dry break of couplings and flotation on fuel hoses.
		PS 9.2.3 Spill kits available in the event of a spill during bunkering.	**MC 9.2.3** Records confirm presence of spill kits.

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[14] Defined as 'Slight, short-term local impact (less than one year), on species, habitat (but not affecting ecosystem function), physical or biological attributes'.

	C 9.3 Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • Implement a completed PTW and/or JSA for the hydrocarbon bunkering/refuelling operation. • Visually monitor gauges, hoses, fittings and the sea surface during the operation. • Check hoses prior to commencement. • Commence bunkering/ refuelling 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. • Do not transfer hydrocarbons in marginal weather conditions.	**PS 9.3** Comply with Contractor procedures for managing bunkering/helicopter operations.	**MC 9.3.1** Records demonstrate bunkering/refuelling performed in accordance with contractor bunkering procedures.
	C 9.4 Preferentially avoid refuelling general support vessels in the Operational Area	**PS 9.4** Refuelling of general support vessel preferentially avoided in the Operational Area	**MC 9.4.1** Records demonstrate refuelling planning of general support vessels is assessed and prioritised to avoid occurring within the Operational Area where possible.
Detailed oil spill preparedness and response performance outcomes, standards and MC for the Petroleum Activities Program are presented in **Appendix D**.			

6.9.4 Unplanned Discharges: Deck and Subsea Spills

Context	
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Accidental discharge to the ocean of other hydrocarbons/chemicals from project vessel deck activities and equipment (e.g. cranes) including subsea ROV hydraulic leaks		X		X	X		A	F	2	L	LCS GP PJ	Broadly Acceptable	EPO 10

Description of Source of Risk

Deck spills can result from spills of stored hydrocarbons/chemicals or equipment. Project vessels typically store hydrocarbon/chemicals in various volumes (20 L, 205 L; up to about 4000 to 6000 L). 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). During EHU and pipeline recovery, hydraulic spills also have the potential to occur from the deck tensioner and reel drive systems.

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 of less than 10 L.

Subsea spills can result from a loss of containment of fluids from subsea equipment, mainly from ROVs. The ROV hydraulic fluid is supplied through hoses containing about 20 L of fluid. Hydraulic lines to the ROV arms and other tooling may become caught, resulting in minor leaks to the marine environment. Small volume hydraulic leaks may occur from equipment operating via hydraulic controls subsea (subsea control fluid). These include the cutting tool (e.g. diamond wire saw), bolt tensioning equipment, ROV tooling etc.

All chemicals that may be released or discharged to the marine environment during the Petroleum Activities Program are assessed as per Woodside Chemical Selection and Assessment. This procedure is used to demonstrate that the potential impacts of the chemicals that may be released are acceptable and ALARP.

The relatively small unplanned discharges associated with the Petroleum Activities Program are not expected to have impacts beyond the Operational Area.

Impact Assessment

Potential Impacts to Water Quality, Other Habitats and Communities and Protected Species

Accidental spills of hydrocarbons or chemicals from the project vessels will decrease the water quality in the immediate area of the spill; however, the impacts are expected to be temporary and very localised due to dispersion and dilution in the open ocean environment.

Given the offshore/open water location, receptors such as marine fauna may be affected if they come in direct contact with a release (i.e. by traversing the immediate spill area). If marine fauna come into contact with a release, they could suffer fouling, ingestion, inhalation of toxic vapours, irritation of sensitive membranes in the eyes, mouth, digestive and respiratory tracts, and organ or neurological damage. Cetaceans may exhibit avoidance behaviour patterns and, as they are smooth skinned, hydrocarbons and other chemicals are not expected to adhere. Given the small area of the potential spill and the dilution and weathering of any spill, the likelihood of ecological impacts to marine fauna (protected species), other communities and habitats is likely to be negligible.

No impacts on socio-economic receptors are expected, due to the low levels of fishing activity in the Operational Area, the small volumes of hydrocarbons/chemicals that could be accidentally spilled, and the localised and temporary nature of the impacts.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that other hydrocarbon/chemical spills to the marine environment will not result in a potential impact greater than slight, short term local impacts on species, habitat (but not affecting ecosystems function), physical and biological attributes (i.e. Environment Impact – E).

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)*	*Benefit in Impact/ Risk Reduction*	*Proportionality*	*Control Adopted*
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention – oil) 2014, requires SOPEP/SMPEP (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 9.1**
Liquid 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.	Controls based on legislative requirements – must be adopted.	Yes **C 10.1**
Good Practice				
Spill kits positioned in high risk locations around the Project vessels (near potential spill points such as transfer stations).	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 10.2**
Project vessels have self-containing hydraulic oil drip tray management system.	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 10.3**
Fluids and additives planned to be used and intended or likely to be discharged to the marine environment will have an	F: Yes. CS: Minimal cost. Standard practice.	Environmental assessment of chemicals will reduce the consequence of impacts resulting from	Benefits outweigh cost/sacrifice.	Yes **C 5.1**

<table>
<tr><th colspan="5">Demonstration of ALARP</th></tr>
<tr><th><i>Control Considered</i></th><th><i>Control Feasibility (F) and Cost/Sacrifice (CS)</i></th><th><i>Benefit in Impact/ Risk Reduction</i></th><th><i>Proportionality</i></th><th><i>Control Adopted</i></th></tr>
<tr><td>environmental assessment completed before use.</td><td></td><td>discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for the safe execution of activities and therefore no reduction in likelihood can occur.</td><td></td><td></td></tr>
<tr><td>Chemical reviews will be performed on all previously approved chemicals to confirm potential chemical impacts are reduced to ALARP.</td><td>F: Yes.
CS: Minimal cost. Standard practice.</td><td>Reviews will ensure chemicals selected for drilling and completions fluids remain ALARP.</td><td>Benefits outweigh cost/sacrifice.</td><td>Yes
C 5.2</td></tr>
<tr><td colspan="5">Detailed oil spill preparedness and response performance outcomes, standards and MC for the Petroleum Activities Program are presented in Appendix D.</td></tr>
<tr><td colspan="5"><i>Professional Judgement – Eliminate</i></td></tr>
<tr><td colspan="5">No additional controls identified.</td></tr>
<tr><td colspan="5"><i>Professional Judgement – Substitute</i></td></tr>
<tr><td colspan="5">No additional controls identified.</td></tr>
<tr><td colspan="5"><i>Professional Judgement – Engineered Solution</i></td></tr>
<tr><td>Below-deck storage of all hydrocarbons and chemicals.</td><td>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.</td><td>Not considered, control not feasible.</td><td>Not considered, control not feasible.</td><td>No</td></tr>
<tr><td>A reduction in the volumes of chemicals and hydrocarbons stored onboard project vessels.</td><td>F: Yes. Increases the risks associated with transportation and lifting operations.
CS: Project delays if required chemicals not onboard.</td><td>No reduction in likelihood or consequence, as chemicals will still be required to enable activities to occur.</td><td>Disproportionate. The cost/sacrifice outweighs the benefit gained.</td><td>No</td></tr>
<tr><td colspan="5"><i>ALARP Statement</i>
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 the potential unplanned accidental spills described above. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.</td></tr>
</table>

Demonstration of Acceptability
Acceptability Statement An unplanned minor discharge of hydrocarbons or chemicals as a result of minor deck and subsea spills represents a low risk that is unlikely to result in potential impact greater than localised and temporary disruption but not impacting on ecosystem function. 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 residual risk of unplanned loss of chemicals / hydrocarbons from projects vessels 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. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of minor unplanned deck and subsea spills to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 10 No unplanned spills to the marine environment from deck activities greater than a consequence level of E[15] during the Petroleum Activities Program.	**C 9.1** See **Section 6.9.3**	**PS 9.1** See **Section 6.9.3**	**MC 9.1.1** See **Section 6.9.3**
	C 10.1 Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/ moved temporarily.	**PS 10.1** Failure of primary containment in storage areas does not result in loss to the marine environment.	**MC 10.1.1** Records confirms all liquid chemicals and fuel are stored in bunded/ secondarily contained areas when not being handled/moved temporarily.
	C 10.2 Spill kits positioned in high risk locations around the rig (near potential spill points such as transfer stations).	**PS 10.2** Spill kits to be available for use to clean up deck spills.	**MC 10.2.1** Records confirms spill kits are present, maintained and suitably stocked.
	C 10.3 Project vessels have self-containing hydraulic oil drip tray management system.	**PS 10.3** Contain any on-deck spills of hydraulic oil.	**MC 10.3.1** Records demonstrate Project vessels are equipped with a self-containing hydraulic oil drip tray management system.
	C 5.1 See **Section 6.8.5**	**PS 5.1** See **Section 6.8.5**	**MC 5.1.1** See **Section 6.8.5**
	C 5.2 See **Section 6.8.5**	**PS 5.2** See **Section 6.8.5**	**MC 5.2.1** See **Section 6.8.5**
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**.			

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[15] Defined as 'Slight, short-term local impact (less than one year), on species, habitat (but not affecting ecosystem function), physical or biological attributes'.

6.9.5 Planned and Unplanned Discharges: Releases of Solid Hazardous and Non-hazardous Wastes

Context	
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Accidental loss of hazardous or non-hazardous wastes to the marine environment (excludes sewage, grey water, putrescible waste and bilge water) within the Operational Area.		X		X	X		A	F	2	L	LCS GP PJ	Broadly Acceptable	EPO 11
Unplanned loss of fragments of coating/field joint coating during pipeline recovery		X		X	X	X							
Inappropriate disposal of waste generated from infrastructure removal		X	X	X	X	X							
Generation and disposal of waste from infrastructure removal		X	X	X	X	X		E	-				EPO 12

Description of Source of Risk

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.

Pipeline recovery methods, reverse reel lay and s-lay, have the potential to result in unplanned discharge of larger pieces of plastic, originating from the pipeline coating (4LPP) and the field joint coatings (IMPU). Swarf generated from subsea cut and recover is addressed in **Section 6.8.5.**

During pipeline recovery there is the potential for the coating to undergo fracturing and for fragments of the material to break away and be released from the pipeline. While the likelihood remains low, fracturing of coating during pipeline recovery is more likely to occur at the section of pipeline closest to the wells where elevated temperatures and temperature cycling during production may have increased the likelihood of coating degradation. Further study work (and if required, pipeline sampling) will determine the selection of the pipeline recovery method. The selection process will include consideration of the risk of fracturing and accidental loss to the environment of coating material.

Prior to attempting recovery, it is difficult to estimate the potential size or volume of coating that could be released. Given that both PP and IMPU are less dense than seawater (PP SG = 0.83-0.85 g/cm-3; IMPU SG = 0.69 g/cm-3) any fragments released are expected to float to the sea surface. However, the presence of marine growth may limit buoyancy resulting in some fragments not reaching the sea surface. If fragments are visible at the surface, attempts to recover larger visible fragments will be made where safe and practical to do so.

Infrastructure recovery will also generate industrial waste mainly comprising of steel, chromium alloy, copper, Nylon 11 and HDPE (**Section 3.7.2.1 and 3.12**) that will require onshore handling and disposal at licensed facilities. The Echo Yodel pipeline was tested for contamination and tests confirmed there were no NORMS present and that mercury levels were within background concentrations and below the marine sediment threshold of 0.15 mg/kg (ANZEEC, 2013) (**Section 3.7.1**). Wastes generated from decommissioning of subsea infrastructure could contribute to the increasing pressure on local landfills if not managed appropriately through consideration of the waste hierarchy and alternate means of disposal to landfill. There is also the potential for recovered infrastructure to be incorrectly classified and disposed of inappropriately leading to contamination of waste streams.

Impact Assessment

Potential Impacts to Water Quality, Other Habitats and Communities, Protected Species and Socio-economic Values

Hazardous and Non Hazardous Wastes

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 individual animals. Several migratory and threatened species were identified as potentially occurring within the Operational Area, including whale sharks, cetaceans and marine turtles. However, these species are expected to be transient as there are no known key aggregation areas. The Operational Area overlaps BIAs for whale sharks, flatback turtle and wedge-tailed shearwaters. However, 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 species or water quality.

Incorrect classification of waste can also result in inappropriate disposal of hazardous decommissioning wastes that could contaminate non-hazardous waste streams. This has the potential to result in contamination to air, soil and water during disposal. Given the sampling of the Echo Yodel subsea infrastructure has not identified NORMS or mercury at levels that represent a possible risk to contamination (**Section 3.7.1**), incorrect disposal of hazardous waste onshore could result in slight impacts to the environment on a near-field scale (i.e. limited to the disposal site/facility)

Unplanned loss of fragments of coating/field joint coating during pipeline recovery

Degradation Mechanisms

The Echo Yodel pipeline coating is a 4LPP with IMPU used for the field joint coatings. During recovery of the pipeline, there is potential for the PP and IMPU field joint coatings to undergo fracturing and for fragments of the material to break away and be released from the pipeline.

Any fragments released that are unable to be retrieved will undergo solar UV-induced photo-degradation, which is believed to be the most important abiotic degradation pathway in the ocean environment for most plastics with a carbon-carbon chemical structure, including polypropylenes (PP) (Bergmann et al. 2015; Gewert et al. 2015). Polyolefins, such as PP, do not contain any unsaturated double bonds in their polymer backbone, and thus might be expected to be immune to photo-initiated degradation. However, small amounts of external impurities or structural abnormalities incorporated into the macromolecular structure can allow for photo-initiated degradation to some extent (Gewert et al. 2015). PP is highly sensitive to oxidation and typically contains significant amounts of antioxidants and UV stabilisers (Zweifel 2001), which will inhibit any photo-degradation.

Potential Impacts to Sediment Quality, Water Quality, Ecosystems/Habitats, Species and Socio-economic Values

If fragments of the coating are released during pipeline recovery and are unable to be retrieved, it is expected that they will weather via mainly abiotic mechanisms, over an extremely long timeframe, resulting in embrittlement and disintegration of the materials into microplastics. Any microplastics are expected to float until they are washed ashore or sink and be incorporated into seabed sediments, or are ingested by marine fauna. This process of microplastic formation will occur over an extremely long timeframe and at a very slow rate.

The uptake, accumulation and elimination of microplastics by marine organisms depends on the size of the particle. The risk of associated impacts following exposure to microplastics depends on: i) the number of particles; ii) the type of particles (e.g. polymer type, size, shape and age; iii) the duration of exposure; iv) the concentrations and type of contaminants associated with the plastic; and, v) the physiology and life-history of the organism (GESAMP 2016).

Figure 6-2 shows a conceptual view of microplastics interactions with physical and biological matrices in the marine environment. As summarised in GESAMP (2016):

- Microplastics have been documented in a diversity of habitats and in over 100 species.
- Microplastics can impact an organism at many levels of biological organisation, including at the levels of populations and assemblages. The majority of the evidence is at levels that are sub-organismal (e.g. changes in gene expression, inflammation, tumour promotion) or affect individual organisms (i.e. death).

- Microplastics can be a source and sink of hazardous chemicals (e.g. persistent organic pollutants (POP)) to organisms, but their relative importance as a source of chemicals to wildlife relative to others (e.g. water, sediment, diet) is unclear.
- Nano-sized plastics are probably as common as micro-sized plastics, yet the hazards may be more complex.
- Microplastics can transport invasive species, including harmful algal blooms and pathogens.

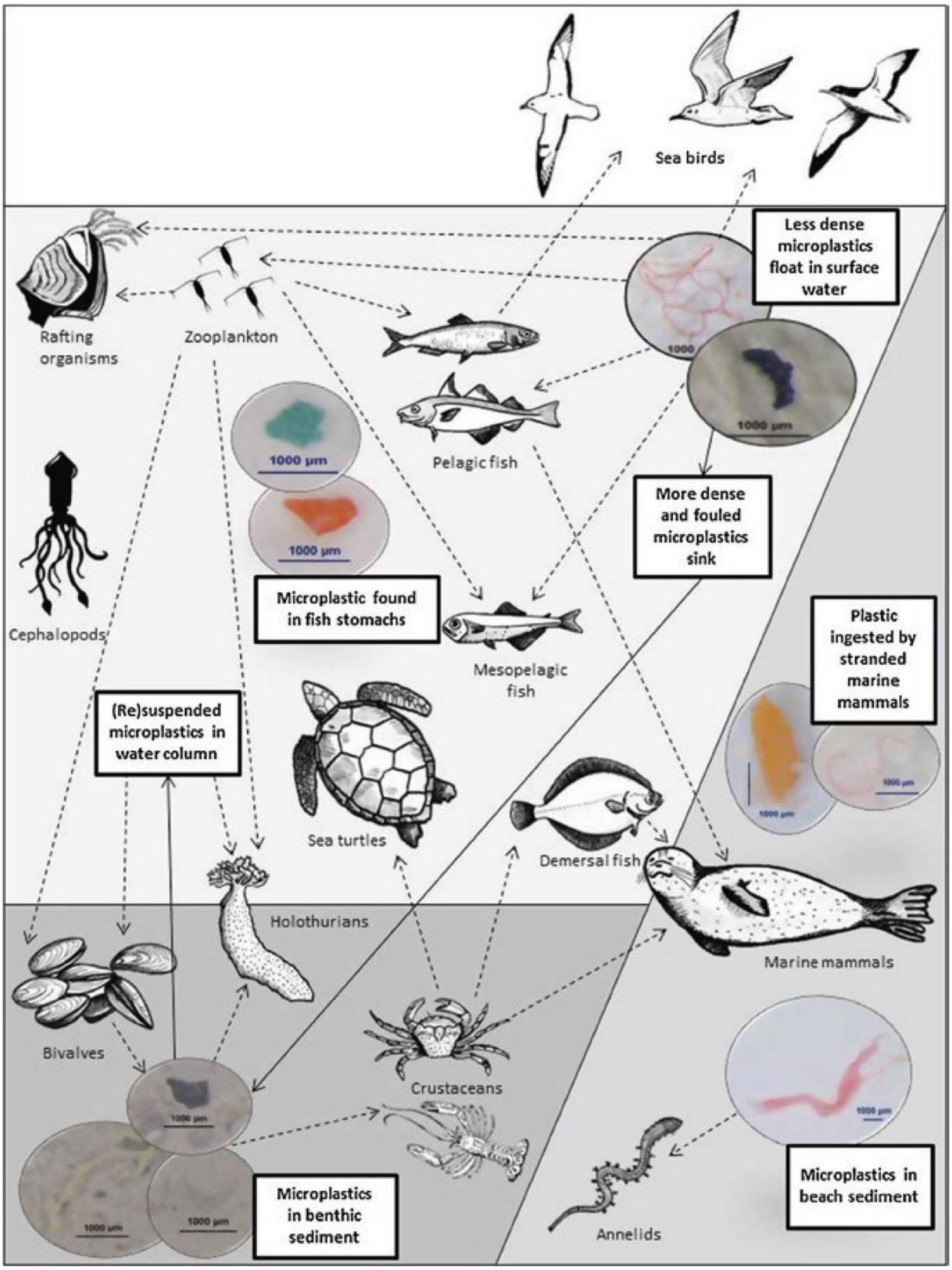

Figure 6-2: Microplastics interactions with physical and biological matrices in the marine environment (Source: Lusher et al., 2015)

Note on Figure: Solid arrows represent environmental links (i.e. how microplastic may transfer between sediment and water) and dashed arrows represent biological links (i.e. how microplastic may transfer among trophic levels).

GESAMP (2016; and references therein) provides a comprehensive review of evidence of microplastic ingestion by a variety of invertebrate and vertebrate marine organisms. Ingestion of microplastics can result in a variety of direct and indirect physical effects (e.g. mortality), and toxicity effects associated with the chemical ingredients of the particles.

Impacts to Sediment Quality

As described above, microplastics generated from coating fragments will float until they are washed ashore or sink because their density changes due to biofouling. Microplastics that sink to the seabed will become incorporated into benthic sediments, where they will be available for ingestion by infaunal and epifaunal invertebrates. This process will occur over an extremely long timeframe and at a very slow rate, and given the quantity of material released this will result in a negligible incremental decline in sediment quality when compared to other inputs of microplastics to benthic sediments in the region.

Impacts to Water Quality

If plastic fragments are released, they will most likely float in the upper layers of the water column, where the relatively high levels of UV radiation will accelerate the breakdown of the material relative to degradation at the seabed. These materials are expected to be widely dispersed by ocean currents and will be available for ingestion by zooplanktonic organisms. This process will occur over an extremely long timeframe and at a very slow rate, and given the quantity of material released this will result in only a small incremental decline in water quality when compared to other input of microplastics to benthic sediments in the region. Microplastics have been shown to potentially be toxic through the concentration of POP, via absorption of these chemicals present in seawater (Andrady 2011). The continental shelf waters of the North West Shelf are expected to have very low levels of POP, as there are very few potential sources in the region.

Impacts to Ecosystems/Habitats

As described in **Section 4.6.3.1**, the Operational Area overlaps the Ancient Coastline at 125 m Depth Contour KEF, which provides areas of hard substrate and may contribute to higher diversity and enhanced species richness relative to soft sediment habitat (Falkner et al. 2009). Microplastics generated from coating fragments may become negatively buoyant over time and sink to the seabed could be deposited onto benthic communities where they could be ingested by invertebrates such as sponges, cnidarians, echinoderms, molluscs and crustaceans. Subsequently, these microplastics could be taken up by benthic and demersal fishes feeding on benthic invertebrates within the KEF. This process will occur over an extremely long timeframe and at a very slow rate, and is not expected to result in any significant impacts to ecosystem function and integrity.

Impacts to Species

As described in **Section 4.4.2.3**, Operational Area overlaps three BIAs for EPBC Act protected species on the North West Shelf:

- flatback turtle internesting BIA around the Montebello Islands
- whale shark foraging BIA
- wedge-tailed shearwater breeding (foraging buffer) BIA.

The flatback turtle internesting BIA extends for 80 km distance from the Montebello Islands; however, the deep offshore waters within Operational Area (>120 m water depth) do not represent foraging habitat for flatback turtles, which generally feed on soft-bodied prey (such as sea cucumbers, soft corals and jellyfish) in inshore, shallow soft-substrate habitats. Marine debris, including microplastics, are identified as a key threat to marine turtles in the Recovery Plan for Marine Turtles in Australia 2017-2017 (Commonwealth of Australia 2017). An assessment against relevant recovery objectives and actions of the Recovery Plan is provided in **Section 6.10** of this EP.

The Operational Area overlaps the foraging BIA for whale sharks that extends north from Ningaloo Reef, centred on the 200 m isobath. The whale shark is a filter-feeder that feeds on a wide variety of planktonic and nektonic prey, including small crustaceans such as krill, crab larvae and copepods, small schooling fishes such as sardines, anchovies, mackerel, and occasionally larger prey such as small tuna, albacore and squid (Colman 1997). Therefore, there is the potential for whale sharks feeding within the foraging BIA to ingest microplastics from prey organisms. Globally, ingestion of microplastics has been identified as a threat to filter-feeding elasmobranchs, such as whale sharks, basking sharks and manta rays, in a number of locations (Germanov et al. 2018, 2019; Parton et al. 2020). Additionally, marine debris is identified as a threat to whale sharks in Australian waters in the approved Conservation Advice for this species (TSSC 2015d).

The Operational Area overlaps a breeding (foraging buffer) BIA for wedge-tailed shearwaters. Many species of seabirds are reportedly contaminated by plastic, and nearly 50 species of Procellariiformes (albatrosses, petrels, shearwaters and storm petrels) have been found to have microplastics in their stomachs, including the wedge-tailed shearwater (Bergmann et al. 2015). Ingested microplastic appeared to comprise primarily of plastic pellets and fragments. Marine debris, including microplastics, are identified as a threat to seabirds in the Draft Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2019).

It is credible that whale sharks and wedge-tailed shearwaters foraging in surface waters within the Operational Area could ingest microplastics originating from any coating fragments released during pipeline recovery. However, this would occur over an extremely long timeframe and at a very slow rate. If released, the contribution of microplastics from coating fragments is not considered a threat to whale sharks and wedge-tailed shearwaters on the North West Shelf given the potential volume released is not expected to be significant in the context of other sources of microplastics in the ocean.

Marine debris has been identified as a threat for a number of threatened and migratory marine fauna, and is the subject of the Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia 2018). An assessment against relevant objectives and actions of the Marine Debris Threat Abatement Plan is provided in **Section 6.10** of this EP.

Impacts to Socio-economic Values

As described in **Section 4.5.3**, the Operational Area overlaps a number of Commonwealth and State-managed commercial fisheries. Microplastics have been documented in finfish, shellfish and crustaceans which are consumed by humans. The impacts of the consumption of microplastics by food fish are unknown; however, studies on non-commercial species suggest microplastics have the potential to negatively affect organism health (GESAMP 2016). There is the potential for microplastics originating from degradation of coating fragments to be ingested by target species for several of these fisheries, particularly demersal and pelagic fishes. However, this would occur over an extremely long timeframe and at a very slow rate. Given the potential small quantity of material that could be released the contribution of microplastics as a threat to the quantity or quality of catches for commercial fisheries on the North West Shelf is considered to be insignificant in the context of other sources of microplastics in the ocean.

Cumulative Impact Assessment

Previous studies estimated approximately 8 million metric tons (MMT) of macroplastic and 1.5 MMT of primary microplastic enter the marine environment globally each year (Jambeck et al. 2015; Boucher and Friot 2017; Lau et al. 2020). If plastic production and waste generation continue to grow at current rates, the cumulative mass of plastics in the ocean could increase by an order of magnitude from 2010 levels by 2025, to an estimated 100-250 MMT (Jambeck et al. 2015).

At present, there is limited information on the quantities or types of plastics present in Australian waters, or annual inputs. Reisser et al. (2013) characterised and estimated the concentration of marine plastics in waters around Australia using surface net tows. Marine plastics recorded were predominantly microplastics resulting from the breakdown of larger objects made of polyethylene and polypropylene (e.g. packaging and fishing items). Mean sea surface plastic concentration was 4256.4 pieces km^{-2}, and after incorporating the effect of vertical wind mixing, this value increased to 8966.3 pieces km^{-2}. These plastics appear to be associated with a wide range of ocean currents that connect the sampled sites to their international and domestic sources. The high prevalence of microplastics in Australian waters is consistent with other regions of the world's oceans. Plastic pollution levels were moderate when compared to concentrations in other marine areas, and higher amounts of plastic were found close to cities on Australia's east coast, as well as in remote locations (west Tasmania and North West Shelf). High concentrations found on the North West Shelf could be associated with international sources and/or maritime operations (Reisser et al. 2013).

There are several different sources for plastics inputs into North West Shelf waters and adjacent coastlines:

- land-based (e.g. riverine inputs, ports; storm drains, sewage disposal)
- shipping
- commercial and recreational fisheries
- aquaculture
- oil and gas
- tourism
- defence activities
- international waters.

Currently, there is no information available on inputs of macroplastic and microplastic from these different sources into North West Shelf waters, or on current levels of contamination in waters, sediments and biota. Acknowledging these data gaps, it is still highly likely that any inputs of microplastics into the marine environment of the North West Shelf from microplastics originating from coating fragments released during recovery will be insignificant in the context of other inputs of microplastics into the region.

Generation and disposal of waste from infrastructure removal

The increasing pressure on landfills globally is considered a significant environmental and social challenge and can result in indirect impacts to biodiversity, air and water pollution. Decommissioning wastes generated from Echo Yodel infrastructure removal will result in a slight contribution domestically and negligible contribution globally to increasing landfill capacity.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that the accidental discharge of solid waste, inappropriate disposal of waste generated from infrastructure removal and unplanned loss of fragments of coating/field joint coating during pipeline recovery will result in localised impacts not significant to environmental receptors (i.e. Environment Impact –

F), and generation and disposal of waste from infrastructure removal, will not result in a potential impact greater than slight, short-term impact on species/ a possible breach of legislation (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)***[16]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Project vessels compliant with Marine Orders for safe vessel operations: • Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 • Marine Order 95 (Pollution prevention – Garbage).	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**
Disposal of any hazardous waste associated with the subsea infrastructure will comply with relevant State and Commonwealth legislation: • Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 • WA Environmental Protection (Controlled Waste) Regulations 2004.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of incorrect disposal of infrastructure. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 11.2**
Good Practice				
Project vessel waste arrangements, which require: • 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 11.3**
Project vessel ROV, crane or support vessel may be used to attempt recovery of solid wastes lost overboard. 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 • objects proximity to subsea infrastructure • ability to recover the object (i.e. nature of object, lifting equipment, or ROV availability and suitable weather).	F: Yes. CS: Minimal cost. Standard practice.	Occurs after an unplanned release of solid waste and therefore no change to the likelihood. Since the waste objects may be recovered, a reduction in consequence is possible.	Benefit outweighs cost/sacrifice.	Yes **C 11.4**

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[16] Qualitative measure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)[16]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Collection of plastic fragments discharges by booms from a general support vessel	F: Yes CS: Significant cost/effort required to retrieve fragments	Collection of fragments would prevent the potential generation of macroplastic and microplastics. However, the use of booms to recover fragments is not practicable. Booming requires a certain sea state and fragment size to enable efficient recovery. The open water environment of the Operational Area may not be suitable for collection and fragments released may not be suitable for collection in a boom. Another consideration is the potential H&S risks associated with handling the equipment and manoeuvring the vessel to aid collection.	Disproportionate While recovery of fragments will reduce the consequence, this method introduces other potential risks and therefore the cost/sacrifice outweighs the benefit gained.	No
Remove pipeline on acceptance of EP to avoid further coating degradation	F: Yes CS: Significant cost	No benefit given coating not expected to further degrade over this time period (**Section 3.7.2**).	Disproportionate The cost/sacrifice outweighs the benefit gained.	No
Undertake additional studies to support selection of removal methods to minimise coating integrity failure during recovery resulting in unplanned release of plastic.	F: Yes CS: Moderate cost	Reduces the likelihood of unplanned release of plastic pipeline coating material during recovery.	Benefit outweighs cost/sacrifice.	Yes **C 11.5**
Implement an infrastructure disposal and resource recovery strategy that: • monitors and tracks waste from recovery to end state • considers the waste hierarchy when determining appropriate end state for waste • describes contingency procedures for dealing with contaminants offshore and onshore	F: Yes. CS: Minimal cost. Standard practice.	Reduces the risk of unsuitable disposal through efficient use of resources and reduces the risk of an unplanned contamination of waste streams during disposal.	Benefit outweighs cost/sacrifice.	Yes **C 12.1**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)[16]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Undertake engagement with waste contractors to identify potential waste disposal pathways.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the risk of unsuitable disposal through efficient use of resources.	Benefit outweighs cost/sacrifice.	Yes **C 12.2**
Professional Judgement – Eliminate				
Should further studies identify localised or broad coating degradation/potential for failure, preferentially select subsea cut and recover method to reduce potential quantity of plastic fragments released into the marine environment.	F: Yes. CS: Significant cost	Recovery method will be selected through further work and market engagement, and will be based on a number of criteria, including environmental impacts and risks but primarily technical feasibility and health and safety risk (**Section 3.8.1.1**). Further study work (and if required, pipeline sampling) will be undertaken to determine the most appropriate pipeline recovery method (**Section 3.8.1**). The selection process will include consideration of the risk of fracturing and accidental loss to the environment of coating material. Preferentially selecting a recovery method may result in unacceptable technical challenges that may prevent the pipeline from being recovered safely and efficiently.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls 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 accidental discharges of waste. As no reasonable additional/alternative controls were identified that				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)[16]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement Unplanned discharges from a release of solid hazardous and non-hazardous wastes represent a low current risk rating and may result in localised impacts with no lasting effect (<1 month) to water quality, habitats (but not ecosystems) and species. BIAs within the Operational Area include flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. Relevant recovery plans and conservation advice have been 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 expectations of Australian Marine Orders. Therefore, Woodside considers the adopted controls appropriate to manage risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 11 No unplanned release of solid hazardous or non-hazardous waste to the marine environment greater than a consequence level of F[17] during the Petroleum Activities Program	**C 11.1** Project vessels compliant with Marine Orders for safe vessel operations: - Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 - Marine Order 95 (Pollution prevention – Garbage).	**PS 11.1.1** Project vessels compliant with Marine Order 94 and Marine Order 95.	**MC 11.1.1** Records demonstrate project vessels are compliant with Marine Order 94 and Marine Order 95 (as appropriate to vessel class).
	C 11.2 Disposal of any hazardous waste associated with the subsea infrastructure will comply with relevant State and Commonwealth legislation: - Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 - WA Environmental Protection (Controlled Waste) Regulations 2004.	**PS 11.2.1** Disposal of any hazardous waste associated with the subsea infrastructure is compliant with the Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 and WA Environmental Protection (Controlled Waste) Regulations 2004.	**MC 11.2.1** Records demonstrate disposal of hazardous waste associated with the subsea infrastructure was compliant with relevant Commonwealth and State legislation.

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[17] Defined as 'No lasting effect (less than one month). Localised impact not significant to areas or items of cultural significance)'.

	C 11.3 Project vessel waste arrangements will be applied, which require: • 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 11.3.1** Hazardous and non-hazardous waste managed in accordance with the project vessels' waste arrangements.	**MC 11.3.1** Records demonstrate compliance against project vessels' waste arrangements.
	C 11.4 Project vessel ROV, crane or support vessel may be used to attempt recovery of solid wastes lost overboard. 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, ROV availability and suitable weather).	**PS 11.4.1** Any solid waste dropped to the marine environment recovered where safe and practicable to do so.	**MC 11.4.1** Records detail the recovery attempt consideration and status of any waste lost to the marine environment.
	C 11.5 Undertake additional studies that support selection of removal methods to reduce potential for coating integrity failure during recovery resulting in unplanned release of plastic.	**PS 11.5.1** Additional studies will be undertaken prior to pipeline recovery to support method selection.	**MC 11.5.1** Records detailing additional study outcomes and recommendations on preferred pipeline removal method.
EPO 12 Waste disposed to landfill will be minimised in accordance with the principles of the waste hierarchy.	**C 12.1** Implement an infrastructure disposal and resource recovery strategy that: • monitors and tracks waste from recovery to end state • considers the waste hierarchy when determining appropriate end state for waste • describes contingency procedures for dealing with contaminants offshore and onshore	**PS 12.1.1** Decommissioning waste generated from infrastructure removal is managed in accordance with the infrastructure disposal and resource recovery strategy.	**MC 12.1.1** Records demonstrate compliance against a infrastructure disposal and resource recovery strategy.
	C 12.2 Undertake engagement with waste contractors to identify potential waste disposal pathways.	**PS 12.2.1** Engagement with relevant waste contractors to identify potential waste disposal pathways will be undertaken prior to inform preparation of an infrastructure disposal and resource recovery strategy.	**MC 12.2.1** Records demonstrating relevant waste contractors have been engaged

6.9.6 Physical Presence: Vessel Collision with Marine Fauna

Context	
Project vessels – **Section 3.10**	Biological environment – **Section 4.4**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	***Marine Sediment***	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Accidental collision between project vessels and threatened and migratory marine fauna within the Operational Area.						X		A	E	1	L	LCS GP	Broadly Acceptable	EPO 13

Description of Source of Risk

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 turtles and whale sharks. Vessel movements can result in collisions between the project 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), the type of animal potentially present and their behaviours. Project vessels would typically be stationary or moving at low speeds during the Petroleum Activities Program. Furthermore, support vessels typically transit to and from the Operational Area between two and four trips per week (e.g. to port).

Impact Assessment

Potential Impacts to Protected Species

Vessel collisions with marine fauna have potential to occur within the Operational Area. Vessel disturbance is a key threat to a number of migratory and threatened species identified as occurring within the Operational Area including flatback turtles and whale sharks. Relevant conservation actions outlined in these plans are outlined in **Section 6.10.** Two of these species have BIAs that intercept the Operational Area:

- whale shark foraging BIA.
- flatback turtle internesting buffer BIA

Refer to **Section 4.4.2** for more information about these species and details of seasonal timings.

Whale sharks

Whale sharks are at risk from vessel strikes when feeding at the surface or in shallow waters (where there is limited option to dive). Whale sharks may traverse the Operational Area during their migrations to and from Ningaloo Reef. Aggregations at Ningaloo reef occur between March and November. However, it is expected that whale shark presence within the Operational Area would not comprise high numbers and their presence would be transitory and of a short duration.

Marine reptiles

With the absence of potential nesting or foraging habitat (i.e. no emergent islands, reef habitat or shallow shoals) and the water depth (125–140 m) and the distance of the Operational Area from the nearest nesting beaches (Montebello Islands are more than 68 km away), it is expected that the presence of marine turtles, including flatback turtles, would be very unlikely and only comprise individuals transiting the open, offshore waters for short periods of time.

Other fish and marine mammals may also be at risk of injury or mortality from vessels through being caught in thrusters during station keeping operations (i.e. DP). However, this is unlikely given the low presence of individuals combined with the avoidance behaviour commonly displayed during station keeping operations.

The likelihood of vessel collisions with marine fauna largely depends on the speed at impact. The greater the speed, the greater the risk of mortality (Jensen and Silber, 2004; Laist *et al.*, 2001). As an example of this, Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale from a vessel strike incident increased from about 20% at 8.6 knots to 80% at 15 knots. Furthermore, reported data contained in the US NOAA database (Jensen and Silber, 2004) shows there have only been two recorded instances of collisions with vessels travelling at less than six knots. Both of these were whale watching vessels that were deliberately placed among whales and do not necessarily represent how project vessels would be positioned in relation to marine fauna. Specifically in relation to marine turtles, the draft National Strategy for Mitigating Vessel Strike of Marine Megafauna states that 'a study by Hazel (2007) recorded 60% of green turtles fleeing from vessels travelling at 4 km/h [about two knots] while only 4% fled from vessels travelling at 19 km/h [about ten knots] and the study concluded that most turtles would be unlikely to avoid vessels travelling at greater than 4 km/h' (DoEE, 2016). It is unlikely that vessel movement associated with the Petroleum Activities Program will have a significant impact on marine fauna populations, given the low presence of transiting individuals and the low operating speed of the support vessels (generally less than eight knots or stationary, unless operating in an emergency).
Summary of Potential Impacts to Environmental Value(s)
Given the adopted controls, it is considered that a collision, were it to occur, will not result in a potential impact greater than slight, short-term impact on species (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[18]: • Project vessels will not travel greater than six knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. • Project vessels will not travel greater than eight knots within 250 m of a whale shark and not allow the vessel to	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a cetacean, whale shark or turtle occurring. The consequence of a collision is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 13.1**

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[18]For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability, e.g. anchor handling, 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)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
approach closer than 30 m of a whale shark.				
Good Practice				
Variation of the timing of the Petroleum Activities Program to avoid migration and foraging periods.	F: No. Timing of activities is linked to project vessel schedules. Timing of all activities is currently not determined and, due to vessel availability and operational requirements, performing activities during migration seasons may not be able to be avoided. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
The use of dedicated MFOs on project vessels for the duration of each activity to watch for whales and provide direction about and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes. However, vessel bridge crews already maintain a constant watch during operations in compliance with the Woodside Marine – Charterers Instructions on the requirements of vessel and whale interactions, and crew perform specific cetacean observation training. CS: Additional cost of MFOs considered unnecessary.	Given that project vessel bridge crews already maintain a constant watch during operations in compliance with the Woodside Marine – Charterers Instructions, additional MFOs would not significantly further reduce the risk.	Disproportionate. The cost/ sacrifice outweighs the benefit gained.	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 risks and consequences of potential vessel collision with protected marine fauna. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement Given the adopted controls, a project vessel collision with marine fauna represents a low current risk rating that may result in slight, short-term impacts (<1 year) to species. Relevant BIAs within the Operational Area include flatback turtle internesting and whale shark foraging BIAs. Relevant recovery plans and conservation advice have been

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 (**Section 6.10**).

The adopted controls are considered consistent with industry good practice and meet the requirements of Part 8 (Division 8.1) of the EPBC Regulations 2000. Therefore, Woodside considers the adopted controls appropriate to manage the risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 13 No vessel strikes with protected marine fauna (whales, whale sharks, turtles) during the Petroleum Activities Program.	**C 13.1** EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[19]: • Project vessels will not travel greater than six knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. • Project vessels will not travel greater than eight knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	**PS 13.1.1** Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to minimise the potential for vessel strike and application of these regulations to whale sharks and marine turtles.	**MC 13.1.1** Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and application of these regulations to whale sharks and marine turtles.
		PS 13.1.2 All vessel strike incidents with cetaceans, whale sharks and marine turtles 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, CoA, 2015).	**MC 13.1.2** Records demonstrate reporting cetacean, whale sharks and marine turtles ship strike incidents to the National Ship Strike Database.

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[19] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability; e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

6.9.7 Physical Presence: Dropped Object Resulting in Seabed Disturbance

Context	
Project vessel activities – **Section 3.10** Infrastructure removal activities – **Section 3.9**	Physical environment – **Section 4.3** Biological environment – **Section 4.4**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Dropped objects, including infrastructure during removal activities, resulting in the disturbance of benthic habitat	X			X			A	F	2	L	GP	Broadly Acceptable	EPO 14

Description of Source of Risk

There is the potential for objects to be dropped overboard from the project vessels to the marine environment. Objects that have been dropped during previous offshore activities include small numbers of personal protective gear (e.g. glasses, gloves, hard hats), small tools (e.g. spanners) and hardware fixtures (e.g. riser hose clamp).

There is the potential for objects to be dropped overboard from the project vessels to the marine environment. Objects that have been dropped during previous offshore activities include small numbers of personal protective gear (e.g. glasses, gloves, hard hats), small tools (e.g. spanners) and hardware fixtures (e.g. riser hose clamp). The spatial extent in which dropped objects can occur is restricted to the Operational Area.

There is also potential for larger equipment and infrastructure to be dropped during the activity. Removal of the EHU, pipeline sections and infrastructure associated with these includes methodology to separate infrastructure from the seabed and recover it to the project vessel via the crane. Whilst the infrastructure is being craned to the project vessel, there is potential that it can become disconnected from the crane rigging and drop back to the seabed. In the event that infrastructure is dropped localised seabed disturbance will occur and further disturbance may occur during attempts to recover dropped infrastructure.

Impact Assessment

Potential Impacts to Benthic Communities

In the unlikely event of an object being dropped into the marine environment from a project vessel, potential environmental effects would be limited to localised physical impacts on benthic communities. In most cases, recovery of the objects will be possible and therefore these impacts will also be temporary in nature. However, there may be instances where smaller objects are unable to be recovered due to health and safety, operational constraints or other factors such as the difficulty of recovering dropped objects at depth. When dropped objects are unable to be recovered, the impact will continue to be localised but would also be long-term.

In the event that infrastructure is dropped during removal and recovery activities, potential environmental effects would also be limited to localised physical impacts on benthic communities and temporary increases in turbidity in the location where the infrastructure was dropped. These are likely to be consistent with the impacts from removal of the infrastructure itself as assessed in **Section 6.8.2**.

The temporary or permanent loss of dropped objects including infrastructure into the marine environment is not likely to have a significant environmental impact, as the benthic communities associated with the Operational Area are of low sensitivity and are broadly represented throughout the NWMR. As described in **Section 4**, the Ancient Coastline at 125 m Depth Contour KEF is located within the Operational Area. The habitat types associated with the hard substrate that characterises the Ancient Coastline at 125 m Depth Contour KEF are not considered to be unique by Falkner *et al.* (2009) in their review of KEFs in the NWMR. Furthermore, benthic habitats in the Operational Area are expected to consist of bare unconsolidated sediments dominated by silt and clay fractions (**Section 4.3.4**). Given the nature and scale of risks and consequences from dropped objects or infrastructure, seabed sensitivities associated with the Operational Area will not be significantly impacted. Further, considering the types, size and frequency of dropped objects that could occur, it is unlikely that a dropped object would have a significant impact on any benthic community.

As discussed in **Section 6.7.2**, there is potential for activities to occur within or adjacent to the 500 m exclusion zone of the operating GWA facility or near other live subsea infrastructure overlapping the Operational Area. Risks associated with this include damage to live infrastructure from dropped objects which could result in a loss of hydrocarbons to the environment. The worst-case credible hydrocarbon release scenarios from these risks have been defined and assessed in the GWA Operations EP (currently under assessment). Controls for prevention of dropped objects on live infrastructure as a result of the Petroleum Activities Program have been included below.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls and the predicted small footprint of a dropped object, it is considered that a dropped object or infrastructure will result in only localised impacts to a small area of the seabed and a small proportion of the benthic population; however, no significant impact to environmental receptors, and with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)20***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
The project vessels' work procedures for lifts, bulk transfers and cargo loading, which require: • The security of loads shall be checked before commencing lifts. • Loads shall be covered if there is a risk of loss of loose materials. • Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	F: Yes. CS: Minimal cost. Standard practice.	Occurs after a dropped object event and therefore no change to the likelihood. Since the object may be recovered, a reduction in consequence is possible.	Benefits outweigh cost/sacrifice.	Yes **C 14.1**
Project vessel inductions include control measures and training for crew in dropped object prevention.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring crew are appropriately trained in dropped object prevention, the likelihood of a dropped object event is reduced. No change in consequence will occur.	Benefits outweigh cost/sacrifice.	Yes **C 14.2**
Dropped objects/waste will be recovered using the project vessel ROV, crane or support vessel when safe and practicable.	F: Yes. CS: Minimal cost. Standard practice.	Occurs after an object has been dropped and therefore no change to the likelihood. Since the objects may be	Benefit outweighs cost/sacrifice	Yes **C 14.3**

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[20] Qualitative measure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)20***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
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, or ROV availability and suitable weather)		recovered, a reduction in consequence is possible.		
Infrastructure with potential to cause damage to live infrastructure within the Operational Area resulting in a loss of containment will be cut and walked to beyond a calculated drop radius before being recovered.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring infrastructure is lifted beyond a calculated drop radius to reduce the likelihood of damage to live infrastructure.	Benefit outweighs cost sacrifice.	Yes **C 14.4**
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls 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 seabed disturbance from dropped objects. 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 A dropped object or infrastructure resulting in seabed disturbance represents a low current risk rating and may result in localised impacts with no lasting effect (<1 month) to environmental receptors. The adopted controls are considered consistent with industry good practice. Therefore, Woodside considers the adopted controls appropriate to manage the risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 14 No incidents of dropped objects to the marine environment greater than a consequence level of F[21] during the Petroleum Activities Program.	**C 14.1** The project vessels' work procedures for lifts, bulk transfers and cargo loading, which require: • the security of loads to be checked before commencing lifts • loads to be covered if there is a risk of losing loose materials • lifting operations to be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	**PS 14.1** All lifts conducted in accordance with applicable project vessels' work procedures to limit potential for dropped objects.	**MC 14.1.1** Records show lifts conducted in accordance with the applicable project vessels' work procedures.
	C 14.2 Project vessel inductions include control measures and training for crew in dropped object prevention.	**PS 14.2** Project vessels crews aware of requirements for dropped object prevention.	**MC 14.2.1** Records show dropped object prevention training is provided to the project vessels.
	C 14.3 Dropped objects/waste will be recovered using the project vessel ROV, crane or support vessel when safe and practicable. Consideration will be given to: • risk to personnel to retrieve object • whether the location of the object is in recoverable water depths • nature of object, lifting equipment, or ROV availability and suitable weather	**PS 14.3.1** Any objects dropped to the marine environment will be recovered where safe and practicable to do so.	**MC 14.3.1** Records detail the recovery of any objects/waste lost to the marine environment.
	C 14.4 Infrastructure with potential to cause damage to live infrastructure within the Operational Area will be cut and walked to beyond a calculated drop radius before being recovered.	**PS 14.4** Infrastructure is recovered outside calculated drop radii around live infrastructure.	**MC 14.4** Records demonstrate drop radii are calculated for any removal activities in proximity to live infrastructure, and infrastructure is recovered outside these radii.

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[21] Defined as 'No lasting effect (less than one month). Localised impact not significant to areas or items of cultural significance)'.

6.9.8 Physical Presence: Accidental Introduction and Establishment of Invasive Marine Species

Context		
Project vessels – **Section 3.10**	Physical environment – **Section 4.3** Biological environment – **Section 4.4** Socio-economic – **Section 4.5**	Stakeholder consultation – **Section 5**

Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-Economic***	***Decision Type***	***Consequence***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Introduction of invasive marine species (IMS).				X	X	X	A	E	0	L	LCS GP PJ	Broadly Acceptable	EPO 15

Description of Source of Risk

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 can survive, reproduce, and establish founder populations. However, not all NIMS introduced into an area will thrive or cause demonstrable impacts (i.e. become IMS). Most 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.

NIMS can be translocated from a donor to a recipient location by two mechanisms - within a ship's ballast water or as biofouling on a vessel's submerged surfaces or internal systems. During the Petroleum Activities Program, vessels undertaking activities will be transiting to and from the Operational Area, potentially including mobilising from beyond Australian waters (**Section 3.10**).

A section of the Echo Yodel pipeline spool was removed in 2018 and opportunistic testing was undertaken to determine potential presence of IMS. Identification was undertaken using ROV video footage, still images and dried samples. The ROV video footage and still photographic images of biofouling were analysed for IMS identification.

Diverse tertiary biofouling (i.e. structurally complex) assemblages of sessile and mobile species were identified on the pipeline at ~130 m water depth. ROV footage and images did not allow for clear identification of species, however potentially some Didemnum species colonies were observed. No evidence of other IMS of concern was observed. Three dried samples were collected and preserved to determine the presence of Didemnum species such as *Didemnum perlucidum* or *Didemnum vexillum*. No Didemnum species was observed amongst the samples tested.

Whilst testing results and water depth of the Operational Area suggest that no IMS will be present on subsea infrastructure, should the infrastructure being removed contain NIMS, these have the potential to be translocated from one environment to another during the transport of the infrastructure to shore. However, this risk will be minimised as the majority of the marine growth will be cleared from the infrastructure during the recovery process in the Operational Area using high pressure water jetting and potentially citric acid. Following cleaning, the infrastructure will be stored dry on the vessel until it is offloaded reducing the risk of survival of any remaining marine species.

All project vessels are subject to some level of marine fouling whereby organisms attach to the vessel hull. This could particularly occur 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). Organisms can also be drawn into ballast tanks during onboarding of ballast water as cargo is loaded or to balance vessels under load.

During the Petroleum Activities Program, project vessels and submersible equipment such as ROVs have the potential to introduce IMS to the Operational Area through marine fouling (containing IMS) on vessels as well as within high-risk ballast water discharge. Cross contamination between vessels can also occur (e.g. IMS translocated between project vessels) during times when vessels need to be alongside each other.

Impact Assessment

Potential Impacts to Ecosystems/Habitats, Species and Socio-economic 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.

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 deepwater 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).

While project vessels have the potential to introduce IMS into the Operational Area, the deep offshore open waters of the Operational Area (which is more than 100 m deep) is not conducive to the settlement and establishment of IMS. Furthermore, the Operational Area away from shorelines and/or critical habitat. The likelihood of IMS being introduced and establishing viable populations within the Operational Area or immediate surrounds is considered not credible.

Furthermore, the removal of marine growth from the infrastructure and storage on board the vessel in dry conditions prior to departing the Operational will minimise the risk of transporting IMS (should they occur) to other shallower habitats.

Summary of Potential 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 6-9**.

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 6-9: Evaluation of risks and impacts from IMS translocation

IMS Introduction Location	Credibility of Introduction	Consequence of Introduction	Likelihood
Introduced to Operational Area and establishment on the seafloor	*Not Credible* 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 Operational Area and establishment on a project vessel.	*Credible* There is potential for the transfer of marine pests between project vessels within the Operational Area.	*Environment – Not credible* The translocation of IMS from a colonised project vessel to another vessel and then to the environment is not credible. This is because the Operational Area is in deep open waters away from shorelines and/or critical habitat. Furthermore, the translocation to shallower environments via	*Remote (0)* Interactions between project vessels will be limited during the Petroleum Activities Program. Due to the short timeframe for the activity, there will

		natural dispersion from a project vessel is not considered credible, given the distances of the Operational Area from nearshore environments (i.e. greater than 12 nm/50 m water depth). On this basis there is no credible environmental risk. *Reputation – D* If IMS were to establish on a project vessel, from another colonised vessel, this could potentially impact the vessel operationally through the fouling of intakes, and potentially cause the infected vessels to be quarantined and requiring costly cleaning. Such introduction would be expected to have minor impact to Woodside's reputation, particularly with Woodside's contractors, and may impact future proposals. This would likely have a reputational impact on future proposals.	be limited interactions between the specialised pipe removal vessels and the offshore support vessel(s). Spread of marine pests via ballast water or spawning in these open ocean environments is also considered remote.
Transferred between project vessels and from project vessels to other marine environments beyond the Operational Area.	*Not Credible* This risk is considered so remote that it is not 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, deep 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 the nearshore waters to which the infected vessel travels.		
Transferred from recovered subsea infrastructure to other marine environments beyond the Operational Area	*Not Credible* This risk is considered so remote that it is not credible for the purposes of the activity. As described above, 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. Furthermore, results from inspection of the pipeline spool conducted in 2018 found no evidence of IMS. Infrastructure recovered will be loaded onto vessel decks and will be cleaned to remove marine growth, including possible IMS, within the Operational Area using high pressure water jetting and potentially citric acid (**Section 3.7.2.1**). Following cleaning, the infrastructure will be stored dry on the vessel until it is offloaded. If marine pests were present on the infrastructure and not removed during cleaning, they would need to survive in a dry environment on the vessel for a significant period of time, and be subsequently transferred from the infrastructure to waters outside the Operational Area (e.g. during offloading). It would then need conditions conducive to establishing a viable population in nearshore waters to which the vessel transported the equipment travels.		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[1]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements.	F: Yes. CS: Minimal cost. Standard practice.	The use of an approved ballast water treatment system will reduce the likelihood of transfer of 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 15.1**
Good Practice				
Woodside's IMS risk assessment process[22] will be applied to the project vessels and relevant 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 • 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.	F: Yes. CS: Minimal cost. Good practice implemented across all Woodside Operations.	The IMS risk assessment process will identify potential risks and additional controls implemented accordingly. In doing so, the likelihood of transferring marine pests between project vessels within the Operational Area are reduced. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	Yes **C 15.2**

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[1] Qualitative measure.

[22] 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)[1]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• 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.				
Professional Judgement – Eliminate				
No exchange of ballast water during the Petroleum Activities Program.	F: No. Ballast water exchanges are critical for maintaining vessel stability during recovery operations. 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 project vessels.	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. While the project will attempt to source project vessels locally, availability is not guaranteed. There	Sourcing vessels from within Australia will reduce the likelihood of IMS from outside Australian	Disproportionate. Sourcing vessels from Australian waters may result in a slight reduction in	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[1]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	are limited project vessels based in Australian waters and sourcing Australian based project vessels only will cause increases in cost due to pressures of vessel availability. CS: Significant cost and schedule impacts due to supply restrictions.	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.	the likelihood of introducing IMS to the Operational Area but 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.	
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 manage the introduction of IMS through biofouling, while targeting its efforts and resources to areas of greatest concern.	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 implemented. No change in consequence would occur.	Disproportionate. The cost/sacrifice outweighs the benefit gained, as other controls that are proposed to be implemented achieve an ALARP position.	No
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 that the adopted controls are 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 cost, the risks and consequences are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The accidental introduction and establishment of IMS represents a low current risk rating and may result in slight, short-term impacts (>1 year) on habitat (but not affecting ecosystems function) or biological attributes. BIAs within the Operational Area include flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted. The adopted controls are considered consistent with industry LCS good practice and professional judgment. Therefore, Woodside considers the adopted controls appropriate to manage the risk to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 15 No introduction and establishment of IMS into the Operational Area as a result of the Petroleum Activities Program.	**C 15.1** Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements.	**PS 15.1** Project vessels manage ballast water in accordance with Australian Ballast Water Management Requirements.	**MC 15.1.1** Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements.
	C 15.2 Woodside's IMS risk assessment process[23] will be applied to project vessels and relevant immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels: • vessel type	**PS 15.2.1** Before entering the Operational Area, project vessels and relevant immersible equipment are determined to be low risk[24] of introducing IMS of concern, and maintain this low risk status to mobilisation.	**MC15.2.1** Records of IMS risk assessments maintained for all project vessels and relevant immersible equipment entering the Operational Area to undertake the Petroleum Activities Program.

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[23] 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).

[24] 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***
	• 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 15.2.2** 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 15.2.2** Records confirm that the IMS risk assessments undertaken by an Environment Adviser or IMS inspector (as relevant).

6.10 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 1.9.1.3**, 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 for species overlapping the Operational Area) are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)
- Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a)
- Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 (Commonwealth of Australia, 2014)
- Sawfishes and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b)
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Commonwealth of Australia, 2018).

Table 6-10 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 not inconsistent with that action. The results of this assessment against relevant actions are presented in **Table 6-11** to **Table 6-15.**

Table 6-10: 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			
1. 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		
2. The management of marine turtles is supported	Y		
3. Anthropogenic threats are demonstrably minimised	Y	Y	Y
4. 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. Adaptatively 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		
B. Enabling and measuring recovery			

EPBC Act Part 13 Statutory Instrument	**Applicable to:**		
	Government	***Titleholder***	***Petroleum Activities Program***
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			
1. The conservation status of blue whale populations is assessed using efficient and robust methodology	Y		
2. The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described	Y	Y	Y
3. Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place	Y		
4. 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		
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			

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
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			
1. Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters	Y		
2. Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
3. Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
4. Where practicable, minimise the impact of shark control activities on the grey nurse shark	Y		
5. Investigate and manage the impact of ecotourism on the grey nurse shark	Y		
6. Manage the impact of aquarium collection on the grey nurse shark	Y		
7. Improve understanding of the threat of pollution and disease to the grey nurse shark	Y	Y	Y
8. 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	
9. Continue to develop and implement research programs to support the conservation of the grey nurse shark	Y	Y	
10. Promote community education and awareness in relation to grey nurse shark conservation and management	Y		
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

EPBC Act Part 13 Statutory Instrument	**Applicable to:**		
	Government	***Titleholder***	***Petroleum Activities Program***
Specific Objectives			
1. Reduce and, where possible, eliminate adverse impacts of commercial fishing on sawfish and river shark species	Y		
2. Reduce and, where possible, eliminate adverse impacts of recreational fishing on sawfish and river shark species	Y		
3. Reduce and, where possible, eliminate adverse impacts of Indigenous fishing on sawfish and river shark species	Y		
4. Reduce and, where possible, eliminate the impact of illegal, unregulated and unreported fishing on sawfish and river shark species	Y		
5. Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	Y	Y	Y
6. Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species noting the linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life	Y	Y	Y
7. Reduce and, where possible, eliminate any adverse impacts of collection for public aquaria on sawfish and river shark species	Y		
8. 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		
9. Develop research programs to assist conservation of sawfish and river shark species	Y	Y	
10. Improve community understanding and awareness in relation to sawfish and river shark conservation and management	Y		
Marine Debris Threat Abatement Plan			
Objectives			
1. Contribute to long-term prevention of the incidence of marine debris	Y	Y	
2. Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations	Y	Y	Y
3. Remove existing marine debris	Y	Y	Y
4. Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris	Y		
5. 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 6-11: 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 – no relevant actions	Refer **Section 6.9.5** and **Section 6.8.2** **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles. The proposal would remove the infrastructure, including the majority of the plastics, from the marine environment.	**EPO 11** **C 11.1, 11.2, 11.3** **PS 11.1.1, 11.2.1, 11.3.1**
	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	Refer **Sections 6.9.2, 6.9.3, 6.9.4** **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 7.9** 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	Refer **Sections 6.8.7** **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	**EPO 7** **C 7.1** **PS 7.1.1, 7.1.2, 7.1.3**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
		• F-Pil – Manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and emerging/dispersing hatchlings can continue	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. Controls adopted to minimise impacts to wedge-tailed shearwaters from light emissions may reduce any potential disturbance to marine turtles.	
	Action Area B1: Determine trends at index beaches	**Action**: Maintain or establish long-term monitoring programs at index beaches to collect 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 – no relevant actions	**Not inconsistent assessment**: Woodside contributes to Action Area B1 via its support of the Ningaloo Turtle Program[25].	N/A
	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 NWS stock to other stocks • LH-WA – no relevant actions	Refer **Sections 6.8.3** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to marine turtles. Vessel and transponder 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

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[25] http://www.ningalooturtles.org.au/media_reports.html

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
		- F-Pil – no relevant actions		

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 6-12: 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 6.8.3** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to cetaceans, including pygmy blue whales. Acoustic emissions from project vessels will not cause injury to any pygmy blue whale. There are no known or possible foraging areas for pygmy blue whales within or adjacent to Operational Area. If the Petroleum Activities Program within Operational Area overlaps with northbound or southbound migration, individuals may deviate slightly from the migratory route, but will continue on their migration. Controls applied to manage vessel collision with marine fauna may further reduce impact from noise emissions; however, reduction is expected to be negligible.	**EPO 13** **C 13.1** **PS 13.1.1, 13.1.2**
	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 6.9.6** **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 within Operational Area overlaps with northbound or southbound migration, individuals may deviate slightly from the migratory route, but will continue on their migration. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the very slow vessel speeds and the fact there are no known or possible foraging areas for pygmy blue whales within or adjacent to Operational Area.	**EPO 13** **C 13.1** **PS 13.1.1, 13.1.2**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
	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[26]).	N/A
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.				

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[26] 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

Table 6-13: 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 **Section 6.9.5** **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish and river shark. The proposal would remove the infrastructure, including the majority of the plastics, from the marine environment.	**EPO 11** **C 11.1, 11.2, 11.3** **PS 11.1.1, 11.2.1, 11.3.1**
			Refer **Sections 6.9.2, 6.9.3, 6.9.4** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to grey nurse sharks.	Refer **Section 7.9** 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 6-14: 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 6.9.2, 6.9.3, 6.9.4** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to sawfish and river shark.	Refer **Section 7.9** 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 6.9.5** and **Section 6.8.2** **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish and river shark. The proposal would remove the infrastructure, including the majority of the plastics, from the marine environment.	**EPO 11** **C 11.1, 11.2, 11.3** **PS 11.1.1, 11.2.1, 11.3.1**
Assessment Summary 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 6-15: 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 2**: Understand the scale of marine plastic and microplastic impact on key species, ecological communities and locations	**Action 2.04**: Build understanding related to plastic and microplastic pollution	Refer **Section 6.9.5** and **Section 6.8.2** **Not inconsistent assessment**: The proposal would remove the infrastructure, including the majority of the plastics, from the marine environment. The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to the marine environment. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the Petroleum Activities Program	**EPO 11** **C 11.1, 11.2, 11.3** **PS 11.1.1, 11.2.1, 11.3.1**
	Objective 3: Remove existing marine debris	**Action 3.01**: Support beach-based clean-up efforts	**Not inconsistent assessment**: Implementation of the plastics offsets program will contribute to outputs from this action, as identified in the Marine Debris TAP: • Removal of marine debris from Australia's coastal environment • Collected materials reused, recycled or appropriately land-filled • Data on the types of marine debris collected in beach-based clean-up efforts	N/A

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.

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 environmental risks and impacts are continually being reduced to ALARP and are acceptable, and that EPOs and standards outlined in this EP are achieved.

Woodside, as Operator, is responsible for ensuring the Petroleum Activities Program is managed in accordance with this Implementation Strategy and the WMS (see **Section 1.9**).

7.2 Systems, Practice and Procedures

All operational activities are planned and performed in accordance with relevant legislation and standards, management measures identified in this EP and internal environment standards and procedures (**Section 6**).

The systems, practices and procedures that will be implemented are listed in the Performance Standards (PS) contained in this EP. Document names and reference numbers may change during the statutory duration of this EP and is managed through a change register and update 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)*.

Table 7-1: Roles and Responsibilities

Title (role)	Environmental Responsibilities
Office-based Personnel	
Woodside Project Manager	• 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 activities are performed as per this EP and approval conditions. • Ensure all project and support vessel crew members complete an HSE induction. • Verify that contractors meet environmental related contractual obligations. • Confirm controls and performance standards in this EP are actioned, as required, before activities commence. • 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.
Subsea Delivery Manager	• Ensure the subsea activities are performed as per this EP and approval conditions. • Provide sufficient resources to implement the subsea related management measures (i.e. controls, EPOs, PSs and MC) in this EP. • Ensure vessel personnel are given an Environmental Induction, as per **Section 7.4.2**, of this EP at the start of the activities. • Confirm controls and performance standards in this EP are actioned, as required, before activities commence. • Ensure relevant vessels meet the requirements of Woodside's Marine Operations Operating Standard. • Communicate changes to the subsea program to the Woodside Environmental Adviser in a timely manner. • Ensure all chemicals proposed to be discharged are assessed and approved as per the requirements of the EP.

Title (role)	Environmental Responsibilities
Woodside Environmental Adviser	• Verify relevant Environmental Approvals for the activities exist before commencing activity. • Track compliance with performance outcomes and performance standards as per the requirements of this EP. • Prepare environmental component of relevant Induction Package. • Assist with the review, investigation and reporting of environmental incidents. • Ensure environmental monitoring and inspections/audits are performed as per the requirements of this EP. • 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. • Monitor and close out corrective actions (Campaign Action Register) identified during environmental monitoring or audits. • Provide advice to relevant Woodside personnel and contractors to help them understand their environment responsibilities. • Liaise with contractors to ensure communication and understanding of environment requirements as outlined in this EP and in line with Woodside's Compass values and management systems.
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	• Conduct relevant audit and inspection to confirm vessels comply with relevant Marine Orders and Woodside Marine Charters Instructions requirements to meet safety, navigation and emergency response 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.

Title (role)	Environmental Responsibilities
Vessel-based Personnel	
Vessel 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. • Ensure 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 performance standards detailed in this EP are reported immediately to the Woodside Site Representative. • Ensure corrective actions for incidents or breaches are developed, communicated to the Woodside Site Representative, and tracked to close out in a timely manner. Close out of actions must be communicated to the Woodside Site Representative.
Vessel Logistics Coordinators	• Ensure waste is managed on the relevant support vessels and sent to shore as per the relevant waste management plan (WMP).
HSE Advisers	• Support the Woodside Site Representative to ensure the controls detailed in this EP relevant to offshore activities are implemented on the vessel and assist in collecting and recording evidence of implementation (other controls are implemented and evidence collected onshore). • Support the Woodside Site Representative to ensure the EPOs are met and the performance standards detailed in this EP are implemented on the vessel. • Support the Woodside Site Representative to ensure environmental incidents or breaches of outcomes or standards outlined in this EP are reported, and corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner. • Ensure periodic environmental inspections/reviews are completed and corrective actions from inspections are developed, tracked and closed out in a timely manner.
Woodside Site Representative	• Support the Subsea Delivery Manager and the Project Manager to ensure the environmental performance outcomes are met and the performance standards detailed in this EP are implemented on the project vessels. • Any environmental incidents or breaches of relevant environmental performance outcomes or performance standards detailed in this EP, are reported to the Subsea Delivery Manager and the Environment Adviser. Corrective actions for incidents or breaches are developed, communicated and tracked to close out in a timely manner. • Participation in periodic environmental inspections to ensure regular checking of compliance with the EP.

Title (role)	Environmental Responsibilities
Offshore Supervisor (Contractor)	• Confirm activities are performed in accordance with this EP, as detailed in the Woodside-approved Contactor Environmental Management Plan. • Ensure personnel commencing work on the project receive a relevant environmental induction that meets the requirements specified in this EP. • Ensure personnel are competent to perform the work they have been assigned. • Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP, are reported immediately to the Woodside Site Representative or Vessel Master.

It is the responsibility of all Woodside employees and contractors to implement the Woodside Corporate HSE and Risk Management Policies (**Appendix A**) in their areas of responsibility and that the personnel are suitably trained and competent in their respective roles.

7.4 Training and Competency

7.4.1 Overview

Woodside as part of its contracting process assesses a proposed contractor's EMS to determine the level of compliance with the standard AS/NZ ISO 14001. This assessment is performed for the Petroleum Activities Program as part of the pre-mobilisation process. The assessment determines whether there is a clearly defined organisational structure that clearly defines the roles and responsibilities for key positions. The assessment also assesses whether there is an up-to-date training matrix that defines any corporate and site/activity specific environmental training and competency requirements.

As a minimum, environmental awareness training is required for all personnel, detailing awareness and compliance with the contractor's environmental policy and EMS.

7.4.2 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 will be 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 EMS– HSE Policy
- EP importance/structure/implementation/roles and responsibilities
- main environmental aspects/hazards and potential environmental impacts and related EPOs, EPs and MC
- oil spill preparedness and response
- monitoring and reporting on performance outcomes and standards using MC
- incident reporting.

7.4.3 Petroleum Activities Program Specific Environmental Awareness

Before commencing the subsea campaigns associated with the Petroleum Activities Program, a pre-activity meeting will be held on the vessels with all relevant personnel. The pre-activity meeting provides an opportunity to reiterate specific environmental sensitivities or commitments associated with the activity. Relevant sections of the pre-activity meeting will also be communicated to the support vessel personnel. Attendance lists are recorded and retained.

During operations, regular HSE meetings will be held on the vessels. During these meetings, recent environmental incidents are reviewed and awareness material presented regularly.

7.4.4 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 performed and identifying minimum training requirements.

7.5 Monitoring, Auditing, Management of Non-conformance and Review

7.5.1 Monitoring

Woodside and its contractors will perform a program of periodic monitoring during the Petroleum Activities Program – starting at mobilisation of each activity, 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 EPOs, EPS and MC in this EP. The tools and systems will collect, as a minimum, the data (evidence) referred to in the MC in **Section 6** and **Appendix D**.

The collection of this data (against the MC) will form part of the permanent record of compliance maintained by Woodside and will form the basis for demonstrating that the EPOs and standards are met, which will be summarised in a series of routine reporting documents.

7.5.1.1 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 to record and submit safety and environment risk observation cards routinely (frequency varies with contractor)
- collection of evidence of compliance with the controls detailed in the EP relevant to offshore activities by the Woodside Offshore HSE Adviser (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 the function scorecard for KPIs
- internal auditing and assurance program as described in **Section 7.5.2**.

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 7.5.2**.

7.5.1.2 Management of Knowledge

Review of knowledge relevant to the existing environment is undertaken 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 stakeholder information
- environmental legislation.

The frequency and record of reviews, communication of relevant new knowledge and consideration of management of change are documented in the WMS EP Guideline.

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.

7.5.2 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 Performance Outcomes, Controls and Standards detailed in this EP.

Internal auditing will be performed to cover each key project activity as summarised below.

7.5.2.1 Subsea Scope Activities

The following internal auditing will be performed for the subsea scope activities:

- Pre-mobilisation inspection/audit report will be conducted by a relevant person (before commencing). The scope of the audits is risk-based and specific to the relevant activity, but will generally focus on aspects relating to ensuring appropriate understanding of environmental commitments and the operational readiness of the activity scope, including appropriate environmental controls in place. All primary vessels associated with the subsea removal activities will be audited by Woodside. Support or transport vessels will be assessed on a risk-based approach, but will be audited via the primary contractor’s process.
- At least one operational compliance audit relevant to applicable EP commitments will be conducted by a Woodside Environment Adviser for the decommissioning campaign. The audit may be conducted offshore or office-based, subject to the duration of the activity and logistics of performing the audit offshore for short duration scopes.
- Contractor-specific HSE audits will also be conducted of the associated support vessels. The audits will consider the implementation of HSE management, risk management, as well as pre-mobilisation and offshore readiness.
- Vessel based HSE inspections will be conducted fortnightly by vessel HSE personnel. Each inspection will focus on a specific risk area relevant to the project activity and a formal report will be issued (for example, bunkering controls, chemical and discharge management, cetacean reporting, etc).

The internal audits and reviews, combined with the ongoing monitoring described in **Section 7.5.1**, and collection of evidence for MC are used to assess EPOs and standards.

As part of Woodside’s EMS and/or assurances processes, activities may also be 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.

This Environmental Commitments and Actions Register is used to track subsea support vessel and subsea activity compliance with EP commitments, including any findings and corrective actions.

Non-conformances identified will be reported and/or tracked in accordance with **Section 7.8.3** and **Section 7.8.4**.

7.5.2.2 Marine Assurance

Woodside's marine assurance is managed by the Marine Assurance Team of the Logistics Function in accordance with Woodside's Marine Offshore Vessel Assurance Procedure. The Woodside process is 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 process is mandatory for all vessels (other than tankers and floating production storage and offloading vessels) hired for Woodside operations, including for short term hires (i.e. <3 months in duration). It defines applicable marine offshore assurance activities, ensuring all vessel operators operate seaworthy vessels that meet the requirements for a defined scope of work and are managed with a robust safety management system.

The process is multi-faceted and encompasses the following marine assurance activities:

- Offshore Vessel Safety Management System assessment (OVMSA)
- DP system verification
- Offshore Vessel Inspection Database (OVID) or condition and suitability assessment
- project support for tender review, evaluation and pre/post contract award.

Vessel inspections are used to verify actual levels of compliance with the company's Safety Management System, the overall condition of the vessel and the status of the planned maintenance system onboard. Woodside Marine Assurance Specialist will conduct a risk assessment on the vessel to determine the level of assurance applied and the type of vessel inspection required.

Methods of vessel inspection may include, and are not limited to:

- Woodside Marine Vessel Inspection
- OCIMF OVID Inspection
- IMCA CMID Inspection
- Marine Warranty Survey.

Upon completion of the marine assurance process, to confirm that identified concerns are addressed appropriately and conditions imposed are managed, the Woodside Marine Assurance Team will issue the vessel a statement of approval. Should a vessel not meet the requirements of the Woodside Marine Offshore Vessel Assurance Process and be rejected, there does exist an opportunity to further scrutinise the proposed vessel.

Where a vessel inspection and/or OVMSA verification review is not available and all reasonable efforts based on time and resource availability have been made to complete this (e.g. short term vessel hire), the Marine Assurance Specialist Offshore may approve the use of an alternate means of inspection, known as a risk assessment.

7.5.2.3 Risk Assessment

Woodside conducts a risk assessment of vessels where either an OVMSA Verification Review and/or vessel inspection cannot be completed. 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 Specialist, 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.

7.5.3 Management of Non-conformance

Woodside classifies non-conformances with EPOs 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 HSE Event Reporting and Investigation Procedure which includes learning requirements.

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 2.7**). Detailed investigations are completed for all categories A, B, C and high potential environmental incidents.

7.5.4 Review

7.5.4.1 Management Review

Within the Environment Function, senior management regularly monitor and review environmental performance and the effectiveness of managing environmental risks and performance. Within each Function and Business Unit Leadership Team (e.g. Subsea and Developments/Projects), managers review environmental performance regularly, including through quarterly HSE review meetings.

Woodside's Environment Team will perform six-monthly reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- environment KPIs (leading and lagging)
- tools and systems to monitor environmental performance (detailed in **Section 7.5.1**)
- lessons learned about implementation tools and throughout each campaign.

Reviews of oil spill arrangements and testing are performed in accordance with **Section 7.9**.

7.5.4.2 Learning and Knowledge Sharing

Learning and knowledge sharing occurs via a number of different methods including:

- event investigations
- event bulletins
- after action review conducted at the end of the activity, including review of environmental incidents as relevant
- ongoing communication with vessel operators
- formal and informal industry benchmarking
- cross asset learnings
- engineering and technical authorities discipline communications and sharing.

7.5.4.3 Review of Impacts, Risks and Controls Across the Life of the EP

In the unlikely case that activities described in this EP do not occur continuously or sequentially, before recommencing activities after a cessation period greater than 12 months, impacts, risks and controls will be reviewed.

The process will identify or review impacts and risks associated with the newly-commencing activity, and will identify or review controls to ensure impacts and risks remain/are reduced to ALARP and acceptable levels. Information learned from previous activities conducted under this EP will be considered. Controls which have previously been excluded on the basis of proportionality will be reconsidered. Any required changes will be managed by the MOC process outlined below (**Section 7.6**).

7.6 Management of Change and Revision

7.6.1 Environment Plan 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, DAWE 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 (**Section 3**); 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 2.6**) 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.

7.6.2 OPEP Management of Change

Relevant documents from the OPEP 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 EP, including OPEP, resubmission is required (see **Section 7.6.1**).

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.

7.7 Record Keeping

Compliance records (outlined in MC in **Section 6**) will be maintained.

Record keeping will be in accordance with Regulation 14(7) that addresses maintaining records of emissions and discharges.

7.8 Reporting

To meet the EPOs and standards outlined in this EP, Woodside reports at a number of levels, as outlined in the next sections.

7.8.1 Routine Reporting (Internal)

7.8.1.1 Daily Progress Reports and Meetings

Daily reports are prepared and issued to key support personnel and stakeholders, by relevant managers responsible for the activities. The report provides performance information, 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.

7.8.1.2 Regular HSE Meetings

Regular dedicated HSE meetings are held with the offshore and Perth-based management and advisers to address targeted HSE incidents and initiatives. Minutes of these meetings are produced and distributed as appropriate.

7.8.1.3 Performance Reporting

Monthly and quarterly performance reports are developed and reviewed by the Function and Business Unit Leadership Teams. 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 KPI targets, which include environmental metrics
- outstanding actions as a result of audits or incident investigations
- technical high and low lights.

7.8.2 Routine Reporting (External)

7.8.2.1 Start and End Notifications of the Petroleum Activities Program

In accordance with Regulation 29, Woodside will notify NOPSEMA and DMIRS of the commencement of the Petroleum Activities Program at least ten days before the activity commences and will notify NOPSEMA and DMIRS within ten days of completing the activity.

7.8.2.2 Environmental Performance Review and Reporting

In accordance with applicable environmental legislation for the activity, Woodside is required to report information about environmental performance to the appropriate regulator. Regulatory reporting requirements are summarised in **Table 7-2**.

Table 7-2: Routine external reporting requirements

Report	Recipient	Frequency	Content
Monthly Recordable Incident Reports (**Appendix E)**	NOPSEMA	Monthly, by the 15th day of each month.	Details of recordable incidents that have occurred during the Petroleum Activities Program for previous month (if applicable).
Environmental Performance Report	NOPSEMA	Annually, with the first report submitted within 12 months of the commencement of the Petroleum Activities Program covered by this EP (as per the requirements of Regulation 14(2).	Compliance with EPOs, controls and standards outlined in this EP, in accordance with the Environment Regulations.

7.8.2.3 End of the Environment Plan

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended and all of the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 25A of the Environment Regulations.

7.8.3 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 HSE Event Reporting and Investigation Procedure and this section of this EP.

7.8.4 Incident Reporting (External) – Reportable and Recordable

7.8.4.1 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 **Figure 2-4**))
- 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 **Figure 2-4**)).

The environmental risk assessment (**Section 6**) for the Petroleum Activities Program identifies those risks with a potential consequence level of C+ for environment. The incidents that have the potential to cause this level of impact include hydrocarbon loss of containment events to the marine environment resulting from a diesel spill.

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 State Minister (DMIRS) 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 DMIRS, within seven days of the written report being provided to NOPSEMA.

AMSA will be notified of oil spill incidents ASAP after their occurrence, and DAWE notified if MNES are to be affected by the oil spill incident.

7.8.4.2 Recordable Incidents

Definition

A recordable incident as defined under Regulation 4 of the Environment Regulations is an incident arising from the activity that 'breaches an environmental performance outcome or environmental performance standard, in the EP that applies to the activity, that is not a reportable incident'.

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 (**Appendix E**) 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.

7.8.4.3 Other External Incident Reporting Requirements

In addition to the notification and reporting of environmental incidents defined under the Environment Regulations and Woodside requirements, **Table 7-3** describes the incident reporting requirements that also apply in the Operational Area.

Table 7-3: 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 Rescue Coordination Centre (RCC)	As per Article 8 and Protocol I of MARPOL within two hours via the national emergency 24-hour notification contacts and a written report within 24 hours of the request by AMSA	AMSA RCC Australia	If the ship is at sea, reports are to be made to: Free call: 1800 641 792 Phone: 08 9430 2100 (Fremantle)
Oil pollution incidents in Commonwealth waters	Vessel Master	AMSA	Without delay as per Protection of the Sea Act, part II, section 11(1), AMSA RCC notified verbally via the national emergency 24-hour notification contact of the hydrocarbon spill; follow up with a written Pollution Report ASAP after verbal notification	RCC Australia	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	Vessel Master	DAWE	Reported verbally, ASAP	DNP	Phone: 02 6274 2220
Activity causes unintentional death of or injury to fauna species listed as Threatened or Migratory under the EPBC Act	Vessel Master	DAWE	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 plastic material
- 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 Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H**).

External incident reporting requirements under the OPGGS (Safety) Regulations, including under Subregulation 2.42, notices and reports of dangerous occurrences will be reported to NOPSEMA under the approved activity safety cases.

7.9 Emergency Preparedness and Response

7.9.1 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 7-4**.

Table 7-4: 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 for the Echo Yodel Decommissioning EP (**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) • Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H**) • Oil Spill Preparedness and Response Mitigation Assessment for the Echo Yodel Decommissioning EP (**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.

Content	Environment Regulations Reference	Document/Section Reference
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 for the Echo Yodel Decommissioning EP (**Appendix D**) • Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H**)
Details the arrangements for updating and testing the oil pollution response arrangements	Regulation 14(8), (8A), (8B), (8C)	EP: **Section 7.9.5** Oil Spill Preparedness and Response Mitigation Assessment for the Echo Yodel Decommissioning EP (**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 for the Echo Yodel Decommissioning EP (**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)

7.9.2 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. 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 7-5: 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.
- 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).

7.9.3 Emergency Response Preparation

The CICC, based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CICC is staffed by a roster of appropriately skilled personnel available on call 24 hours a day. The CICC, under the leadership of the CICC Leader, supports the site-based Incident Management Team by providing additional support in areas such as operations, logistics, planning, people management and public information (corporate affairs). A description of Woodside's Incident Command Structure and arrangements is further detailed 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 ERPs 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 the event of an emergency of any type:

- Vessel Master (depending on the location of the emergency) will assume overall onsite command and act as the IC. All persons will be required to act under the IC's directions. The vessels will maintain communications with the onshore project manager and/or other emergency services in the event of an emergency. Emergency response support can be provided by the contractor's emergency centre or WCC if requested by the IC.
- The vessels will have on-board equipment for responding to emergencies including medical equipment, fire-fighting equipment and oil spill response equipment.

7.9.4 Oil and Other Hazardous Materials Spill

A significant hydrocarbon spill during the proposed Petroleum Activities Program is unlikely, but should such an event occur, it has the potential to result in a serious safety or environmental incident and cause asset and reputational damage if not managed properly. The Woodside Oil Pollution Emergency Arrangements (Australia) document, supported by the Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H**) which provides tactical response guidance to the activity/area and **Appendix D** this EP, cover spill response for this Petroleum Activities Program.

The Security and Emergency Management Function is responsible for managing Woodside's hydrocarbon spill response equipment and for maintaining oil spill preparedness and response documentation. In the event of a major spill, Woodside will request that AMSA (administrator of the National Plan) provides support to 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). AMSA and Woodside have a Memorandum of Understanding in place to support Woodside in the event of an oil spill.

The Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan provides immediate actions required to commence a response (**Appendix H**).

The vessels will have SOPEPs in accordance with the requirements of MARPOL 73/78 Annex I. These plans outline responsibilities, specify procedures and identify resources available in the event of a hydrocarbon or chemical spill from vessel activities. The Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan is intended to work in conjunction with the SOPEPs, if hydrocarbons are released to the marine environment from a vessel.

Woodside has established EPOs, performance standards and MC to be used for oil spill response during the Petroleum Activities Program, as detailed in **Appendix D**.

7.9.5 Emergency and Spill Response

Woodside categorises incidents and emergencies in relation to response requirements as follows:

7.9.5.1 Level 1

Level 1 incidents are those that can be resolved using 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.

7.9.5.2 Level 2

Level 2 incidents are characterised by a response that requires external operational support to manage the incident. It is triggered if the capabilities of the tactical level response are exceeded. This support is provided to the activity by activating all or part of the responsible CICC.

7.9.5.3 Level 3

A Level 3 incident or crisis is identified as a critical event that seriously threatens the organisation's people, the environment, company assets, reputation, or livelihood. 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 ICC may also be activated as required to manage the operational incident response.

7.9.6 Emergency and Spill Response Drills and Exercises

Woodside's capability to respond to incidents will be tested periodically, in accordance with the Emergency and Crisis Management Procedure. The scope, frequency and objective of these tests is described in **Table 7-6**. Emergency response testing 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 reference points developing and scheduling emergency and crisis management exercises. External participants may be invited to attend exercises (e.g. government agencies, specialist service providers, oil spill response organisations, or industry members with which Woodside has mutual aid arrangements).

The overall objective of exercises is to test procedures, skills and the teamwork of the Emergency Response and Command Teams in their ability to respond to major accident / major environment events. After each exercise, the team holds a debriefing session, during which the exercise is reviewed. Any lessons learned or areas for improvement are identified and incorporated into revised procedures, where appropriate.

Table 7-6: Testing of response capability

Response Category	Scope	Response Testing Frequency	Response Testing Objective
Level 1 Response	Exercises are project-/ activity-specific	At least one Level 1 'First Strike' drill must be conducted during an activity. For campaigns with an operational duration of greater than one month this will occur within the first two weeks of commencing the activity and then at least every 6 month hire period thereafter.	• Comprehensive exercises test elements of the Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan (**Appendix H).** • Emergency drills are scheduled to test other aspects of the Emergency Response Plan.
Level 2 Response	Exercises are vessel specific	Level 2 Emergency Management exercises are relevant to activities with an operational duration of one month or greater. At least one Emergency Management exercise per vessel per campaign must be conducted within the first month of commencing the activity and then at least every 6 month hire period thereafter, where applicable based on duration.	• 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.

7.9.7 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:

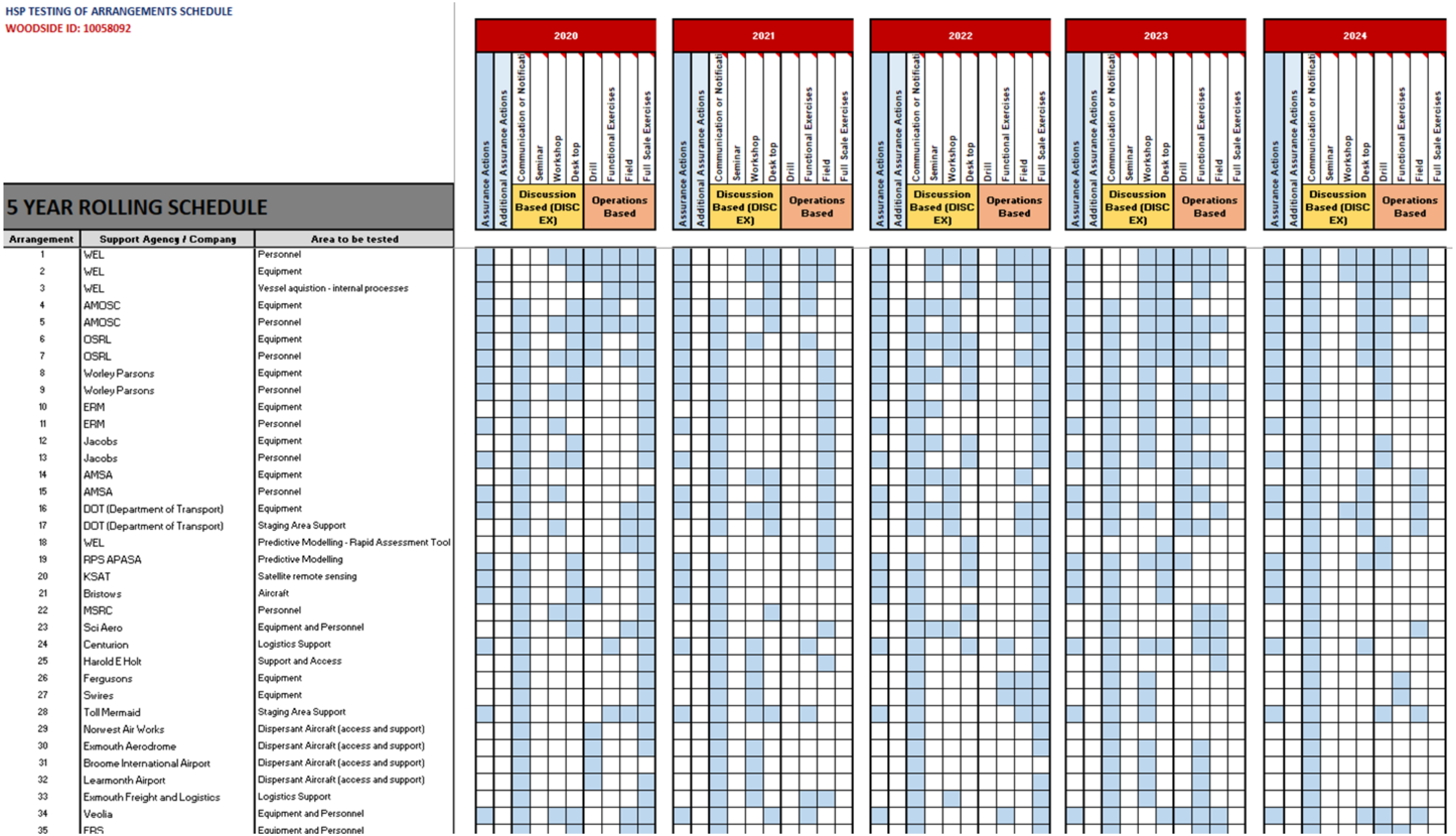
- ensure relevant responders, contractors and key personnel understand and practise their assigned roles and responsibilities
- test response arrangements and actions to validate response plans
- ensure lessons learned are incorporated into Woodside's processes and procedures and improvements are made where required.

If new response arrangements are introduced, or existing arrangements significantly amended, additional testing is undertaken accordingly. If the vessels leave the field for an extended period, additional testing will be undertaken when it returns to routine operations. 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 7-6**, up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment.

7.9.7.1 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.



HSP TESTING OF ARRANGEMENTS SCHEDULE

WOODSIDE ID: 10058092

5 YEAR ROLLING SCHEDULE

Arrangement	Support Agency / Company	Area to be tested
1	WEL	Personnel
2	WEL	Equipment
3	WEL	Vessel aquistion - internal processes
4	AMOSC	Equipment
5	AMOSC	Personnel
6	OSRL	Equipment
7	OSRL	Personnel
8	Worley Parsons	Equipment
9	Worley Parsons	Personnel
10	ERM	Equipment
11	ERM	Personnel
12	Jacobs	Equipment
13	Jacobs	Personnel
14	AMSA	Equipment
15	AMSA	Personnel
16	DOT (Department of Transport)	Equipment
17	DOT (Department of Transport)	Staging Area Support
18	WEL	Predictive Modelling - Rapid Assessment Tool
19	RPS APASA	Predictive Modelling
20	KSAT	Satellite remote sensing
21	Bristows	Aircraft
22	MSRC	Personnel
23	Sci Aero	Equipment and Personnel
24	Centurion	Logistics Support
25	Harold E Holt	Support and Access
26	Fergusons	Equipment
27	Swires	Equipment
28	Toll Mermaid	Staging Area Support
29	Norwest Air Works	Dispersant Aircraft (access and support)
30	Exmouth Aerodrome	Dispersant Aircraft (access and support)
31	Broome International Airport	Dispersant Aircraft (access and support)
32	Learmonth Airport	Dispersant Aircraft (access and support)
33	Exmouth Freight and Logistics	Logistics Support
34	Veolia	Equipment and Personnel
35	ERS	Equipment and Personnel

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 in **Section 7.9.6**.

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**).

7.9.7.2 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 7.9.7.1**)
- 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).

7.9.8 Cyclone and Dangerous Weather Preparation

As the timing of some activities associated with the Petroleum Activities Program are not yet determined, it is possible activities will overlap with the cyclone season (November to April, with most cyclones occurring between January and March). If conducting activities in cyclone season, the vessel contractors must have a Cyclone Contingency Plan (CCP) in place outlining the processes and procedures that would be implemented during a cyclone event, which will be reviewed and accepted by Woodside.

The project vessels will receive daily forecasts from the Bureau of Meteorology. If a cyclone (or severe weather event) is forecast, the path and its development will be plotted and monitored using the BoM data. If there is the potential for the cyclone (severe weather event) to affect the Petroleum Activities Program, the CCP will be actioned. If required, vessels can transit from the proposed track of the cyclone (severe weather event).

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9. GLOSSARY

Term	Meaning
(the) Regulator	The Government Agency (State or Commonwealth) that is the decision maker for approvals and performs ongoing regulation of the approval once granted
3D seismic data	A set of numerous closely-spaced seismic lines that provide a high spatially sampled measure of subsurface reflectivity and 3D image
Acceptability	The EP must demonstrate that the environmental impacts and risks of an activity will be of an acceptable level as per Regulation 10A(c).
ALARP	A legal term in Australian safety legislation, it is taken here to mean that all contributory elements and stakeholdings have been considered by assessment of costs and benefits, and which identifies a preferred course of action
API (gravity)	A measure of how heavy or light a petroleum liquid is compared to water
Australian Standard	An Australian Standard that provides criteria and guidance on design, materials, fabrication, installation, testing, commissioning, operation, maintenance, re-qualification and abandonment
Ballast	Extra weight taken on to increase a ship's stability to prevent rolling and pitching. Most ships use seawater as ballast. Empty tank space is filled with inert (non-combustible) gas to prevent the possibility of fire or explosion.
Bathymetry	Related to water depth, a bathymetry map shows the depth of water at a given location on the map.
Benthos/Benthic	Relating to the seabed and includes organisms living in or on sediments/rocks on the seabed
Biodiversity	Relates to the level of biological diversity of the environment. The EPBC Act defines biodiversity as "the variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part) and includes: (a) diversity within species and between species; and (b) diversity of ecosystems".
Biota	The animal and plant life of a particular region, habitat or geological period
Cetacean	Whale and dolphin species
Consequence	The worst-case credible outcome associated with the selected event, assuming some controls (prevention and mitigation) have failed. Where more than one impact applies (e.g. environmental and legal/compliance), the consequence level for the highest severity impact is selected.
Coral	Anthozoa that are characterised by stone-like, horny or leathery skeletons (external or internal). The skeletons of these animals are also called coral.
Coral Reef	A wave-resistant structure resulting from skeletal deposition and cementation of hermatypic corals, calcareous algae, and other calcium carbonate-secreting organisms
Crustacean	A large and variable group of mostly aquatic invertebrates that have a hard external skeleton (shell), segmented bodies, with a pair of often very modified appendages on each segment, and two pairs of antennae (e.g. crabs, crayfish, shrimps, wood lice, water fleas and barnacles)
Cyclone	A rapidly-rotating storm system characterised by a low-pressure centre, strong winds, and a spiral arrangement of thunderstorms that produce heavy rain
Datum	A reference location or elevation that is used as a starting point for subsequent measurements
dB	Decibel, a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (that is, 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies

Term	Meaning
dB re 1 µPa^2	Measure of underwater noise, in terms of sound pressure. Because the dB is a relative measure rather than an absolute measure, it must be referenced to a standard 'reference intensity', in this case 1 micro Pascal (1 mPa), which is the standard reference that is used. The dB is also measured over a specified frequency, which is usually either a one Hertz bandwidth (expressed as dB re 1 mPa2/Hz), or over a broadband that has not been filtered. Where a frequency is not specified, it can be assumed that the measurement is a broadband measurement.
dB re 1 µPa^2.s	Normal unit for sound exposure level
Demersal	Living close to the floor of the sea (typically of fish)
DRIMS	Woodside's internal document management system
Dynamic positioning	In reference to a marine vessel that uses satellite navigation and radio transponders in conjunction with thrusters to maintain its position
EC$_{50}$	The concentration of a drug, antibody or toxicant which induces a response halfway between the baseline and maximum after a specified exposure time
Echinoderms	Any of numerous radially symmetrical marine invertebrates of the phylum Echinodermata, which includes the starfishes, sea urchins and sea cucumbers, that have an internal calcareous skeleton and are often covered with spines
Endemic	A species that is native to or confined to a certain region
Environment	The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations (Source: ISO 14001)
EP	Prepared in accordance with the *OPGGS (Environment) Regulations 2009*, which must be assessed and accepted by the Designated Authority (NOPSEMA) before any petroleum-related activity can be performed
Environment Regulations	OPGGS (Environment) Regulation 2009
Environmental approval	The action of approving something, which has the potential to have an adverse impact on the environment. Environmental impact assessment is generally required before environmental approval is granted.
Environmental Hazard	The characteristic of an activity or event that could potentially cause damage, harm or adverse effects on the environment
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services (Source: HB 203:2006).
Environmental impact assessment	An orderly and systematic process for evaluating a proposal or scheme (including its alternatives), and its effects on the environment, and mitigation and management of those effects (Source: Western Australian *Environmental Impact Assessment Administrative Procedures 2010*)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth legislation designed to promote the conservation of biodiversity and protection of the environment.
Epifauna	Benthic animals that live on the surface of a substrate
Fauna	Collectively, the animal life of a particular region
Flora	Collectively, the plant life of a particular region
IC$_{50}$	A measure of the effectiveness of a compound in inhibiting biological or biochemical function
Infauna	Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom
ISO 14001	ISO 14001 is an international standard that specifies a process (called an EMS) for controlling and improving a company's environmental performance. An EMS provides a framework for managing environmental responsibilities so they become more efficient and more integrated into overall business operations.

Term	Meaning
Jig Fishing	Fishing with a jig, which is a type of fishing lure. A jig consists of a lead sinker with a hook moulded into it and usually covered by a soft body to attract fish.
LC_{50}	The concentration of a substance that is lethal to 50% of the population exposed to it for a specified time
Likelihood	The description that best fits the chance of the selected consequence actually occurring, assuming reasonable effectiveness of the prevention and mitigation controls
MARPOL (73/78)	The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978. MARPOL 73/78 is one of the most important international marine environmental conventions. It was designed to minimise pollution of the seas, including dumping, oil and exhaust pollution. Its stated objective is to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances.
Meteorology	The study of the physics, chemistry and dynamics of the earth's atmosphere, including the related effects at the air–earth boundary over both land and the oceans
Mitigation	Management measures that minimise and manage undesirable consequences
NOHSC (1008:2004)	National Occupational Health and Safety Commission – Approved Criteria for Classifying Hazardous Substances
Oligotrophic	Low in plant nutrients and having a large amount of dissolved oxygen throughout
pH	Measure of the acidity or basicity of an aqueous solution
Protected Species	Threatened, vulnerable or endangered species that are protected from extinction by preventive measures. Often governed by special Federal or State laws.
Putrescible	Refers to food scraps and other organic waste associated with food preparation that will be subject to decay and rot (putrefaction)
Risk	The combination of the consequences of an event and its associated likelihood. For guidance, see Environmental Guidance on Application of Risk Management Procedure.
Stereo-BRUVS	Stereo-baited remote underwater video systems
Sessile	Organism that is fixed in one place; immobile
Syngnathids	Family of fish which includes the seahorses, the pipefishes, and the weedy and leafy sea dragons
Teleost	A fish belonging to the Teleostei or Teleostomi, a large group of fishes with bony skeletons, including most common fishes. The teleosts are distinct from the cartilaginous fishes such as sharks, rays, and skates.
Thermocline	A temperature gradient in a thermally stratified body of water
Zooplankton	Plankton consisting of small animals and the immature stages of larger animals

9.1 Abbreviations

Abbreviation	Meaning
µm	Micrometer
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACS	Australian Custom Service
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHO	Australian Hydrographic Office
AHV	Anchor Handling Vessels

Abbreviation	Meaning
AIMS	Australian Institute of Marine Science
ALARP	As Low As Reasonably Practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
AS (NZS)	Australian Standard (New Zealand Standard)
ASAP	As soon as practicable
ASL	Above sea level
ATSB	Australian Transport Safety Bureau
bbl	Oil barrel
BC	Bioconcentration
BCF	Bioconcentration Factor
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BOP	Blow-out Preventer
BRUVS	Baited Remote Underwater Video System
CALM	Department of Conservation and Land Management
CCP	Cyclone Contingency Plan
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CFA	Commonwealth Fisheries Association
CICC	Corporate Incident Coordination Centre
CoA	Commonwealth of Australia
COABIS	Woodside’s Component Orientated Anomaly Based Inspection System
COLREGS	International Regulations for Prevention of Collisions at Sea
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
CV	Company Values
DAA	Department of Aboriginal Affairs
DAWE	Department of Agriculture, Water and Environment
DAWR	Department of Agriculture and Water Resources (now DoAWE)
dB	Decibel
DEC	Department of Environment and Conservation
DEWHA	Department of Environment, Water, Heritage and the Arts
DGPS	Differential global surface positioning system
DIIS	Department of Industry Innovation and Science
DMIRS	Department of Mines, Industry Regulation and Safety
DMP	Department of Mines and Petroleum
DNP	Director of National Parks

Abbreviation	Meaning
DAWE	Department of Agriculture, Water and the Environment
DoD	Department of Defence
DoEE	Department of the Environment and Energy
DoF	Department of Fisheries
DoT	Department of Transport
DP	Dynamically Positioned
DPIRD	Department of Primary Industries and Regional Development
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EC_{50}	half maximal effective concentration
EDS	Emergency Disconnect Sequence
EEZ	Exclusive Economic Zone
EHU	Electrohydraulic umbilical
EMBA	Environment that May Be Affected
EMS	Environmental Management System
ENVID	Environmental hazard Identification
EP	Environment Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ERP	Emergency Response Plans
ESD	Ecological Sustainable Development
FPSO	Floating Production, Storage and Offtake vessel
FRDC	Fisheries Research and Development Centre
g/m^2	Grams per square metre
GDSF	Gascoyne Demersal Scalefish Fishery
GHG	Greenhouse Gas
GP	Good Practice
GWA	Goodwyn Alpha
GWF-1	Greater Western Flank – 1
GWF-2	Greater Western Flank – 2
HDPE	High Density Polyethylene
HDXRF	High definition X-ray fluorescence
HOCNF	Harmonised Offshore Chemical Notification Format
HQ	Hazard Quotient
HSE	Health, Safety and Environment
HSPU	Hydrocarbon Spill Preparedness Unit
IAP	Incident Action Plan
IAPP	International Air Pollution Prevention
IC	Incident Controller

Abbreviation	Meaning
IC_{50}	Half maximal inhibitory concentration
ILT	In-line tee
IMO	International Marine Organisation
IMS	Invasive Marine Species
IOPP	International Oil Pollution Prevention
ISPP	International Sewage Pollution Prevention Certificate
ISV	Installation support vessel
ITF	Indonesian Through Flow
ITOPF	International Tanker Owners Pollution Federation
IUCN	International Union for Conservation of Nature
IUTB	Infield umbilical termination basket
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
KBGFC	King Bay Game Fishing Club
KEF	Key Ecological Feature
kHz	Kilohertz
km	Kilometre
kPa	Kilopascal
KPI	Key Performance Indicator
L	Litres
LBL	Long Baseline
LC_{50}	Lethal concentration, 50%
LCS	Legislation, Codes and Standards
LNG	Liquefied Natural Gas
MBES	Multibeam Echo Sounder
MC	Measurement Criteria
MCDA	Multi Criteria Decision Assessment
MEG	Mono-ethylene Glycol
MIMI	Japan Australia LNG Pty Ltd
MMA	Marine Management Area
MMO	Marine mammal observers
MNES	Matters of National Environmental Significance
MoU	Memorandum of Understanding
MP	Marine Park
MPA	Marine Protected Areas
MPRA	Marine Parks and Reserves Authority
ms^1	Metres per second
MSIN	Maritime Safety Information Notifications
NBSFC	Nickol Bay Sport Fishing Club

Abbreviation	Meaning
NCDSF	North Coast Demersal Scalefish Fishery
NIMS	Non-indigenous Marine Species
nm	Nautical mile (1,852 m) a unit of distance on the sea
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NORM	Naturally Occurring Radioactive Material
NRC	North Rankin Complex
NTM	Notice to Mariners
NWBM	Non Water Based Mud
NWMR	North-west Marine Region
NWP	Northwest Province
NWS	North-west Shelf
NWSTF	North West Slope Trawl Fishery
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OIW	Oil in Water
OOC	Oil on cuttings
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage
OSPAR	Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic
OVID	Offshore Vessel Inspection Database
OVMSA	Offshore Vessel Safety Management System assessment
PAH	Polyaromatic Hydrocarbon
PJ	Professional Judgement
PLET	Pipeline End Termination
PLONOR	OSPAR definition of a substance Poses Little Or NO Risk to the environment
PMST	Protected Matters Search Tool
PPA	Pearl Producers Association
ppb	Parts Per Billion
ppm	Parts Per Million
PRT	Pipeline recovery tool
psi	Pounds per square inch
PSU	Practical Salinity Unit
PSV	Pipe supply vessel
PTW	Permit To Work
RBA	Risk Based Analysis

Abbreviation	Meaning
RCC	Rescue Coordination Centre
RMS	Root Mean Square
RO	Reverse Osmosis
ROV	Remotely Operated Vehicle
SA	South Australia
S-BRUVS	Stereo-baited Remote Underwater Video System
SBTF	Southern Bluefin Tuna Fishery
SCE	Solids Control Equipment
SIMAP	Spill Impact Mapping and Analysis Program
SIMOPS	Simultaneous Operations
SMPEP	Spill Monitoring Programme Execution Plan
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound Pressure Levels
SSIV	Subsea Isolation Valve
SV	Societal Values
SW	Southwest
TEC	Threatened Ecological Communities
TGB	Temporary Guide-base
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
UK	United Kingdom
USBL	Ultra-short baseline
UTAs	Umbilical termination assemblies
VOC	Volatile Organic Hydrocarbons
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WBM	Water Based Mud
WCC	Woodside Communication Centre
WDTF	Western Deepwater Trawl Fishery
WEL	Woodside Energy Ltd
WHA	World Heritage Area
WMP	Waste Management Plan
WMS	Woodside Management System
Woodside	Woodside Energy Ltd

APPENDIX A. WOODSIDE HEALTH, SAFETY AND ENVIRONMENT AND RISK MANAGEMENT POLICIES

WOODSIDE POLICY

Woodside

Health, Safety and Environment Policy

OBJECTIVES

Strong health, safety and environment (HSE) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSE through managing our activities in a sustainable manner with respect to our workforce, our communities and the environment.

At Woodside we believe that process and personal safety related incidents, and occupational illnesses, are preventable. We are committed to managing our activities to minimise adverse health, safety or environmental impacts.

PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSE risk management
- complying with relevant laws and regulations and applying responsible standards where laws do not exist
- setting, measuring and reviewing objectives and targets that will drive continuous improvement in HSE performance
- embedding HSE considerations in our business planning and decision-making processes
- integrating HSE requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSE obligations and feels empowered to speak up and intervene on HSE issues
- undertaking and supporting research to improve our understanding of HSE and using science to support impact assessments and evidence-based decision making
- taking a collaborative and pro-active approach with our stakeholders
- requiring contractors to comply with our HSE expectations in a mutually beneficial manner
- publicly reporting on HSE performance

APPLICATION

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

Updated by the Board in April 2021

APPROVED

WOODSIDE POLICY

Woodside

Risk Management Policy

OBJECTIVES

Woodside recognises that risk is inherent in our business and the effective management of risk is vital to deliver our strategic objectives, continued growth and success. We are committed to managing risks in a proactive and effective manner as a source of competitive advantage.

Our approach protects us against potential negative impacts, enables us to take risk for reward and improves our resilience against emerging risks. The objective of our risk management framework is to provide a single consolidated view of risks across the company to understand our full risk exposure and prioritise risk management and governance.

The success of our approach lies in the responsibility placed on everyone at all levels to proactively identify, assess and treat risks relating to the objectives they are accountable for delivering.

PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive framework for the identification, assessment and treatment of current risks and response to emerging risks;
- Ensuring line of sight of financial and non-financial risks at appropriate levels of the organisation;
- Demonstrating leadership and commitment to integrating risk management into our business activities and governance practices;
- Recognising the value of stakeholder engagement, best available information and proactive identification of potential changes in external and internal context;
- Embedding risk management into our critical business processes and control framework;
- Understanding our exposure to risk and tolerance for uncertainty to inform our decision making and assure that Woodside is operating with due regard to the risk appetite endorsed by the Board; and
- Evaluating and improving the effectiveness and efficiency our approach.

APPLICATION

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this policy is effectively implemented.

Managers are responsible for promoting and applying the Risk Management Policy. Responsibility for the effective application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control.

This policy will be reviewed regularly and updated as required.

Revised by the Woodside Petroleum Ltd Board on 4 December 2020.

APPENDIX B. RELEVANT REQUIREMENTS

General Relevant Requirements

The below table refers to Commonwealth Legislation related to the project.

Commonwealth Legislation	Legislation Summary
Air Navigation Act 1920 • *Air Navigation Regulations 1947* • *Air Navigation (Aerodrome Flight Corridors) Regulations 1994* • *Air Navigation (Aircraft Engine Emissions) Regulations 1995* • *Air Navigation (Aircraft Noise) Regulations 1984* • *Air Navigation (Fuel Spillage) Regulations 1999*	This Act relates to the management of air navigation.
Australian Maritime Safety Authority Act 1990	This Act establishes a legal framework for the Australian Maritime Safety Authority (AMSA), which represents the Australian Government and international forums in the development, implementation and enforcement of international standards including those governing ship safety and marine environment protection. AMSA is responsible for administering the Marine Orders in Commonwealth waters.
Australian Radiation Protection and Nuclear Safety Act 1998	This Act relates to the protection of the health and safety of people, and the protection of the environment from the harmful effects of radiation.
Biosecurity Act 2015 • *Quarantine Regulations 2000* • *Biosecurity Regulation 2016* • *Australian Ballast Water Management Requirements 2017*	This Act provides the Commonwealth with powers to take measures of quarantine, and implement related programs as are necessary, to prevent the introduction of any plant, animal, organism or matter that could contain anything that could threaten Australia's native flora and fauna or natural environment. The Commonwealth's powers include powers of entry, seizure, detention and disposal. This Act includes mandatory controls on the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters. The Regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly

	to the quarantine officers.
Environment Protection and Biodiversity Conservation Act 1999 • *Environment Protection and Biodiversity Conservation Regulations 2000*	This Act protects (MNES. It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places. Under this Act, actions that may be likely to have a significant impact on matters of NES must be referred to the Commonwealth Environment Minister.
Environment Protection (Sea Dumping) Act 1981 • *Environment Protection (Sea Dumping) Regulations 1983*	This Act provides for the protection of the environment by regulating dumping matter into the sea, incineration of waste at sea and placement of artificial reefs.
Industrial Chemicals (Notification and Assessment Act) 1989 • *Industrial Chemicals (Notification and Assessment) Regulations 1990*	This Act creates a national register of industrial chemicals. The Act also provides for restrictions on the use of certain chemicals which could have harmful effects on the environment or health.
National Environment Protection Measures (Implementation) Act 1998 • *National Environment Protection Measures (Implementation) Regulations 1999*	This Act and Regulations provide for the implementation of National Environment Protection Measures (NEPMs) to protect, restore and enhance the quality of the environment in Australia and ensure that the community has access to relevant and meaningful information about pollution. The National Environment Protection Council has made NEPMs relating to ambient air quality, the movement of controlled waste between states and territories, the national pollutant inventory, and used packaging materials.
National Greenhouse and Energy Reporting Act 2007 • *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*	This Act and associated Rule establishes the legislative framework for the NGER scheme for reporting greenhouse gas emissions and energy consumption and production by corporations in Australia.

Navigation Act 2012 - *Marine order 12 – Construction – subdivision and stability, machinery and electrical installations* - *Marine order 30 - Prevention of collisions* - *Marine order 47 - Mobile offshore drilling units* - *Marine order 57 - Helicopter operations* - *Marine order 60 - Floating offshore facilities* - *Marine order 91 - Marine pollution prevention—oil* - *Marine order 93 - Marine pollution prevention—noxious liquid substances* - *Marine order 94 - Marine pollution prevention—packaged harmful substances* - *Marine order 96 - Marine pollution prevention—sewage* - *Marine order 97 - Marine pollution prevention—air pollution*	This Act regulates navigation and shipping including Safety of Life at Sea (SOLAS). The Act will apply to some activities of the MODU and project vessels. This Act is the primary legislation that regulates ship and seafarer safety, shipboard aspects of marine environment protection and pollution prevention.
Offshore Petroleum and Greenhouse Gas Storage Act 2006 - *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* - *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011* - *Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009*	This Act is the principal Act governing offshore petroleum exploration and production in Commonwealth waters. Specific environmental, resource management and safety obligations are set out in the Regulations listed.

Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 - *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995*	This Act provides for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. The Act will only apply to Woodside if it manufactures, imports or exports ozone depleting substances.
Protection of the Sea (Powers of Intervention) Act 1981	This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 *Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994* - *Marine order 91 - Marine pollution prevention—oil* - *Marine order 93 - Marine pollution prevention—noxious liquid substances* - *Marine order 94 - Marine pollution prevention—packaged harmful substances* - *Marine order 95 - Marine pollution prevention—garbage* - *Marine order 96 - Marine pollution prevention—sewage* *Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007* MARPOL Convention	This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. Under this Act, discharge of oil or other harmful substances from ships into the sea is an offence. There is also a requirement to keep records of the ships dealing with such substances. The Act applies to all Australian ships, regardless of their location. It applies to foreign ships operating between 3 nm off the coast out to the end of the Australian EEZ (200 nm). It also applies within the 3 nm of the coast where the State/Northern Territory does not have complementary legislation. All the Marine Orders listed, except for Marine Order 95, are enacted under both the *Navigation Act 2012* and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This Act is an amendment to the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This amended Act provides the protection of the sea from pollution by oil and other harmful substances discharged from ships.
Protection of the Sea (Harmful Antifouling Systems) Act 2006 - *Marine order 98—(Marine pollution prevention—anti-fouling systems)*	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility.

Decommissioning Relevant Requirements

Definition of "All": Offshore infrastructure (subsea or otherwise) associated with oil and gas exploration (e.g. pipeline, platforms, wells, umbilicals, etc.)

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
International Conventions					
United Nations Convention on the Law of the Sea, 1982, 1833 U.N.T.S. 397 (modification of the Geneva Convention) (UNCLOS)	International	The UNCLOS provides for a regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated and need to be addressed as a whole. Assesses the potential effect of planned activities on the marine environment and communicate the results, where there may be reasonable grounds for believing that such activities may cause substantial pollution or significant and harmful changes to the marine environment.	All	The following Article is relevant to this EP: Article 60 Artificial islands, installations and structures in the EEZ 3. "...Any installations or structures which are abandoned or used shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organisation. Such removal shall also have due regard to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed"	The Echo Yodel infrastructure will be permanently removed.
IMO Resolution A.672 (16) - Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the EEZe, International Maritime Organisation (IMO) Guidelines and Standards, 1989, International Maritime Organisation (the Guidelines)	International	Guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the EEZ	All	The Guidelines contain the following Paragraphs that are relevant to this EP: "3.1 All abandoned or disused installations or structures standing in less than 75 m of water and weighing less than 4,000 tonnes in air, excluding the deck and superstructure, should be entirely removed." "3.2 All abandoned or disused installations or structures emplaced on the sea-bed on or after 1 January 1998, standing in less than 100 m of water and weighing less than 4,000 tonnes in air, excluding the deck and superstructure, should be entirely removed." "3.4 The coastal State may determine that the installation or structure may be wholly or partially in place where: 1. an existing installation or structure, including one referred to in paragraphs 3.1 or 3.2, or a part thereof, will serve a new use if permitted to remain wholly or partially in place on the seabed (such as enhancement of a living resource); or 2. an existing installation or structure, other than one referred to in paragraphs 3.1 and 3.2, or part thereof, can be left there without causing unjustifiable interference with other users of the sea." "3.6. Any abandoned or disused installation or structure, or part thereof, which projects above the surface of the sea should be adequately maintained to prevent structural failure. In cases of partial removal referred to in paragraphs 3.4.2 or 3.5, an	The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				unobstructed water column sufficient to ensure safety of navigation, but not less than 55 m, should be provided above any partially removed installation or structure which does not project above the surface of the sea." "3.13 On or after 1 January 1998, no installation or structure should be placed on any continental shelf or in any exclusive economic zone unless the design and construction of the installation or structure is such that v."	
United Nations Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention), IMO, 1972 (the London Convention and 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, IMO, 1996 (the London Protocol)	International	The London Convention is one of the first global conventions to protect the marine environment from human activities. The London Convention promotes the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. The London Protocol entered into force in 2006. It was agreed to further modernise the London Convention and eventually replace it. Under the London Protocol all dumping is prohibited, except for possibly acceptable wastes on the 'revers list'.	Platforms or other man-made structures	The following sections of the London Convention, as amended by the London Protocol, are relevant to this EP: Article 2 Objectives: "Contracting Parties shall individually and collectively protect and preserve the marine environment from all sources of pollution and take effective measures, according to their scientific, technical and economic capabilities, to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter Article 1: Definitions: 4.1 "Dumping" means: 4.1.1 any deliberate disposal into the sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; 4.1.2 any deliberate disposal into the sea of vessels, aircraft, platforms or other man-made structures at sea; 4.1.3 any storage of wastes or other matter in the seabed and the subsoil thereof from vessels, aircraft, platforms or other man-made structures at sea; and 4.1.4 any abandonment or toppling at site of platforms or other man-made structures at sea, for the sole purpose of deliberate disposal. 4.2 "Dumping" does not include: 4.2.3 notwithstanding paragraph 4.1.4, abandonment in the sea of matter (e.g., cables, pipelines and marine research devices) placed for a purpose other than the mere disposal thereof.	The Echo Yodel infrastructure will be permanently removed.
Australia – Legislation & Guidelines					
Offshore Petroleum and Greenhouse Gas Storage Act (OPGGSA) 2006, Commonwealth Government	Australia	Commonwealth legislation providing a regulatory framework for petroleum exploration and recover and the injection and storage of greenhouse gas substances in offshore areas.	All	Although the entire Petroleum Activities Program is required to comply with the OPGGSA, the following sections are specifically relevant to this EP: S572(3) states that titleholders must remove all structures, equipment and property within the title	The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				area that is not being, or will not be used in connection with authorised operations. S270(3)(c) applies when application is made to surrender a permit, licence or lease held under the OPGGSA. S270 states that the titleholder can only surrender the title if it has removed all property to the satisfaction of NOPSEMA or made arrangements that are satisfactory to NOPSEMA in relation to that property.	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Australia	Section 3 of the EPBC Act outlines a number of objectives for the Act. The following are most relevant to this EP: - To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and - To promote ecologically sustainable development through conservation and ecologically sustainable use of natural resources.	All	The EPBC Act does not provide specific decommissioning recommendations. However, the requirements of the EPBC Act to not undertake actions that have or may cause significant impact to MNES applies to the Petroleum Activities Program, as do the principles of ecologically sustainable development.	This EP considers the potential impacts of the Petroleum Activities Program, including the removal of the Echo Yodel subsea infrastructure, on MNESas well as the principles of ecologically sustainable development. Section 6 of this EP contains assessment of how the risks and impacts on all aspects of the environment, including matters of national environmental significance, will be managed to ALARP.
Environment Protection (Sea Dumping) Act 1981 (Sea Dumping Act)	Australia	The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) is the legislative instrument that addresses Australia's obligations under the London Protocol. The aims of the London Protocol are to protect and preserve the marine environment from all sources of pollution, and to prevent, reduce and eliminate pollution by controlling the dumping of wastes and other materials at sea.	All	Section 10A of the Sea Dumping Act requires a permit to be obtained for the dumping of controlled material into Australian waters from any vessel, aircraft or platform. 'Controlled material' is defined in the Sea Dumping Act as 'waste or other material (within the meaning of the Protocol [meaning the London Protocol])'. The London Protocol defines 'waste or other material' as 'material and substance of any kind, form or description'	The Echo Yodel infrastructure will be permanently removed. The Sea Dumping Act is not applicable for the Petroleum Activities Program.
Australia – Other Reports					
Offshore Oil and Gas Decommissioning Decision-making Guidelines, APPEA, 2016	Australia	This document states that it is intended as a starting point for discussion between industry, government and community in the development of a recommended approach for decision-making on decommissioning oil and gas facilities in Australia's Commonwealth and State waters.	Facilities	The Offshore Oil and Gas Decommissioning Decision-making Guidelines contains the following guidance in relation to decommissioning facilities: "Any part of a structure not brought onshore for disposal must be adequately cleaned of oily wastes and residual contamination. They must also be assessed as to whether they should remain *in situ*, remediated in place, or removed for disposal."	The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
Discussion Paper - Decommissioning offshore petroleum infrastructure in Commonwealth Waters, Australian Government, Department of Industry, Innovation and Science, 2018	Australia	This discussion paper provides a first step for the Department of Industry, Innovation and Science's review of the decommissioning framework to help ensure it is fit for purpose, remains best practice, and that Australia is positioned to respond to decommissioning challenges and opportunities now and into the future.	All	The following sections of the Discussion Paper - Decommissioning Offshore Petroleum Infrastructure in Commonwealth Waters are relevant to this EP: 1.1.2 "Property removal obligations are the responsibility of the titleholder, and NOPSEMA can challenge titleholders to provide compelling reasons as to why removal is not appropriate, or otherwise to remove property that appears to have no future use." "The Australian Government's policy is that a site should be properly decommissioned before a title is relinquished and blocks becomes vacant acreage." 1.2.1 "While titleholders may wish to explore and submit a number of decommissioning options for regulatory approval, it is expected and would need to remain clear that complete removal would always need to be contemplated and compared as the first option." Page 58, Comparative Assessment Guidelines, "...The workshop agreed that there would be value in industry developing Comparative Assessment Guidelines, in line with a similar guideline developed in the UK. Such a guideline would be intended to provide a clear process for companies and stakeholders to input issues of significance and understand how to achieve the best outcome from decommissioning."	The Echo Yodel infrastructure will be permanently removed.
Section 572 Maintenance and removal of property (Draft), NOPSEMA, 2020	Australia	In October 2019, the former Minister for Resources and Northern Australia issued a statement of expectations requiring NOPSEMA to give heightened focus to oversight of titleholders' compliance with the OPGGS Act section 572 obligations in relation to the maintenance and removal of equipment and property brought onto title. The statement of expectations requires NOPSEMA, through its regulatory processes, to ensure that titleholders maintain property in the title area used in connection with the operations authorised by the title and to remove property when it is no longer used; and only accept alternative arrangements where justification is appropriate and with regard to the Australian Government Offshore Petroleum Decommissioning Guideline.	All	The following sections of Section 572 Maintenance and removal of property (Draft are relevant to this EP: **3.2. Removal of property** “Section 572 places an obligation on titleholders to remove property when it is neither used nor to be used. NOPSEMA will apply the following principles as applicable in Safety Case, Well Operations Management Plan (WOMP) andn EP assessments and in monitoring compliance with the obligation to remove property: • All property is designed, installed and operated with the intention of being removed when it is no longer in use; • Removal is planned to take place throughout the operations authorised by the title when property is neither used nor to be used in connection with the operations; • When a field permanently ceases production, all remaining property is removed if it is not to be used in connection with the operations; • Full removal of property is completed while the title is still in force;	The Echo Yodel subsea infrastructure was installed and operated with the intention of being removed at the end of life. The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				• NOPSEMA's acceptance of the final state of property is obtained through the suite of permissioning documents under the Environment, Safety and Resource Management and Administration Regulations; • Where titleholders engage contractors to operate facilities, titleholders remain ultimately responsible and therefore must ensure that adequate provisions including assurance and oversight are in place to meet the titleholders' obligations under section 572 of the OPGGS Act." **3.3. Alternative arrangements to removal in environmental plans** "Titleholders may demonstrate in an EP that arrangements other than complete removal are acceptable. NOPSEMA will only accept an EP when it is reasonably satisfied that the EP meets the criteria for acceptance under the Environment Regulations and where the EP demonstrates that the proposed alternative is expected to have equal or better environmental outcomes when compared to removal of property." "NOPSEMA considers that a comparative assessment may be used in an EP as a method to evaluate feasible alternatives to removal of property. A comparative assessment may support but does not replace the requirement for the EP to meet the criteria for acceptance of an EP under the Environment Regulations."	
Offshore Petroleum Decommissioning Guideline, Department of Industry, Science, Energy and Resources, 2018	Australia	The purpose of this Guideline is to clarify the application, operation and interaction between components of the Commonwealth regime for decommissioning offshore petroleum infrastructure in Commonwealth waters under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act), associated regulations and, where applicable, other Commonwealth laws. This is to assist offshore petroleum titleholders to plan and seek the regulatory approvals necessary to undertake a decommissioning project, and to understand the expectations of relevant decision-makers.	All	The following sections of Offshore Petroleum Decommissioning Guideline are relevant to this EP: **2.3 Complete removal of infrastructure is the "base case"** "The complete removal of infrastructure and the plugging and abandonment of wells is the default decommissioning requirement under the OPGGS Act. This is consistent with Australia's international obligations, primarily under the United Nations Convention on the Law of the Sea (UNCLOS) and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) and associated Protocol, to remove disused installations and structures and to preserve and protect the marine environment. This requirement is however subject to other provisions of the OPGGS Act and regulations, directions given by the NOPSEMA or the responsible Commonwealth Minister, and other applicable laws."	The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				“This means options other than complete removal may be considered, however the titleholder must demonstrate that the alternative decommissioning approach delivers equal or better environmental, safety and well integrity outcomes compared to complete removal, and that the approach complies with all other legislative and regulatory requirements – including requirements under other Commonwealth laws.” **4.1.1.2 Environmental plans** “The titleholder undertaking the activities will therefore need to submit and receive acceptance for an EP(or receive acceptance for a revision of an existing plan, if appropriate) before the relevant activities may commence. Titleholders must also undertake all activities in a manner consistent with their accepted EP.	
Other Oil and Gas Regimes – Other Reports					
Guidance notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines, Department for Business, Energy & Industrial Strategy, 2018	United Kingdom	These Guidance notes have been prepared to provide operators, licensees and contractors with guidance on the regulatory requirements for decommissioning offshore oil and gas installations and pipelines in accordance with international obligations and those set out in the Petroleum Act.	Pipelines	The following sections of Guidance notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines are relevant to this EP: **Section 10. Pipeline decommissioning** There are currently no international guidelines on the decommissioning of disused pipelines and they are not currently part of Decision 98/3, however we believe it is appropriate to have a robust process for considering pipeline decommissioning. The UK has therefore adopted the principles and processes associated the comparative assessment process in OSPAR Decision 98/3 in its consideration of pipeline decommissioning. This means that as a starting principle, operators must aim to achieve a clear seabed and robustly assess decommissioning options based on evidence and data. **General approach** The following approach will be taken in considering the decommissioning of pipelines on the UK Continental Shelf: • decisions will be taken on a case by case basis, in the light of individual circumstances • the potential for reuse of the pipeline in connection with further hydrocarbon developments should be considered before decommissioning (together with other existing projects such as hydrocarbon storage and carbon capture and storage). If in conjunction with the OGA reuse is considered viable, suitable and enough	The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				maintenance of the pipeline must be detailed • A comparative assessment will be required in all pipeline decommissioning programmes and all feasible decommissioning options should be considered • any removal or partial removal of a pipeline should be performed in such a way as to cause no significant adverse effects upon the marine environment • any decision that a pipeline may be left in place should have regard to the likely deterioration of the material involved and its present and possible future effect on the marine environment • account should also be taken of other users of the sea, and the future use fishing activities in the area • if pipelines are considered complex or are located in sensitive areas a more detailed assessment of the risks involved and the proposed mitigations may be required as part of the decommissioning programme. This will be indicated in discussion with OPRED **Leaving pipelines in place** Where it is proposed that a pipeline should be decommissioned in place, either wholly or in part, then the decommissioning programme should be supported by a suitable study which addresses the degree of past and likely future burial/exposure of the pipeline and any potential effect on the marine environment and other uses of the sea. The study should include the survey history of the line with appropriate data to confirm the current status of the line including the extent and depth of burial, trenching, spanning and exposure. It should also detail levels of fishing activity in the area. As a general guide the following pipelines (inclusive of any "piggyback" lines and umbilicals that cannot easily be separated) may be candidates for *in situ* decommissioning: • those which are adequately buried and trenched and which are not subject to development of spans and are expected to remain so. It is expected that burial or to a minimum depth of 0.6 metres above the top of the pipeline will be necessary in most cases, trenching without burial will require more detailed information on backfill, and fishing activity. Note: Those which are	

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				trenched but not adequately buried will require more information on possible backfill and snagging risks • those which were not buried or trenched at installation but which are expected to self-bury over a sufficient length within a reasonable time and remain so buried • those where burial or trenching of the exposed sections is undertaken to a sufficient depth and it is expected to be permanent • those which are not trenched or buried but which nevertheless are candidates for leaving in place if the comparative assessment shows that to be the preferred option in particular trunk lines • those where exceptional and unforeseen circumstances due to structural damage or deterioration or other cause means they cannot be recovered safely and efficiently Note: Trenching and burying at the time of decommissioning can be considered as an acceptable solution. Where the pipeline being decommissioned is in a sensitive area or is complex in nature, operators may be asked to provide more detailed information on how the risks of the decommissioning options are assessed. Some of the information required may cover areas such as: • How the option aligns with the pipeline owners overall approach to risk, outlining a consideration of any longer term legacy or liability post decommissioning • Business or operational activities • Financial impact of option • Reputational risks associated with the option	
			Small diameter pipelines (flexible flowlines, cables and umbilicals)	The Guidance notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines states that small diameter pipelines, including flexible flowlines and umbilicals are expected to be entirely removed.	The Echo Yodel infrastructure will be permanently removed.
			Pipelines, umbilicals, and cables protected by rock-dump	Guidance notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines states that where rock-dump has previously been used to protect a pipeline it is recognised that removal of the pipeline is unlikely to be practicable and it is generally assumed that the rock-dump and the	Not applicable to the Echo Yodel subsea infrastructure. The Echo Yodel infrastructure will be permanently removed.

Guideline/Legislation/Report:	Jurisdiction:	Objective and/or scope of Guideline/Legislation/Report:	Offshore Infrastructure Applicable to:	Decommissioning recommendations/requirements:	Application to Echo Yodel Subsea Decommissioning Scope
				pipeline will remain in place. Where this occurs it is expected that the rock-dump will remain undisturbed. If there are special circumstances that would warrant consideration of removal of the pipeline despite the presence of rock-dump then operators must ensure that there is minimum disturbance of the rock-dump to allow safe removal of the pipeline and the elimination of any seabed obstruction that may result from the presence of the rock, would be expected.	
			Protective deposits including mattresses, grout bags and rock gabion baskets or nets	Guidance notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines contains the following paragraphs that are relevant to this EP: It is expected that as with pipelines, all related stabilisation features such as mattresses, grout bags, or contained rock deposits which have been installed to protect pipelines or other infrastructure during their operational life should be considered for removal with the aim to achieve a clear seabed and for disposal onshore.	Not applicable to the Echo Yodel subsea infrastructure. The Echo Yodel infrastructure will be permanently removed.

APPENDIX C. EPBC ACT PROTECTED MATTERS SEARCH

Australian Government

Department of Agriculture,
Water and the Environment

EPBC Act Protected Matters Report

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

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

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

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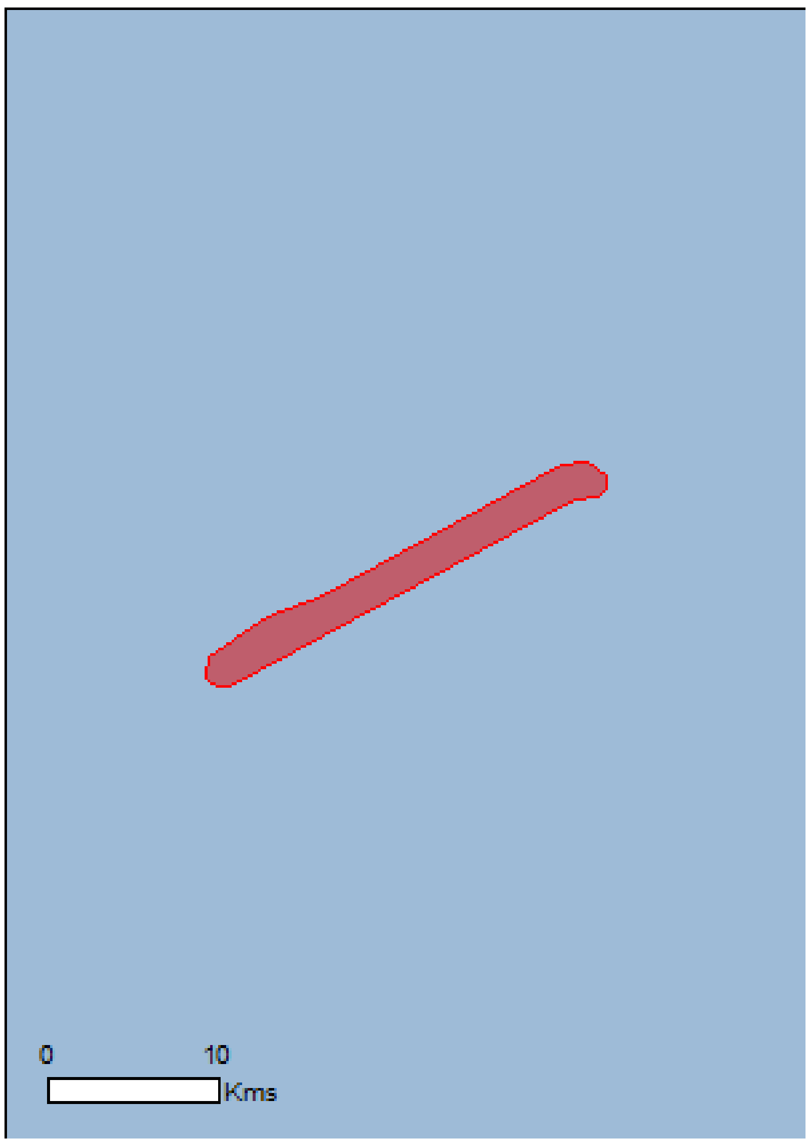

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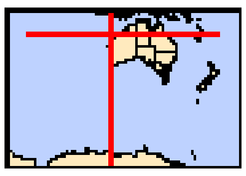


Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	16
Listed Migratory Species:	31

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	48
Whales and Other Cetaceans:	22
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		

Name	Status	Type of Presence
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area

Migratory Wetlands Species

Name	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species

[Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Fish		

Name	Threatened	Type of Presence
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-19.6416 115.9303,-19.6491 115.9395,-19.6553 115.939,-19.6597 115.9346,-19.6604 115.9232,-19.7539 115.7407,-19.7541 115.7335,-19.7494 115.7277,-19.7387 115.7297,-19.7192 115.7597,-19.7085 115.7896,-19.6437 115.9152,-19.6416 115.9303

Acknowledgements

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

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

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

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

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

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

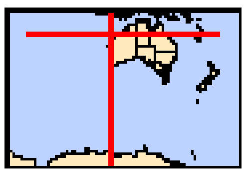
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/10/21 09:45:07

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 0.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	37
Listed Migratory Species:	57

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	1
Listed Marine Species:	105
Whales and Other Cetaceans:	31
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	6

Extra Information

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

State and Territory Reserves:	9
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	7

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
The Ningaloo Coast	WA	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Fish		
Milyeringa veritas Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Petrogale lateralis lateralis Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		

Name	Status	Type of Presence
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding likely to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Congregation or aggregation known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - EXMOUTH VLF TRANSMITTER STATION

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		

Name	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding likely to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Congregation or aggregation known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area

Name	Threatened	Type of Presence
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common		Species or species

Name	Status	Type of Presence
Dolphin [60]		habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area

Name	Status	Type of Presence
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Argo-Rowley Terrace	Multiple Use Zone (IUCN VI)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Airlie Island	WA
Jurabi Coastal Park	WA
Montebello Islands	WA
Muiron Islands	WA
Round Island	WA
Serrurier Island	WA
Unnamed WA40322	WA
Unnamed WA40828	WA
Unnamed WA41080	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west
Mermaid Reef and Commonwealth waters	North-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-20.36034 115.525,-20.38386 115.5096,-20.55402 115.5165,-20.60472 115.4003,-20.66205 115.3474,-20.69086 115.3167,-20.75568 115.2859,-20.79114 115.2703,-20.90839 115.2593,-21.16434 115.2662,-21.29494 115.1972,-21.34195 115.1499,-21.35237 115.1325,-21.36066 115.0246,-21.47037 114.8742,-21.51597 114.801,-21.51911 114.7645,-21.52119 114.7599,-21.52632 114.7556,-21.54185 114.7402,-21.59114 114.7248,-21.63271 114.7114,-21.6521 114.7072,-21.67756 114.648,-21.71357 114.5019,-21.69197 114.4251,-21.68476 114.3789,-21.75023 114.3411,-21.82161 114.3405,-21.84321 114.2944,-21.78559 114.2098,-21.77839 114.1791,-21.81396 114.1034,-21.86482 114.0177,-21.89888 113.9314,-21.98465 113.8725,-22.06648 113.8178,-22.16011 113.7102,-22.25374 113.6718,-22.36897 113.618,-22.54183 113.5796,-22.6463 113.5807,-22.93795 113.5719,-23.46928 113.3681,-23.512 113.3062,-23.51727 113.257,-23.54042 112.85,-23.55059 112.7993,-23.54113 112.7403,-23.45193 112.6485,-23.294 112.1856,-23.68964 111.7312,-23.70455 111.6999,-23.61983 111.6442,-22.26204 112.0266,-20.15395 112.8495,-19.13984 113.6071,-18.72112 113.6821,-17.74816 113.6434,-16.85748 114.3719,-17.03658 114.6309,-16.98576 115.4973,-16.50411 115.7369,-16.62029 115.8168,-17.35365 115.7055,-17.41173 116.3735,-17.24231 117.0488,-18.06522 117.0947,-18.17655 117.407,-17.79414 117.7724,-17.43042 118.3547,-17.54759 118.4704,-17.77964 118.7343,-17.68995 118.8995,-17.42966 119.1734,-17.4174 119.2568,-17.51543 119.2163,-17.96112 118.9023,-18.61158 118.3037,-18.8752 118.1921,-18.91914 118.149,-19.01274 117.9685,-19.04797 117.9547,-19.09813 117.9187,-19.14238 117.8532,-19.15692 117.7579,-19.31286 117.496,-19.38726 117.2767,-19.41409 117.2306,-19.52949 117.0789,-19.67422 116.9418,-19.84381 116.996,-19.86024 117.0176,-19.8844 117.0275,-19.92438 117.0303,-19.99224 116.9923,-20.04411 116.8606,-20.07474 116.6049,-20.46472 116.1636,-20.55402 116.0085,-20.56842 115.8932,-20.58202 115.8255,-20.60443 115.7471,-20.56842 115.6011,-20.52521 115.5857,-20.45319 115.5934,-20.39938 115.5725,-20.38441 115.5675,-20.36115 115.567,-20.35956 115.5319,-20.36034 115.525

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

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

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

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

APPENDIX D. OIL SPILL PREPAREDNESS AND RESPONSE STRATEGY MITIGATION AND ASSESSMENT

Oil Spill Preparedness and Response Mitigation Assessment for Echo Yodel Subsea Decommissioning

Security & Emergency Management
Hydrocarbon Spill Preparedness

December 2021
Revision 0

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FIGURES

TABLES

EXECUTIVE SUMMARY

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Echo Yodel Subsea Decommissioning, hereafter known as the Petroleum Activities Program (PAP). This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and the associated response operations, are controlled to As Low As Reasonably Practicable (ALARP) and Acceptable levels. It achieves this by evaluating response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the Environment Plan (EP). This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness.

A summary of the key facts and references to additional detail within this document are presented in Table 1-1.

Table 1-1: Summary of the key details for assessment

<table>
<tr><th>Key details of assessment</th><th colspan="2">Summary</th><th>Reference to additional detail</th></tr>
<tr><td>Worst Case Credible Scenario (WCCS)</td><td colspan="2">Credible Scenario-01 (CS-01): A short-term (instantaneous) surface release of 1000 m^3 of marine diesel oil (MDO) (19° 45' 10.681" S, 115° 52' 42.898" E) [1], representing loss of vessel fuel integrity after a collision.
5% residual component of 50 m^3.</td><td>Section 1.1</td></tr>
<tr><td>Hydrocarbon Properties</td><td colspan="2">MDO (API 37.2°)
In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. The aromatic content of the oil is approximately 3%.</td><td>Appendix A of the First Strike Plan</td></tr>
<tr><td rowspan="5">Modelling Results</td><td colspan="2">Quantitative, stochastic modelling was assessed help establish the environmental risks of a hydrocarbon spill.
Multiple replicate simulations were completed to account for trends and variations in the trajectory and weathering of spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter. For CS-01, a total of 100 replicate simulations were run over an annual period (25 per quarter).</td><td rowspan="5">Section 2.3</td></tr>
<tr><td>Stochastic modelling results</td><td>CS-01: Hydrocarbon release caused by vessel collision (instantaneous release of 1000 m^3 MDO)</td></tr>
<tr><td>Minimum time to shoreline impact (above 100 g/m²)</td><td><i>No contact at threshold</i></td></tr>
<tr><td>Largest volume ashore at any single Response Priority Area (RPA) (above 100 g/m²)</td><td><i>No contact at threshold</i></td></tr>
<tr><td>Largest total shoreline accumulation (above 100 g/m²) all shorelines</td><td><i>No contact at threshold</i></td></tr>
</table>

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[1] *Please note that modelling of a 1000 m^3 surface release of MDO from Woodside's Greater Western Flank 3 and Lambert Deep Drilling and Subsea Installation Environment Plan, conducted in 2020, was available and has been used for the analysis within this assessment. The Echo Yodel Subsea Decommissioning PAP is located ~140 km from Dampier and 63 km north of Montebello Islands State Marine Park, and the Greater Western Flank 3 release location is ~126 km from Dampier and 71 km north of Montebello Islands State Marine Park. The modelled spill volume of 1000 m^3 is equal to or greater than the largest vessel tank size of 500 m^3 to 1000 m^3 proposed for the Echo Yodel Subsea Decommissioning PAP. The locations are thus considered to be comparable with an equal or lesser credible spill scenario volume and it is therefore predicted that an MDO spill in the vicinity of the Operational Area would have a similar Environment that May Be Affect (EMBA) and impacts. The modelling does not predict shoreline impacts at feasible response thresholds (100 g/m^2).*

Net Environmental Benefit Assessment	Monitor and evaluate, source control via vessel SOPEP, shoreline protection and deflection, and oiled wildlife response, are identified as potentially having a net environmental benefit (dependant on the actual spill scenario) and carried forward for further assessment.	**Section 4**
ALARP evaluation of selected response techniques	The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and acceptable level for the risk presented in **Section 1.1**, with the implementation of considered additional, alternative or improved control measures.	**Section 7**

1 INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Echo Yodel Subsea Decommissioning, hereafter known as the PAP. This document outlines Woodside's decisions and techniques for responding to a hydrocarbon loss of containment event and the process for determining its level of hydrocarbon spill preparedness.

1.2 Purpose

This document, together with the documents listed below, meet the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Environment Regulations) relating to hydrocarbon spill response arrangements.

- the Echo Yodel Subsea Decommissioning Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- the Echo Yodel Subsea Decommissioning Oil Pollution Emergency Plan (OPEP) including:
    - First Strike Plan (FSP)
    - relevant Operations Plans
    - relevant Tactical Response Plans (TRPs, also see ANNEX E: Tactical Response Plans)
    - relevant Supporting Plans
    - Data Directory.

The purpose of this document is to demonstrate that the risks and impacts from an unplanned hydrocarbon release and the associated response operations are controlled to ALARP and Acceptable levels.

1.3 Scope

This document evaluates response options to address the potential environmental risks and impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. It then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness. It should be read in conjunction with the documents listed in

Table 1-1. The location of the PAP is shown in Figure 3-2 of the EP.

1.4 Oil spill response document overview

The documents outlined in **Figure 1-1**are collectively used to manage the preparedness and response for a hydrocarbon release.

ANNEX A: Net Environmental Benefit Analysis Detailed Outcomes contains a pre-operational Net Environmental Benefit Analysis (NEBA) summary, outlining the selected response techniques for this PAP. Relevant Operational Plans to be initiated for associated response techniques are identified in the FSP and relevant forms to initiate a response are appended to the FSP.

The process to develop an Incident Action Plan (IAP) begins once the Oil Pollution FSP is underway. The IAP includes inputs from the Monitor and Evaluate operations and the operational NEBA (**Section 4**). Planning, coordination and resource management are initiated by the Incident

Management Team (IMT). In some instances, technical specialists may be utilised to provide expert advice. The planning may also involve liaison officers from supporting government agencies.

During each operational period, field reports are continually reviewed to evaluate the effectiveness of response operations. In addition, the operational NEBA is continually reviewed and updated to ensure the response techniques implemented continue to result in a net environmental benefit (see **Section 4**).

The response will continue as described in **Section 5** until the response termination criteria have been met as set out in **ANNEX A**.

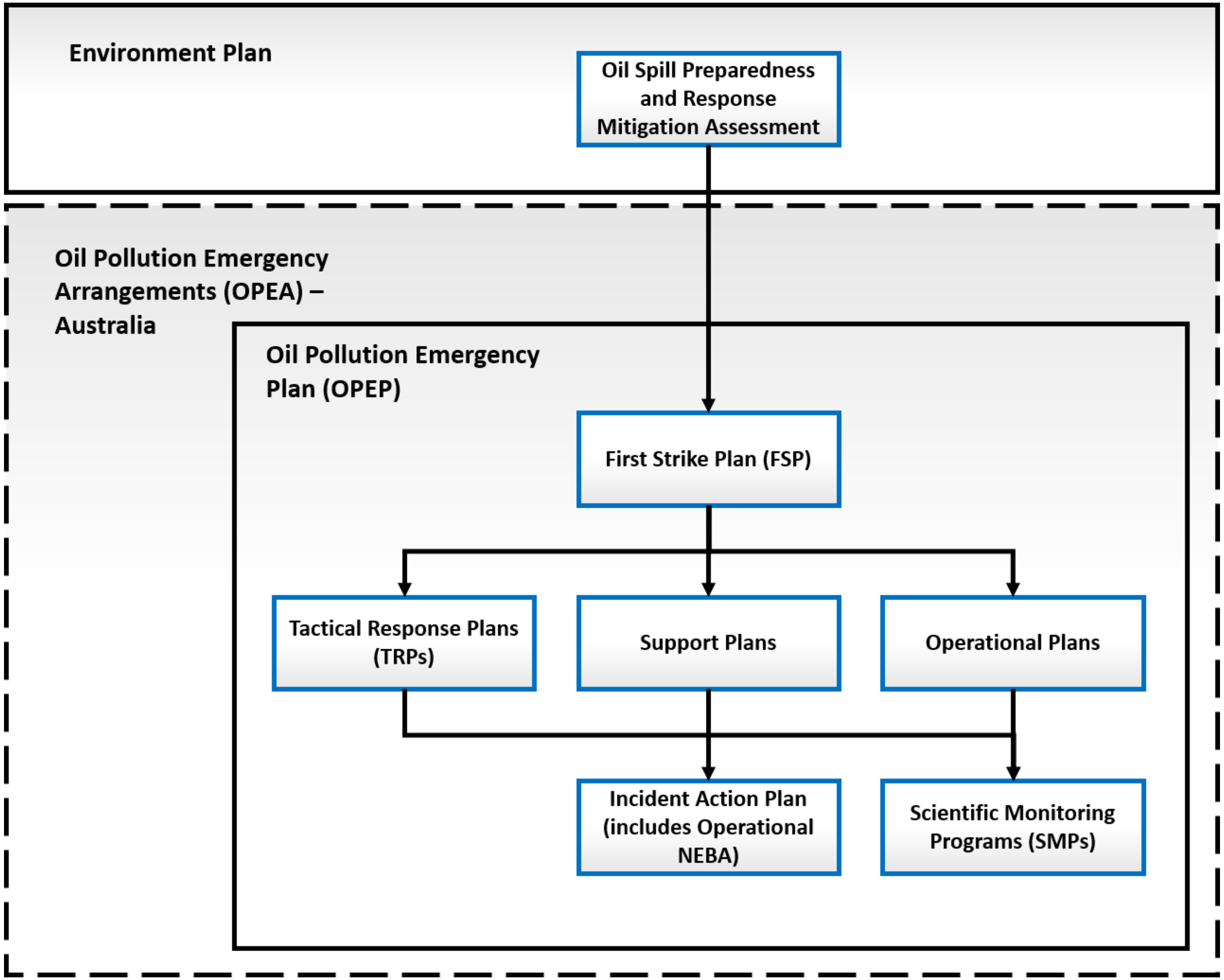

Environment Plan
Oil Spill Preparedness and Response Mitigation Assessment
Oil Pollution Emergency Arrangements (OPEA) – Australia
Oil Pollution Emergency Plan (OPEP)
First Strike Plan (FSP)
Tactical Response Plans (TRPs)
Support Plans
Operational Plans
Incident Action Plan (includes Operational NEBA)
Scientific Monitoring Programs (SMPs)

Figure 1-1: Woodside hydrocarbon spill document structure

Table 1-1: Hydrocarbon spill preparedness and response – document references

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Echo Yodel Subsea Decommissioning Environment Plan	Demonstrates that potential adverse impacts on the environment associated with the PAP for the Echo Yodel Subsea Decommissioning (during both routine and non-routine operations) are mitigated and managed to ALARP and will be of an acceptable level.	NOPSEMA Woodside internal	EP Section 6 (Identification and evaluation of environmental risks and impacts, including credible spill scenarios) EP Section 6 (Environmental Performance Outcome, Performance Standard and Measurement Criteria) EP Section 7 (Implementation strategy – including emergency preparedness and response) EP Section 7 (Reporting and compliance).	
OPEA Australia	Describes the arrangements and processes adopted by Woodside when responding to a hydrocarbon spill from a petroleum activity.	Regulatory agencies Woodside internal	All sections	
Oil Spill Preparedness and Response Mitigation Assessment for the Echo Yodel Subsea Decommissioning (this document)	Evaluates response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP.	Regulatory agencies Corporate Incident Control Centre (CICC): Control function in an ongoing spill response for activity-specific response information.	All Environmental Performance Outcome, Performance Standard and Measurement Criteria related to hydrocarbon spill preparedness and response are included in this document.	

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan	Facility specific document providing details and tasks required to mobilise a first strike response. Primarily applied to the first 24 hours of a response until a full IAP specific to the event is developed. Oil Pollution First Strike Plans are intended to be the first document used to provide immediate guidance to the responding IMT.	Site-based IMT for initial response, activation and notification. CICC for initial response, activation and notification. CICC: Control function in an ongoing spill response for activity-specific response information.	Initial notifications and reporting required within the first 24 hours of a spill event. Relevant spill response options that could be initiated for mobilisation in the event of a spill. Recommended pre-planned tactics. Details and forms for use in immediate response. Activation process for oil spill trajectory modelling (OSTM), aerial surveillance and oil spill tracking buoy details.	
Operational Plans	Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations. Includes details on access to equipment and personnel (available immediately) and steps to mobilise additional resources depending on the nature and scale of a release. Relevant operational plans will be initially selected based on the Oil Pollution First Strike Plan; additional operational plans will be activated depending on the nature and scale of the release.	CICC: Operations and Logistics functions for first strike activities. CICC: Planning Function to help inform the IAP on resources available.	Locations from where resources may be mobilised. How resources will be mobilised. Details of where resources may be mobilised to and what facilities are required once the resources arrive. Details on how to implement resources to undertake a response.	Operational Monitoring Shoreline Protection and Deflection Oiled Wildlife Response Scientific Monitoring
TRPs	Provides options for response techniques in selected Response Protection Areas (RPAs). Provides site, access and deployment information to support a response at the location.	CICC: Planning Function to help develop IAPs, and Logistics Function to assist with determining resources required.	Indicative response techniques. Access requirements and/or permissions. Relevant information for undertaking a response at that site. Where applicable, may include equipment deployment locations and site layouts.	Full list of available TRPs is available in **ANNEX E: Tactical Response Plans**

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Support Plans	Support Plans detail Woodside's approach to resourcing and the provision of services during a hydrocarbon spill response.	CICC: Operations, Logistics and Planning functions.	Technique for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements.	Marine Logistics People and Global Capability Surge Labour Requirement Plan Health and Safety Aviation IT (Emergency Response Plan) Communications (Emergency Response Plan) Stakeholder Engagement Accommodation and Catering Waste Management Guidance for Oil Spill Claims Management (Land based) Security Support Plan Hydrocarbon Spill Responder Health Monitoring Guideline

2 RESPONSE PLANNING PROCESS

This document details Woodside’s process for identifying potential response options for the hydrocarbon release scenarios. **Figure 2-1** outlines the interaction between Woodside’s response, planning/preparedness and selection process.

This structure has been used because it shows how the planning and preparedness activities inform a response and provides indicative guidance on what activities would be undertaken, in sequential order, if a real event were to occur. The process also evaluates alternative, additional and/or improved control measures specific to the PAP.

The Echo Yodel Subsea Decommissioning First Strike Response Plan then summarises the outcome of the response planning process and provides initial response guidance and a summary of ongoing response activities, if an incident were to occur.

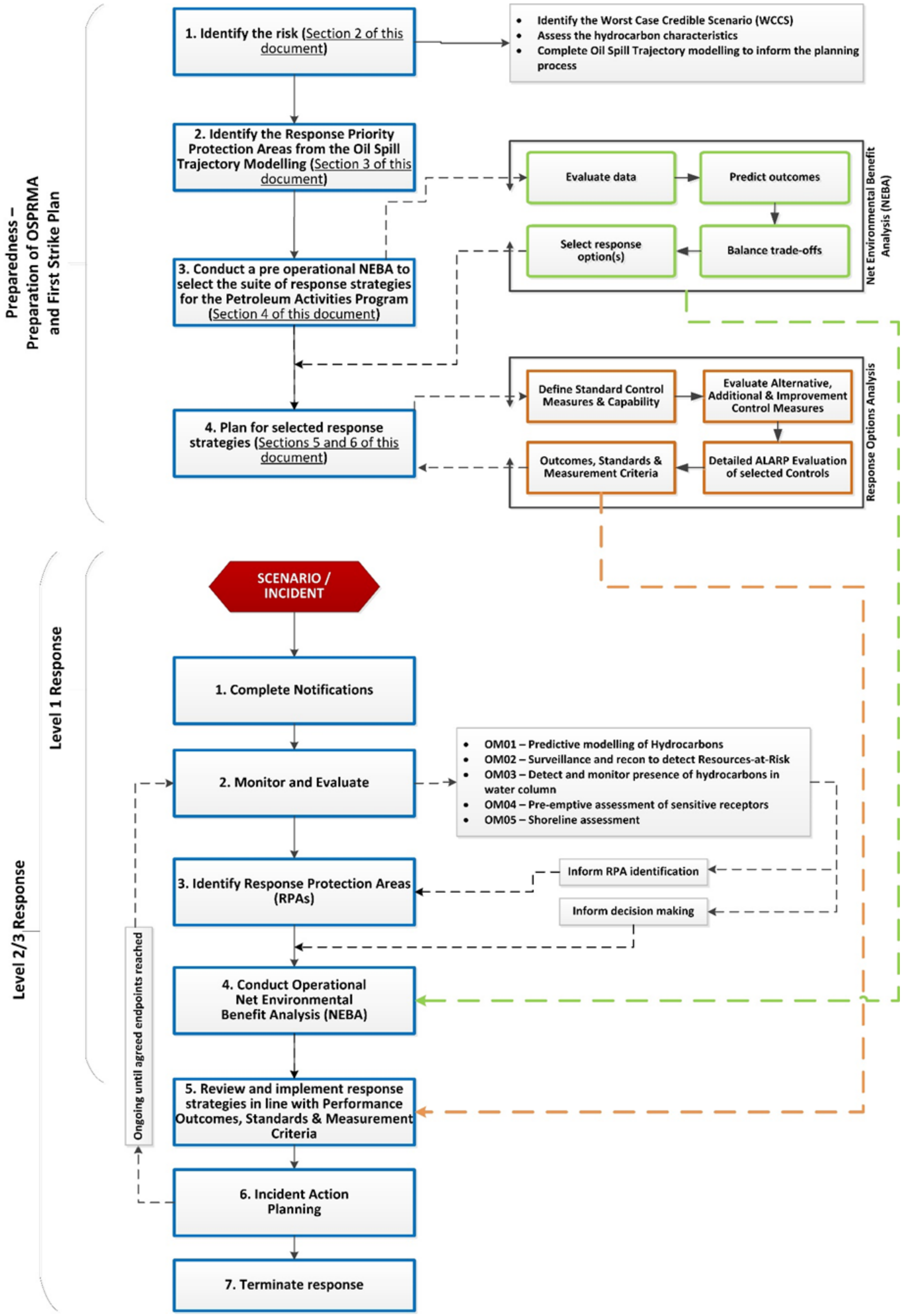


Figure 2-1: Response planning and selection process

2.1 Response planning process outline

This document is expanded below to provide additional context on the key steps in determining capability, evaluating ALARP and hydrocarbon spill response requirements.

Section 1. INTRODUCTION

Section 2. RESPONSE PLANNING PROCESS

- identification of worst-case credible scenario(s) (WCCS)
- spill modelling for WCCS.

Section 3. IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

- areas predicted to be contacted at concentration >100 g/m².

Section 4. NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

- pre-operational NEBA (during planning/ALARP evaluation): this must be reviewed during the initial response to an incident to ensure its accuracy
- selected response techniques prioritised and carried forward for ALARP assessment.

Section 5. HYDROCARBON SPILL ALARP PROCESS

- determines the response need based on predicted consequence parameters
- details the environmental performance of the selected response options based on need
- sets the environmental performance outcomes, environmental performance standards and measurement criteria.

Section 6. ALARP EVALUATION

- evaluates alternative, additional, and improved options for each response technique to demonstrate the risk has been reduced to ALARP
- provides a detailed ALARP assessment of selected control measure options against:
    - predicted cost associated with implementing the option
    - predicted change to environmental benefit
    - predicted effectiveness / feasibility of the control measure.

Section 7. ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

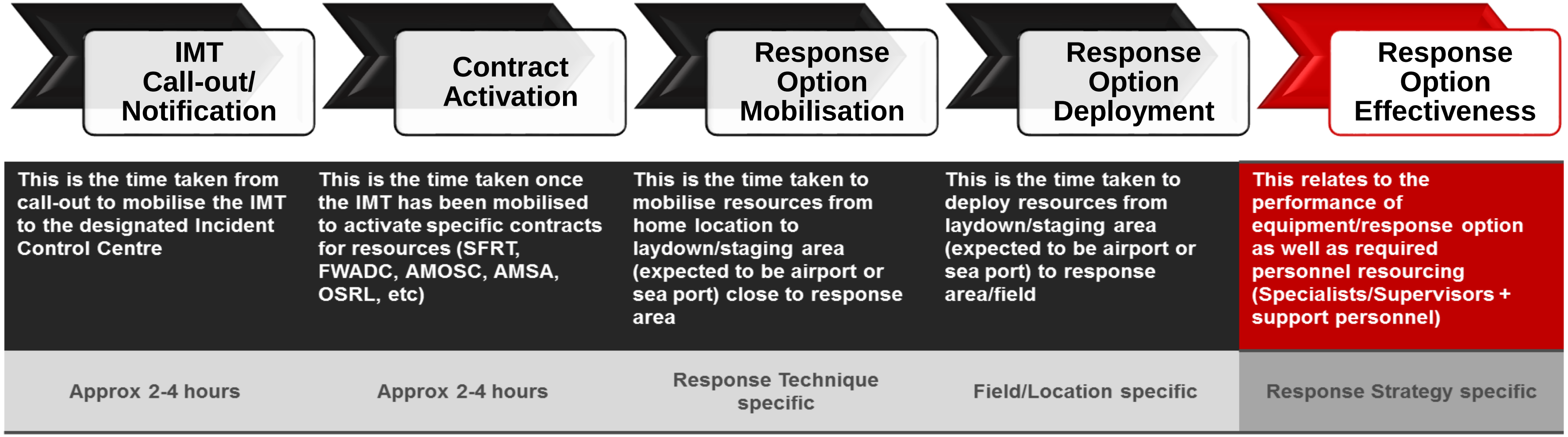
- evaluation of impacts and risks from implementing selected response options.

Section 8. ALARP CONCLUSION

Section 9. ACCEPTABILITY CONCLUSION

2.1.1 Response planning assumptions – timing, resourcing and effectiveness

Figure 2-2 illustrates the initial steps of a response to an oil spill event and, where available, the indicative timing. For the latter stages, the timing will be specific to the selective response option.



IMT Call-out/ Notification	Contract Activation	Response Option Mobilisation	Response Option Deployment	Response Option Effectiveness
This is the time taken from call-out to mobilise the IMT to the designated Incident Control Centre	This is the time taken once the IMT has been mobilised to activate specific contracts for resources (SFRT, FWADC, AMOSC, AMSA, OSRL, etc)	This is the time taken to mobilise resources from home location to laydown/staging area (expected to be airport or sea port) close to response area	This is the time taken to deploy resources from laydown/staging area (expected to be airport or sea port) to response area/field	This relates to the performance of equipment/response option as well as required personnel resourcing (Specialists/Supervisors + support personnel)
Approx 2-4 hours	Approx 2-4 hours	Response Technique specific	Field/Location specific	Response Strategy specific

Figure 2-2: Response planning assumptions – timing, resourcing and effectiveness

2.2 Environment plan risk assessment (credible spill scenarios)

Potential hydrocarbon release scenarios from the activity have been identified during the risk assessment process (Section 6 of the EP). Further descriptions of risk, impacts and mitigation measures (which are not related to hydrocarbon preparedness and response) are provided in Section 6 of the EP. Two unplanned events or credible spill scenarios for the activity have been selected as representative for the type, source and incident/response level.

Table 2-1: presents the credible scenarios and WCCS for the activity. The WCCS is then used for response planning purposes, as any other scenario would be of a lesser scale and extent. By demonstrating capability to manage the response to the WCCS, Woodside assumes other scenarios that are smaller in nature and scale can also be managed by the same capability. Response performance measures have been defined based on a response to the WCCS.

Table 2-1: Petroleum Activities Program credible spill scenario

Credible Scenario	Scenario selected for planning purposes	Scenario description	Maximum credible volume released (liquid m^3)[1]	Incident Level	Hydrocarbon (HC) type	Residual proportion	Residual volume (liquid m^3)
CS-01	Yes	An instantaneous hydrocarbon release of MDO caused by vessel collision (19° 45' 10.681" S, 115° 52' 42.898" E)[2]	1000 m^3	2	MDO	5.0%	50 m^3
CS-02	No	Loss of containment caused by refuelling hose failure, coupling failure or operator error.	8 m^3	1	MDO	5.0%	0.4 m^3

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[2] *Please note that modelling of a 1000 m^3 surface release of MDO from Woodside's Greater Western Flank 3 and Lambert Deep Drilling and Subsea Installation Environment Plan, conducted in 2020, was available and has been used for the analysis within this assessment. The Echo Yodel Subsea Decommissioning PAP is located ~140 km from Dampier and 63 km north of Montebello Islands State Marine Park, and the Greater Western Flank 3 release location is ~126 km from Dampier and 71 km north of Montebello Islands State Marine Park. The modelled spill volume of 1000 m^3 is equal to or greater than the largest vessel tank size of 500 m^3 to 1000 m^3 proposed for the Echo Yodel Subsea Decommissioning PAP. The locations are thus considered to be comparable with an equal or lesser credible spill scenario volume and it is therefore predicted that an MDO spill in the vicinity of the Operational Area would have a similar Environment that May Be Affect (EMBA) and impacts. The modelling does not predict shoreline impacts at feasible response thresholds (100 g/m^2).*

2.2.1 Hydrocarbon characteristics

MDO (API 37.2)

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. The aromatic content of the oil is approximately 3%.

If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending upon the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of the oil have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction. It is predicted that 5% of product would remain after weathering from the representative marine diesel scenario.

2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling (OSTM) tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises there is a degree of uncertainty related to the use of modelling data and has subsequently utilised conservative approaches to volumes, weathering, spatial areas, timing and response effectiveness to scale capability to need.

The Oil Spill Model and Response System (OILMAP) and Integrated Oil Spill Impact Model System (SIMAP) models are both used for stochastic and deterministic trajectory modelling They have been developed over three decades of planning, exercises, actual responses, several peer reviews, and validation studies. OILMAP was originally derived from the *United States Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) Type A model (French et al., 1996), for assessing marine transport, biological impact and economic impact that was also used under the *United States Oil Pollution Act 1990* Natural Resource Damage Assessment (NRDA) regulations. Notable spills where the model has been used and validated against actual field observations include Exxon Valdez (French McCay, 2004), North Cape Oil Spill (French McCay, 2003), along with an assessment of 20 other spills (French McCay and Rowe, 2004). In addition, test spills designed to verify fate, weathering and movement algorithms have been conducted regularly and in a range of climate conditions (French and Rines, 1997; French et al., 1997; Payne et al., 2007; French McCay et al., 2007).

Further to this, the algorithms have been updated using the latest findings from the Macondo/Deepwater Horizon well blowout in the Gulf of Mexico and validated according to the Deepwater Horizon (DWH) oil spill in support of the Natural Resource Damage Assessment (NRDA) (Spaulding et al., 2015; French McCay et al., 2015, 2016). Finally, the OILMAP and SIMAP models have been used extensively in Australia to prosecute pollution offences, predict discharge locations and likely spill volumes based on weathering and surveillance observations, and has been used as expert witness evidence in Australian court proceedings, aiding the prosecution to determine spill quantum estimates.

2.3.1 Stochastic modelling

Whilst specific modelling was not conducted for this activity, to help assess the environmental consequences of the WCCS outlined in **Table 2-1**, quantitative, stochastic modelling of a 1000 m^3 surface release of MDO from Woodside's *Greater Western Flank 3 and Lambert Deep Drilling and*

Subsea Installation Environment Plan, conducted in 2020, has been used for the analysis within this assessment. The Echo Yodel Subsea Decommissioning PAP is located ~140 km from Dampier and 63 km north of Montebello Islands State Marine Park, and the Greater Western Flank 3 release location is ~126 km from Dampier and 71 km north of Montebello Islands State Marine Park. The modelled spill volume of 1000 m^3 is equal to or greater than the largest vessel tank size of 500 m^3 to 1000 m^3 proposed for the Echo Yodel Subsea Decommissioning PAP. The locations are thus considered to be comparable with an equal or lesser credible spill scenario volume and therefore it is predicted that an MDO spill in the vicinity of the Operational Area would have a similar Environment that May Be Affect (EMBA) and impacts. The modelling does not predict shoreline impacts at feasible response thresholds (100 g/m^2).

Multiple replicate simulations were completed to account for trends and variations in the trajectory and weathering of spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter. A total of 100 replicate simulations were run over an annual period (25 per quarter).

2.3.1.1 Environmental impact thresholds – environment that may be affected and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenario. The stochastic modelling result is used to delineate areas of the marine and shoreline environment that could be exposed to hydrocarbon levels exceeding environmental impact threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as Environment that May Be Affected (EMBA). As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is presented for each fate.

A conservative approach – adopting accepted contact thresholds for impacts on the marine environment – is used to define the EMBA. These hydrocarbon thresholds are presented in **Table 2-2**.

Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine EMBA and environmental impacts

Threshold (MDO)	Description
10 g/m^2	Surface hydrocarbon
100 ppb	Entrained hydrocarbon (ppb)
50 ppb	Dissolved aromatic hydrocarbon (ppb)
100 g/m^2	Shoreline accumulation

For this PAP, deterministic modelling was not required because the stochastic spill modelling predicted no contact with shorelines from floating oil at response thresholds.

2.3.2 Deterministic modelling

Deterministic modelling was not undertaken for CS-01. Stochastic modelling has, therefore, been used to scale the response.

2.3.3 Surface hydrocarbon concentrations

The surface thickness of oil at which dispersants are typically effective is approximately 100 g/m^2. However, substantial variations occur in the thickness of the oil within the slick, and most fresh crude oils spread within a few hours, so overall the average thickness is 0.1 mm (or approx. 100 g/m^2) (International Tanker Owners Pollution Federation [ITOPF], 2011). Additionally, the recommended rate of application for surface dispersant is typically one part dispersant to 20 or 25 parts of spilled oil. These figures assume a 0.1 mm slick thickness, averaged over the thickest part of the spill, to calculate a litres/hectare application rate from vessels and aircraft. In practice, this can be difficult to achieve as it is not possible to accurately assess the thickness of the floating oil.

Some degree of localised over-dosage and under-dosage is inevitable in dispersant response. An average oil layer thickness of 0.1 mm is often assumed, although the actual thickness can vary over a wide range (from less than 0.0001 mm to more than 1 mm) over short distances (International Petroleum Industry Environment Conservation Association [IPIECA], 2015).

Guidance from Australian Maritime Safety Authority (AMSA, 2015) indicates spreading of spills will rapidly decrease slick thickness over the first 24 hours of a spill, resulting in the potential requirement of up to a tenfold increase in capability on day 2 to achieve the same level of performance.

Table 2-3: Surface hydrocarbon thresholds for response planning

Surface hydrocarbon concentration (g/m²)	Description	Bonn Agreement Oil Appearance Code (BAOAC)	Mass per area (g/m²)
>10	Predicted minimum threshold for commencing operational monitoring [3]	Code 3 – Dull metallic colours	5 to 50
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [4]	Code 4 – Discontinuous true oil colour	50 to 200
100	Predicted optimum floating oil threshold for containment and recovery and surface dispersant application	Code 5 – Continuous true oil colour	> 200
Shoreline hydrocarbon concentration (g/m²)	**Description**	**National Plan Guidance on Oil Contaminated Foreshores**	**Mass per area (g/m²)**
100	Predicted minimum shoreline accumulation threshold for shoreline assessment operations	Stain	> 100
250	Predicted minimum threshold for commencing shoreline clean-up operations	Level 3 – Thin Coating	200 to 1000

Further guidance from the European Maritime Safety Authority (EMSA) states that spraying the ‘metallic’ looking area of an oil slick (Bonn Agreement Oil Appearance Code [BAOAC] 3, approx. 5 to 50 µm) with dispersant from spraying gear designed to treat an oil layer 0.1 mm (100 µm) thick, will inevitably cause dispersant over-treatment by a factor of 2 to 20 times (EMSA, 2012).

Therefore, dispersant application should be concentrated on the thickest areas of an oil slick and Woodside intends to apply surface dispersants to only BAOAC 4 and 5. Spraying areas of oil designated as BAOAC 4 (Discontinuous true oil colour) with dispersant will, on average, deliver approximately the recommended treatment rate of dispersant.

Spraying areas of oil designated as BAOAC 5 with dispersant (Continuous true oil colour and more than 0.2 mm thick) will, on average, deliver approximately half the recommended treatment rate of dispersant. Repeated application of these areas of thicker oil, or increased dosage ratios, will be required to achieve the recommended treatment rate of dispersant (EMSA, 2012).

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[3] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and control of the incident passes to statutory authorities e.g. Western Australia Department of Transport (WA DoT) or AMSA.

[4] At 50 g/m², containment and recovery and surface dispersant application operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and containing the spread of surface oil.

Guidance from the National Oceanic and Atmospheric Administration (NOAA) in the United States is found in the document: *Characteristics of Response Techniques: A Guide for Spill Response Planning in Marine Environments 2013* (NOAA, 2013).

This guide outlines advice for response planning across all common techniques, including surface dispersant spraying and containment and recovery. It states that oil thickness can vary by orders of magnitude within distinct areas of a slick, thus the actual slick thickness and oil distribution of target areas are crucial for determining response method feasibility. Further to this, ITOPF also states that in terms of oil spill response, sheen can be disregarded as it represents a negligible quantity of oil, cannot be recovered or otherwise dealt with to a significant degree by existing response techniques, and is likely to dissipate readily and naturally (ITOPF, 2014).

Figure 2-3 from AMSA's Identification of Oil on Water – Aerial Observation and Identification Guide (AMSA, 2014) shows expected per cent coverage of surface hydrocarbons as a proportion of total surface area. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

From this information and other relevant sources (Allen and Dale, 1996; EMSA, 2012; Spence, 2018) the surface threshold of 50 g/m^2 was chosen as an average/equilibrium thickness (50 g/m^2 as an average is 50% coverage of 0.1 mm BAOAC 4 – discontinuous true oil colour, or 25% coverage of 0.2 mm BAOAC 5 – continuous true oil colour, which would represent small patches of thick oil or wind-rows.

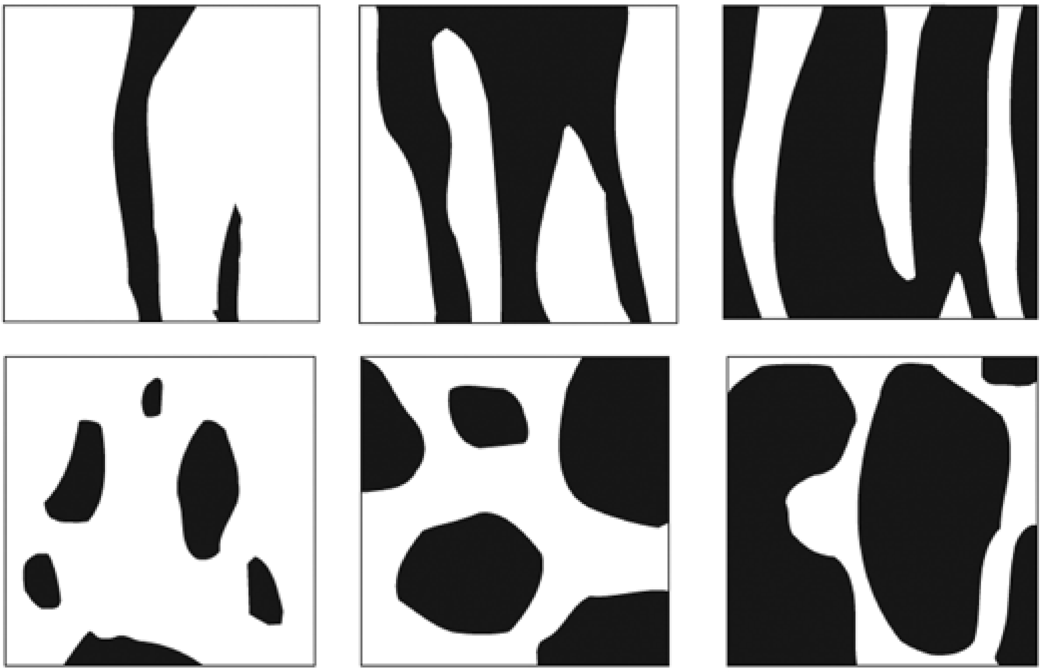

Figure 2-3: Proportion of total area coverage (AMSA, 2014)

Figure 2-4 illustrates the general relationships between on-water response techniques and slick thickness. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

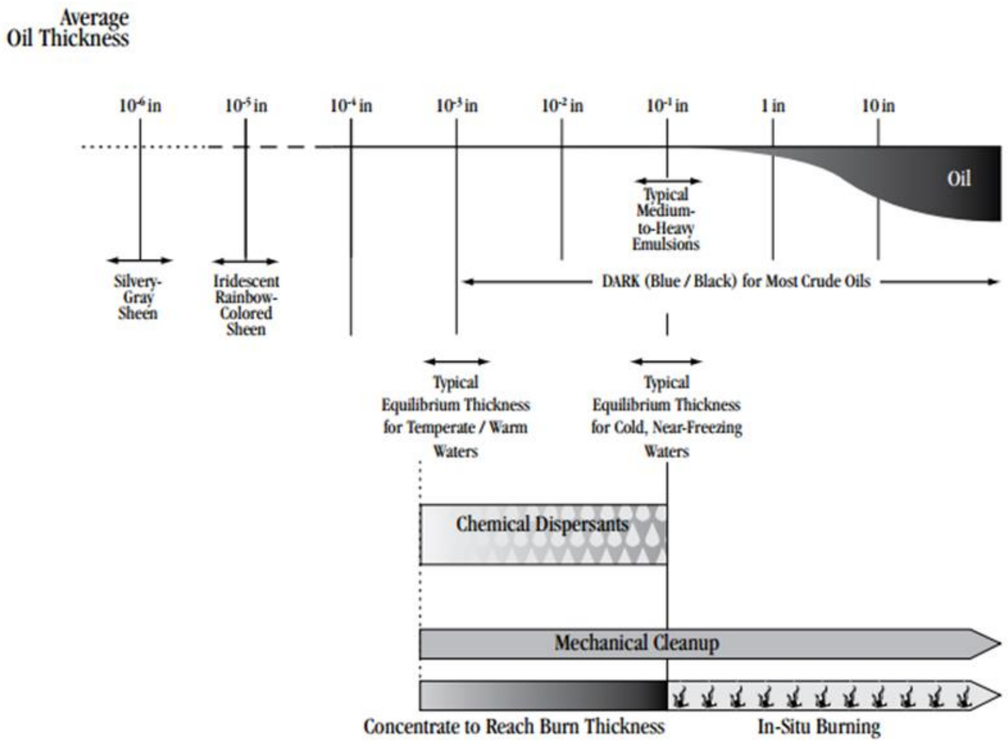

Figure 2-4: Oil thickness versus potential response options (Allen & Dale, 1996)

Wind and waves influence the feasibility of mechanical clean-up operations, dropping the effectiveness significantly because of entrainment and/or splash-over as short period waves develop beyond two to three feet (0.6 to 0.9 m) in height. Waves and wind can also be limiting factors for the safe operation of vessels and aircraft.

2.3.4 Surface hydrocarbon viscosity

Table 2-4: Surface hydrocarbon viscosity thresholds

Surface viscosity (cSt)	Description	European Maritime Safety Authority (EMSA)	Viscosity at sea temperature (cSt)
5,000*	Predicted optimum viscosity for surface dispersant operations	Generally possible to disperse	500-5000
10,000*	Predicted maximum viscosity for effective surface dispersant operations	Sometimes possible to disperse	5000-10,000

*Measured at sea surface temperature

Further to the required thickness for surface dispersant application and containment and recovery to be deployed effectively as outlined above, changes to viscosity will also limit the treatment of offshore response techniques. As outlined in the EMSA Manual on the Applicability of Oil Spill Dispersants (EMSA, 2012), guidance around changes to viscosity and likely effectiveness of surface dispersant application is provided.

This includes the following statements; “It has been known for many years that it is more difficult to disperse a high viscosity oil than a low or medium viscosity oil. Laboratory testing had shown that the effectiveness of dispersants is related to oil viscosity, being highest for modern “Concentrate, UK Type 2/3” dispersants at an oil viscosity of about 1000 or 2000 mPa.s (1000 to 2000 cSt) and then declining to a low level with an oil viscosity of 10,000 mPa.s (10,000 cSt). It was considered that some generally applicable viscosity limit, such as 2000 or 5000 mPa.s (2000 to 5000 cSt), could be applied to all oils.

However, modern oil spill dispersants are generally effective up to an oil viscosity of 5000 mPa.s (5000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 10,000 are, in most cases, no longer dispersible. Guidance from CEDRE (EMSA, 2012) also indicates products with a range of 500 to 5,000 cSt at sea temperature are generally possible to disperse, while those 5000 to 10,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 10,000 cSt at sea temperature below pour point generally impossible to disperse.

To support decision-making and response planning, a threshold of 10,000 cSt at sea temperature was chosen as a conservative estimate of maximum viscosity for surface dispersant spraying operations.

The thresholds described above are compared with the modelling results for the WCCS (**Table 2-5**).

2.3.5 Spill modelling results

Details of the worst-case credible scenario and modelling outputs are included in **Table 2-5**. Shoreline accumulation above 100 g/m² is not predicted.

Table 2-5: Worst case credible scenario modelling results

Modelled results	
Maximum continuous liquid hydrocarbon release rate and duration	Instantaneous surface release of 1000 m^3 of MDO representing loss of vessel fuel integrity after a collision
Maximum residual surface volume remaining post-weathering	5% residual component of 50 m^3
Minimum time to shoreline impact (above 100 g/m²)	*No contact at threshold*
Largest volume ashore at any single Response Priority Area (RPA) (above 100 g/m²)	*No contact at threshold*
Largest total shoreline accumulation (above 100 g/m²) all shorelines	*No contact at threshold*

2.3.5.1 Vessel collision (CS-01)

- Surface hydrocarbon concentrations greater than 50 g/m^2 may occur up to 30 km from the release location and, at 10 g/m^2, up to 54 km from the release location.
- Modelling does not predict shoreline accumulations greater than 100 g/m^2. Contact at concentrations significantly below feasible response thresholds (~10 g/m^2), however, may occur at Ningaloo Coast North WHA (17.7 days at 11 g/m^2) and Pilbara Islands – Southern Island Group (24.6 days at 13 g/m^2) receptor.
- The first receptors to receive entrained hydrocarbon contact at 100 ppb are Rankin Bank (probability of 2% after 18 hours) and Montebello Marine Park (probability of 20% after 34 hours).

Response operations cannot be implemented if the safety of response personnel cannot be guaranteed. Safety circumstances that limit the execution of this control measure include volatile concentrations of hydrocarbons in the atmosphere, high winds (>20 knots), waves and/or sea states (>1.5m waves) and high ambient temperatures.

Due to the volatile nature and rapid weathering of MDO, offshore response (dispersant application and/or containment and recovery) is not deemed feasible. Furthermore, as noted above, atmospheric volatiles in the early stages of a spill event may be at unsafe levels for responders to undertake an offshore response.

3 IDENTIFY RESPONSE PROTECTION AREAS

In a response, operational monitoring programs – including trajectory modelling and vessel/aerial observations – would be used to predict RPAs that may be impacted. For the purposes of planning and appropriately scaling a response, modelling has been used to identify RPAs as outlined in **Figure 3-1.**

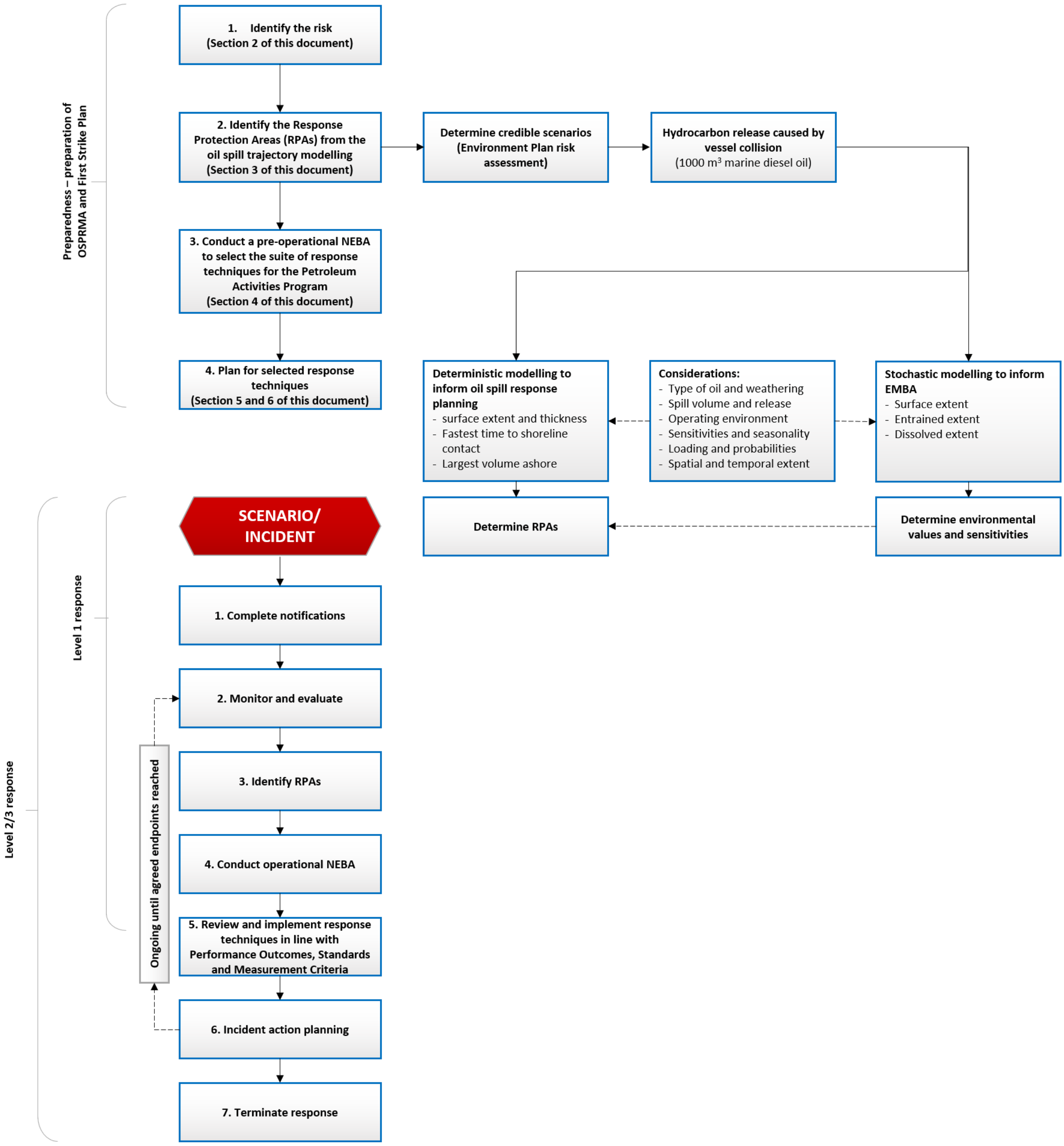

Figure 3-1: Identify Response Protection Areas flowchart

3.1 Identified sensitive receptor locations

Section 4 of the EP includes the list of sensitive receptor locations that have been identified by stochastic modelling as meeting the requirements of:

- receptors with the potential to incur surface, entrained or shoreline accumulation contact above environmental impact thresholds
- receptors within the EMBA which meet:

  a number of priority protection criteria/categories
  International Union of Conservation of Nature IUCN marine protected area categories
  high conservation value habitat and species
  important socio-economic/heritage value.

3.2 Response protection areas

RPAs are selected on the basis of their environmental (ecological, social, economic, cultural and heritage) values and sensitivities and considering the minimum response thresholds (detailed in Section 2.3.2) together with the ability to conduct a response.

Based on the stochastic modelling selected for this activity, no floating or shoreline contact from oil at response thresholds (50 g/m^2 and 100 g/m^2 respectively) is predicted and consequently no deterministic modelling was undertaken. Some potential contact at below response thresholds is predicted at Ningaloo Coast North WHA (17.7 days) and Pilbara Islands – Southern Island Group (24.6 days).

Any additional sensitive receptors are presented in the existing environment description (Section 4 of the EP) and impact assessment section (Section 6 of the EP) for the spill scenario. The pre-operational NEBA (Section 4 and ANNEX A: Net Environmental Benefit Analysis Detailed Outcomes) considers the results from the stochastic modelling to ensure all feasible response techniques are considered in the planning phase, therefore additional receptors are also included in the pre-operational NEBA.

4 NET ENVIRONMENTAL BENEFIT ANALYSIS

A NEBA is a structured process to consider which response techniques are likely to provide the greatest net environmental benefit. The NEBA process typically involves four key steps outlined in Figure 4-1: evaluate data, predict outcomes, balance trade-offs, and select response options. These steps are followed in the planning/preparedness process and would also be followed in a response.

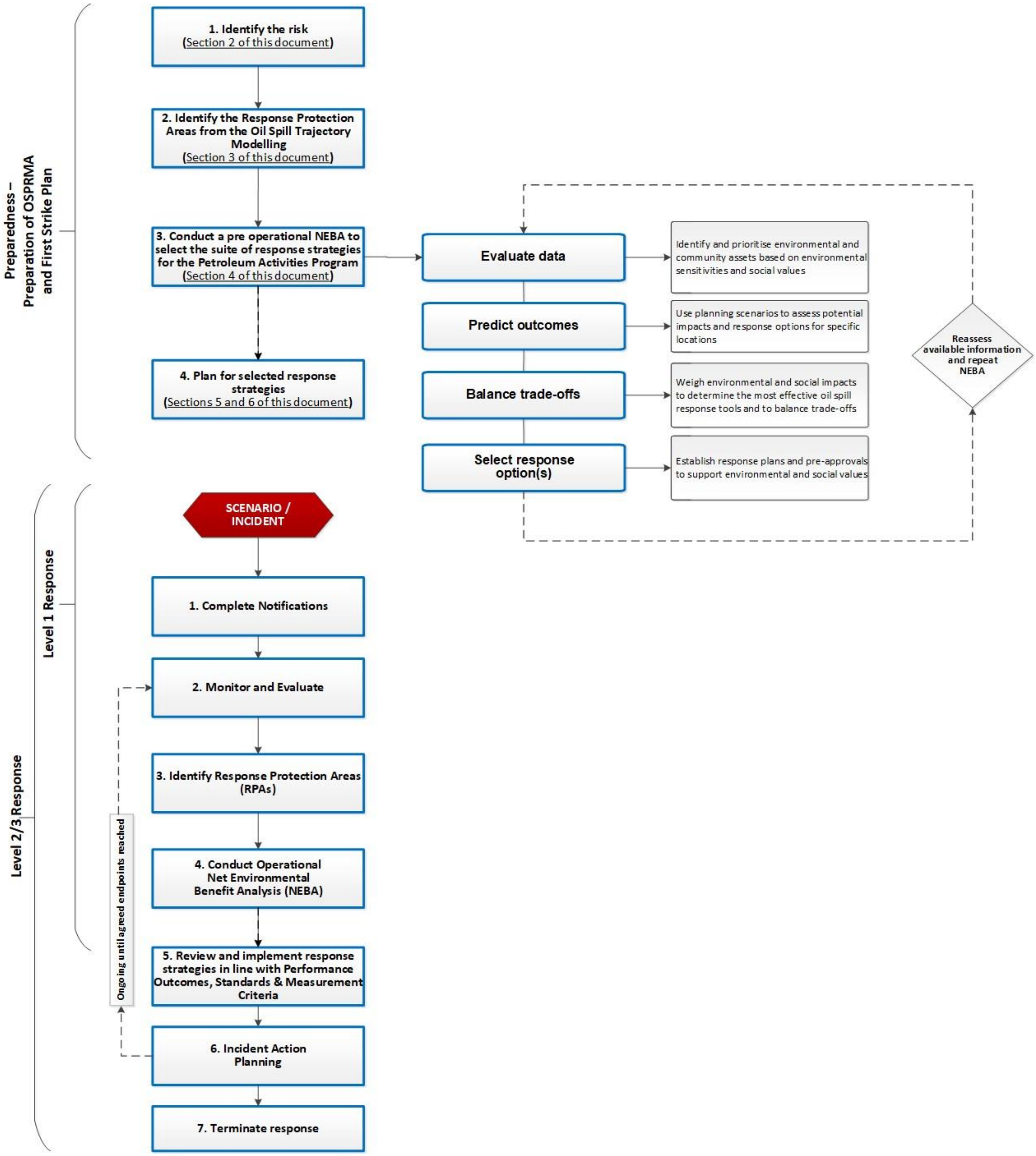

Figure 4-1: NEBA flowchart

4.1 Pre-operational/strategic NEBA

The pre-operational NEBA identifies positive and negative impacts to sensitive receptors from implementing the response techniques. Feasibility is considered by assessing the receptors potentially impacted above response thresholds (**Section 2.3.1.1**).

Completing a pre-operational NEBA is a key response planning control that reduces the environmental risks and impacts of implementing the selected response techniques. Comprehensive details of the pre-operational NEBA for this PAP are contained in **ANNEX A**.

4.2 Stage 1: Evaluate data

Woodside identifies and prioritises environmental and community assets based on environmental sensitivities and social values, informed through the use of trajectory modelling. Interpretation of stochastic oil spill modelling determines the EMBA for the release, which defines the spatial area that may be potentially impacted by the PAP activities.

4.2.1 Define the scenario(s)

Woodside uses scenarios identified from the risk assessment in the EP to assess potential impacts and response options for specific locations. The WCCS is then selected for deterministic modelling and is used for this pre-operational NEBA Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness and scale of the response.

Table 4-1: Scenario summary information (WCCS)

Scenario summary information (CS-01)	
Scenario	Instantaneous surface release of 1000 m^3 of MDO representing loss of vessel fuel integrity after a collision
Location	19° 45' 10.681" S, 115° 52' 42.898" E
Oil type	MDO
Fate and weathering	6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C) 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C) 54% should evaporate over several days (265 °C < BP < 380 °C).
Volume and duration of release	1000 m^3 (instantaneous)

4.2.1.1 Hydrocarbon characteristics

MDO (API 37.2)

MDO is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. The aromatic content of the oil is approximately 3%.

If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending upon the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of the oil have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction.

4.2.2 Determining potential response options

The available response techniques based on current technology can be summarised under the following headings:

- Monitor and Evaluate (including operational monitoring)
- Source Control via vessel SOPEP
- Surface Dispersant Application
  - Aerial Dispersant Application
  - Vessel Dispersant Application
- Mechanical dispersion
- In situ Burning
- Containment and Recovery
- Shoreline Protection and Deflection
  - Protection
  - Deflection
- Shoreline Clean-up:
  - Phase 1 – Mechanical Clean-up
  - Phase 2 – Manual Clean-up
  - Phase 3 – Final Polishing
- Oiled Wildlife Response
- Waste Management
- Post Spill Monitoring/Scientific Monitoring

An assessment of which response options are feasible for the scenarios is included in Error! Reference source not found. and **Table 4-2**. These options are evaluated against each scenario's parameters including oil type, volume and characteristics, prevailing weather conditions, logistical support, and resource availability to determine their deployment feasibility.

A shortlist of the feasible response options is then carried forward for the ALARP assessment with a justification for the exclusion of other response techniques included in **Section 4.2.3**. This assessment will typically result in a range of available options, that are deployed at different areas (at-source, offshore, nearshore and onshore) and times through the response. The NEBA process assists in prioritising which options to use where and when and timings throughout the response.

Table 4-2: Response technique evaluation – MDO

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: MDO				
Monitor and evaluate	Will be effective in tracking the location of the spill, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. • OM05 Shoreline assessment – once OM02, OM03 and OM04 inform if any RPAs have been impacted.	Monitoring of a MDO spill is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and providing information to regulatory agencies including AMSA and WA DoT. Practicable techniques that could be used for this scenario include predictive modelling (OM01), surveillance and reconnaissance OM02) and monitoring of hydrocarbon presence in water (OM03). Modelling does not predict impact of any shoreline receptors at threshold, however, pre-emptive assessment of sensitive receptors at risk (OM04) and monitoring of contaminated resources (OM05) would be utilised if any sensitive shoreline receptors are deemed to be at risk of impact.	Yes	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via vessel SOPEP	Controlling the spill of diesel at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment.	A spill of diesel from a vessel collision will be instantaneous and source control will be limited to what the vessel or facility can safely achieve whilst responding to the incident.	Yes	Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill.
Surface dispersant application	Dispersants are not considered effective when applied on thin surface films such as MDO as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon resulting in the unnecessary addition of chemicals to the marine environment	MDO is prone to rapid spreading and evaporation and is not suitable for surface dispersant application. Furthermore, modelling predicts that floating oil will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA or in open waters. The volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon thus this response technique is deemed inappropriate.	No	The application of dispersant to MDO is unnecessary as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.
Mechanical dispersion	Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages.	Although the technique is possible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area. The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment.	No	Given the limited benefit of mechanical dispersion over natural wind and wave action, secondary contamination and waste issues, and the associated safety risk of implementing the response for this activity, this strategy is deemed unsuitable.
In situ burning	In situ burning is only effective where minimum slick thickness can be achieved.	Use of in situ burning as a response technique for MDO is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading. In addition, there is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which is unlikely to be achieved. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel and its used would unnecessarily cause an increase the release of atmospheric pollutants.	No	Diesel characteristics are not appropriate for the use of in situ burning and would unnecessarily cause an increase the release of atmospheric pollutants.
Containment and recovery	Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5 with a 50-100% coverage of 100 g/m^2 to 200 g/m^2.	MDO is prone to rapid spreading and evaporation and is deemed unsuitable for effective containment and recovery operations. Furthermore, modelling predicts that floating oil will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA or in open waters.	No	Containment and recovery would be an inappropriate response technique for a spill of MDO. In addition to the safety issues, most of the spilled diesel would have been subject to rapid evaporation prior to the commencement of containment and recovery operations.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: MDO				
		The volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon thus this response technique is deemed inappropriate.		
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of at-risk areas.	A MDO spill would be prone to rapid spreading and evaporation and modelling predicts that there may be minor shoreline contact at 10 g/m^2 at Ningaloo Coast North (17.7 days) and Pilbara Islands – Southern Islands Group (24.6 days). The volatile nature of MDO may to lead to unsafe conditions in the vicinity of the hydrocarbon making response unfeasible. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time.	**Potentially**	Whilst minor contact is predicted at two RPAs, a protection and deflection response would only be deployed if operational monitoring detects hydrocarbons at appropriate thresholds for effective protection and deflection operations and the safety of response personnel can be ensured.
Shoreline clean-up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/m^2.	A MDO spill would be prone to rapid spreading and evaporation and the modelling predicts that no shoreline receptors will be contacted at threshold – any minor contact is significantly below any threshold concentration that would allow a response to be feasible. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time.	**No**	In addition to safety issues, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at a recoverable threshold and a spill of MDO is unlikely to accumulate at concentrations appropriate for shoreline clean-up techniques.
Oiled wildlife response	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options may be limited to hazing to ensure the safety of response personnel. The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. Monitor and evaluate will, however, be deployed from the outset of a spill to track the spill location and fate in real-time. Thus, in the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken in accordance with the Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists.	**Yes**	The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. However, in the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken as and where required.

4.2.3 Exclusion of response techniques

Response techniques that are not feasible for all scenarios for this activity are detailed in the subsections below and are excluded from further assessment within this document.

4.2.3.1 Surface dispersant application

Dispersants are not considered effective when applied on thin surface films such as MDO, as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon, making it unsuitable for effective treatment and unnecessarily adding chemicals to the marine environment. An MDO spill is also expected to dissipate rapidly on the surface and become entrained due to local metocean conditions. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon thus this response technique is deemed inappropriate.

4.2.3.2 Mechanical dispersion

Mechanical dispersion involves the use of a vessel’s propeller wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area. The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon.

4.2.3.3 In situ burning

MDO is not suitable for in situ burning due to rapid evaporation, minimum thickness requirements and window of opportunity. It would unnecessarily cause an increase in the release of atmospheric pollutants and may also result in burned residue sinking to the seabed. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon.

Until further operational and environmental information becomes available, Woodside will not consider this option.

4.2.3.4 Containment and recovery

Modelling results for an MDO release indicate that there is a very low probability of thickness >1 g/m^2 during the spill. Surface thresholds required for containment and recovery (> 50 g/m^2) will not be reached and shoreline accumulation is not predicted. MDO has a high portion of non-persistent components, prone to rapid spreading and evaporation thus the effectiveness of containment and recovery is predicted to be very low. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon thus this response technique is deemed inappropriate.

4.2.3.5 Shoreline clean-up

The modelling undertaken predicts that an MDO spill would be prone to rapid spreading and evaporation with no shoreline impact at the response threshold of 100 g/m^2. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon.

4.3 Stage 2: Predict outcomes

Woodside uses planning scenarios to assess potential impacts and response options for specific locations. Locations with potential environmental impacts, selected from the stochastic modelling are included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness of a response.

4.4 Stage 3: Balance trade-offs

Woodside considers environmental impacts and response effectiveness/feasibility to determine the most effective oil spill response tools and balance trade-offs, using an automated NEBA tool. The tool considers potential benefits and impacts associated with a response at sensitive receptors and then considers the effectiveness/feasibility of the response to select the response techniques carried forward to the ALARP assessment.

4.5 Stage 4: Select best response options

To select the response technique, all the other stages in the NEBA process are considered and used to establish response plans and any pre-approvals to support protection of identified environmental and social values. The response techniques implemented may vary according to a particular spill. The hydrocarbon type released and the sensitivities of the receptors (both ecological and socio-economic) may influence the response. The pre-operational NEBA broadly evaluates each response technique and supports decisions on whether they are feasible and of net environmental benefit. Response techniques that are not feasible or beneficial are rejected at this stage and not progressed to planning.

Further risks and impacts from implementing these selected response options are outlined in **Section 7**.

Table 4-3: Selection and prioritisation of response techniques

Response planning scenario	Key characteristics for response planning	Feasibility of response techniques									Outline response technique
		Monitor and evaluate	Source control via SOPEP	Surface dispersant application	In situ burning	Mechanical dispersion	Containment and recovery	Shoreline protection and deflection	Shoreline clean-up	Oiled wildlife response	
CS-01: Instantaneous release of up to 1000 m^3 MDO from a vessel collision (residual component of 50 m^3)	Fastest time to shoreline accumulation >100 g/m^2 – no contact Maximum shoreline accumulation – 13 g/m^2	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**Potentially**	**No**	**Yes**	Monitor and evaluate. Initiate source control if feasible. Initiate protection and deflection activities if required. Plan for oiled wildlife response and implement if oiled wildlife is observed.

From the NEBA undertaken on the WCCS identified Echo Yodel Subsea Decommissioning (vessel collision) the primary response techniques are:

- monitor and evaluate
- source control via vessel SOPEP
- shoreline protection and deflection (at identified RPAs)
- oiled wildlife response

Support functions may include:

- waste management
- scientific monitoring programmes.

5 HYDROCARBON SPILL ALARP PROCESS

Woodside’s hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *Oil Spill Risk Management Guidance Note N-04750-GN1488* (2021) and is set out in the ‘Woodside Hydrocarbon Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Development Guidelines’.

From the identified response planning need and pre-operational NEBA, Woodside conducts a structured, semi-quantitative hydrocarbon spill process which has the following steps:

1. Consider the Response Planning Need identified in terms of surface area (km²) and available surface hydrocarbon volumes (m³) against existing Woodside capability.
2. Consider alternative, additional and improved options for each response technique/control measure by providing an initial and, if required, detailed evaluation of:
    - predicted cost associated with adopting the control measure
    - predicted change/environmental benefit
    - predicted effectiveness/feasibility of the control measure.
3. Evaluate the risks and impacts of implementing the proposed response techniques, and any further control measures with associated environmental performance to manage these additional risks and impacts.

Woodside considers the risks and impacts from a hydrocarbon spill to have been reduced to ALARP when:

1. A structured process for identifying and considering alternative, additional, and improved options has been completed for each selected response technique;
2. The analysis of alternate, additional, and improved control measures meets one of the following criteria:
    - all identified, reasonably practicable control measures have been adopted; or
    - no identified reasonably practicable additional, alternative and/or improved control measures would provide further overall increased proportionate environmental benefit; or
    - no reasonably practical additional, alternative, and/or improved control measures have been identified.
3. Where an alternative, additional and/or improved control measure is adopted, a measurable level of environmental performance has been assigned.
4. Higher order impacts/risks have received more comprehensive alternative, additional and improved control measure evaluations and do not just compare the cost of the adopted control measures to the costs of an extreme or clearly unreasonable control measure.
5. Cumulative effects have been analysed when considered in combination across the whole activity.

The response technique selection is based on the risk assessment conducted in the EP. The risk assessment identifies the type of oil, volume of release, duration of release, predicted fate, weathering and the EMBA (along with other requirements such as time to impact and predicted volumes ashore). Modelling is then used to inform the NEBA and the prioritisation of suitable response options. The scale of the response techniques selected in the pre-operational NEBA is informed through the assessment of results from deterministic modelling. For the purpose of the ALARP assessment, the following terms and definitions have been used:

- Response techniques are considered the control measures that reduce consequences from hydrocarbon spill events. The terms ‘response technique’ and ‘control measure’ are used interchangeably.
- Cost is defined as the time, effort and/or trouble taken in financial, safety, design/storage/installation, capital/lease, and/or operations/maintenance terms to adopt a control measure.
- Where the predicted change to environmental impact is compared against standard environmental values and sensitivities impacts using positive or negative criteria from the NEBA Impact Ranking Classification Guidance in **ANNEX A**.

5.1 Monitor and evaluate (including operational monitoring)

Monitor and evaluate includes the gathering and evaluation of data to inform the oil spill response planning and operations. It includes fate and trajectory modelling, spill tracking, weather updates and field observations. This response option is deployed in some capacity for every event.

Table 5-1 provides the operations monitoring plans that support the successful execution of this response technique.

Table 5-1: Description of supporting operational monitoring plans

ID	Title
OM01	Predictive modelling of hydrocarbons to assess resources at risk
OM02	Surveillance and reconnaissance to detect hydrocarbons and resources at risk
OM03	Monitoring of hydrocarbon presence, properties, behaviour and weathering in water
OM04	Pre-emptive assessment of sensitive receptors at risk
OM05	Shoreline assessment

Woodside maintains an *Operational Monitoring Operational Plan*. If shoreline contact is predicted, RPAs will be identified and assessed before contact. If shorelines are contacted, a shoreline assessment survey will be completed to guide effective shoreline clean-up operations. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill.

The proximity of Dampier to the spill event location means that multiple logistical options are available to monitor the spill in relatively short timeframes. The primary mobilisation base for initial monitoring activities would be Dampier. However, in the event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Exmouth.

5.1.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- No shoreline contact from floating oil above response threshold (100 g/m^2) is predicted.
- Shoreline contact at ~10 g/m^2 is predicted for Ningaloo Coast North (day 17.7) and Pilbara Islands – Southern Islands Group (day 24.6).
- The first receptors to receive entrained hydrocarbon contact at 100 ppb are Rankin Bank (probability of 2% after 18 hours) and Montebello Marine Park (probability of 20% after 34 hours).
- Predictive modelling (OM01), direct observation/surveillance (OM02) and, where appropriate, hydrocarbon detection in water (OM03), will be employed from the outset of a spill to track the oil, assess where and when appropriate response techniques can be deployed and to identify when the spill enters State Waters. When RPAs at threat of impact can be accurately deduced, this will trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04), to direct any protection and deflection operations. OM04 would be undertaken in liaison with WA DoT (if a Level 2/3 incident and within State Waters).
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline contact which is predicted to occur at 10 g/m^2 on day 17.7 at Ningaloo Coast North and on day 24.6 at Pilbara Islands – Southern Group.

- The duration of the spill would be instantaneous with response operations extending until the hydrocarbon discharge has ceased, surface hydrocarbons are no longer visible, and no additional response or clean-up of wildlife or habitats is predicted.
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

5.1.2 Environmental performance based on need

Table 5-2: Environmental performance – monitor and evaluate

Environmental Performance Outcome	To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario.			
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
1	OSTM	1.1	Initial modelling available within six hours using the Rapid Assessment Tool.	1, 3B, 3C, 4
		1.2	Detailed modelling available within four hours of RPS Response receiving information from Woodside.	
		1.3	Detailed modelling service available for the duration of the incident upon contract activation.	
2	Tracking buoy	2.1	Tracking buoy located on facility/vessel and ready for deployment 24/7.	1, 3A, 3C, 4
		2.2	Deploy tracking buoy from facility within two hours as per the First Strike Plan.	1, 3A, 3B, 4
		2.3	Contract in place with service provider to allow data from tracking buoy to be received 24/7 and processed.	1, 3B, 3C, 4
		2.4	Data received to be uploaded into Woodside COP daily to improve the accuracy of other monitor and evaluate techniques.	1, 3B, 4
3	Satellite imagery	3.1	Contract in place with third party provider to enable access and analysis of satellite imagery. Imagery source/type requested on activation of service.	1, 3C, 4
		3.2	Third party provider will confirm availability of an initial acquisition within two hours.	1, 3B, 3C, 4
		3.3	First image received with 24 hours of Woodside confirming to third party provider its acceptance of the proposed acquisition plan.	1
		3.4	Third party provider to submit report to Woodside per image. Report is to include a polygon of any possible or identified slick(s) with metadata.	1
		3.5	Data received to be uploaded into Woodside COP daily to improve accuracy of other monitor and evaluate techniques.	1, 3B, 4
		3.6	Satellite Imagery services available and employed during response.	1, 3C, 4
4	Aerial surveillance	4.1	Two trained aerial observers available to be deployed by day one from resource pool.	1, 2, 3B, 3C, 4
		4.2	One aircraft available for two sorties per day, available for the duration of the response from day one	1, 3C, 4
		4.3	Observer to compile report during flight as per first strike plan. Observers report available to the IMT within two hours of landing after each sortie.	1, 2, 3B, 4
5	Hydrocarbon detections in water	5.1	Activate third-party service provider as per first strike plan. Deploy resources within 3 days: • Three specialists in water quality monitoring. • Two monitoring systems and ancillaries. • One vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment.	1, 2, 3C, 3D, 4

Environmental Performance Outcome		To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
		5.2	Water monitoring services available and employed during response.	1, 3C, 4
		5.3	Preliminary results of water sample as per contractor's implementation plan within seven days of receipt of samples at the accredited lab.	
		5.4	Daily fluorometry reports as per service provider's implementation plan will be provided to IMT to validate modelling and monitor presence/absence of entrained hydrocarbons.	
		5.5	Use of Autonomous Underwater Vehicles (AUVs) for hydrocarbon presence and detection may be used as a contingency if the operational NEBA confirms conventional methods are unsafe or not possible.	1, 2, 3C, 4
6	Pre-emptive assessment of sensitive receptors	6.1	10 days prior to any predicted impact, in agreement with WA DoT (for Level 2/3 incidents), deployment of 2 specialists from resource pool in establishing the status of sensitive receptors.	1, 2, 3B, 3C, 4
		6.2	Daily reports provided to IMT on the status of the receptors to prioritise RPAs and maximise effective utilisation of resources.	1, 3B, 4
7	Shoreline assessment	7.1	10 days prior to any predicted impact, in agreement with WA DoT (for Level 2/3 incidents), deployment of 2 specialist(s) in SCAT from resource pool for each of the Response Protection Areas (RPAs) with predicted impacts	1, 2, 3B, 3C, 4
		7.2	SCAT reports provided to IMT daily detailing the assessed areas to maximise effective utilisation of resources.	1, 3B, 4
		7.3	Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations.	1
8	Management of environmental impact of the response risks	8.1	If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified.	1
		8.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	

The control measures and capability of Woodside and its third-party service providers are shown to support Monitor and Evaluate activities. This is demonstrated by the following:

- Woodside has a documented, structured and tested capability for Monitor and Evaluate operations including internal trajectory modelling capabilities, tracking buoys located offshore and contracted aerial observation platforms with access to trained observers.
- Woodside and its third-party service providers ensure there is sufficient capability for the duration of the response.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in **Section 6.1**.

- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered grossly disproportionate to the environmental benefit gained and/or not reasonably practicable for this PAP.
- The Monitor and Evaluate capability outlined in this section is part of the response developed to manage potential risks and impacts associated with the scenarios to ALARP, and there are no further additional, alternative and improved control measures other than those implemented that would provide further benefit.

5.2 Source control via vessel Shipboard Oil Pollution Environment Plan

Vessel source control will be conducted, where feasible and in accordance with MARPOL 73/78 Annex I, by the Vessel Master under the Shipboard Oil Pollution Environment Plan (SOPEP) triggered by any loss of containment from the PAP vessels.

The SOPEP provides guidance to the Master and Officers on board the vessel with respect to the extra steps to be taken when an unexpected pollution incident has occurred or is likely to occur. The SOPEP contains all information and operational instructions required by IMO Resolution MEPC.54 (32) adopted on 6 March 1992, as amended by resolution MEPC.86 (44) adopted on 13 March 2000.

Its purpose is to set in motion the necessary actions to stop or minimise oil discharge and mitigate its effects and outlines responsibilities, pollution reporting requirements, procedures and resources needed in the event of a hydrocarbon spill from vessel activities.

In the event of the vessel collision event, the vessel master may engage precautionary marine manoeuvres to avoid collision or commence pumping operations to transfer MDO and thus minimise the release.

5.2.1 Environmental performance based on need

Woodside has established control measures, environmental performance outcomes, performance standards and measurement criteria to be used for vessel-source oil spill response during the PAP which are detailed in Section 6.7 of the EP. The vessel master's roles and responsibilities are described in Section 7.3 of the EP.

Performance standards for each contracted PAP vessel are detailed in the vessel's specific SOPEP.

These standards ensure that sufficient resources are available and are adequately tested to ensure implementation of the SOPEP in the event of a hydrocarbon spill.

5.3 Shoreline protection and deflection

The placement of containment, protection or deflection booms on and near a shoreline is a response technique to reduce the potential volume of hydrocarbons contacting or spreading along shorelines, which may reduce the scale of shoreline clean-up. Hydrocarbons contained by the booms would be collected where practicable.

Shorelines would be protected where accessible via vessel or shore. Where hydrocarbon contact has already occurred, there may still be value in deploying protection equipment to limit further accumulations and preventing remobilisation of stranded hydrocarbons.

Shoreline protection and deflection equipment would be mobilised to selected locations, where the following conditions were met:

- Sea-states and hydrocarbon characteristics permit safe deployment of protection and deflection measures.
- Oil trajectory has been identified as heading towards identified RPAs.

5.3.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which the response need can be based:

- No shoreline contact from floating oil above response threshold (100 g/m^2) is predicted.
- Shoreline contact at ~10 g/m^2 is predicted for Ningaloo Coast North (day 17.7) and Pilbara Islands – Southern Islands Group (day 24.6).
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised 10 days prior to shoreline contact which is predicted to occur at 10 g/m^2 on day 17.7 at Ningaloo Coast North and on day 24.6 at Pilbara Islands – Southern Group.
- Predictive modelling (OM01), direct observation/surveillance (OM02) and, where appropriate, hydrocarbon detection in water (OM03), will be employed from the outset of a spill to track the oil, assess where and when appropriate response techniques can be deployed and to identify when the spill enters State Waters. When RPAs at threat of impact can be accurately deduced, this will trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04), to direct any protection and deflection operations. OM04 would be undertaken in liaison with WA DoT (if a Level 2/3 incident and within State Waters).
- Following pre-emptive assessments of sensitive receptors at risk, and in agreement of prioritisation with WA DoT (if a Level 2/3 incident and within State Waters), protection and deflection operations would commence until agreed termination criteria are reached.
- Arrangements for support organisations who provide specialist services (trained personnel, protection and deflection equipment) and/or resources should be tested regularly; and
- TRPs for RPAs along with other relevant plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for Shoreline Protection and Deflection. These assumptions have been described in the table below.

Table 5-3: Response Planning Assumptions – Shoreline Protection and Deflection

Response Planning Assumptions	
Safety considerations	Shoreline protection and deflection operations cannot be implemented if the safety of response personnel cannot be guaranteed. This requires an initial and ongoing risk assessment of health and safety hazards and risks at the site. Personnel safety issues may include: • hydrocarbon gas and/or liquid exposure • safe for deployment and conditions within range of vessels • high ambient temperatures.
Shoreline Protection and Deflection	• 1 x Shoreline Protection and Deflection operation may include; – Quantity of shoreline sealing boom (as outlined in TRP) – Quantity of fence or curtain boom (as outlined in TRP) – 1-2 x trained supervisors – 8-10 x personnel / labour hire Specific details of each operation would be tailored to the TRP implemented (where available).

5.3.2 Environmental performance based on need

Table 5-4: Environmental Performance – Shoreline Protection and Deflection

Environmental Performance Outcome		To stop hydrocarbons encountering particularly sensitive areas		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
22	Response teams	22.1	In liaison with WA DoT (for Level 2/3 incidents), relevant Tactical Response Plans (TRPs) will be identified in the First Strike plan for activation 5 days prior to a predicted impact.	1, 3A, 3C, 4
		22.2	In liaison with WA DoT (for Level 2/3 incidents), mobilise teams to RPAs 5 days prior to predicted impact. Teams to contaminated RPAs comprised of: • 1-2 trained specialists per operation • 8-10 personnel/labour hire • Personnel sourced through resource pool.	1, 2, 3B, 3C, 4
		22.3	In liaison with WA DoT (for Level 2/3 incidents), 1 operation mobilised 5 days prior to predicted impact for each identified RPA. Expected to be 1 RPA within 17.7 days (operation as detailed above) and 1 RPA within 24.6 days.	1, 3A, 3B, 4
		22.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
		22.5	The safety of shoreline response operations will be considered and appropriately managed. During shoreline operations: • All personnel in a response will receive an operational/safety briefing before commencing operations • Gas monitoring and site entry protocols will be used to assess safety of an operational area before allowing access to response personnel.	1, 3B, 4
23	Response equipment	23.1	Equipment mobilised from closest stockpile 5 days prior to predicted impact.	1, 3A, 3C, 4
		23.2	Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles 5 days prior to predicted impact.	1, 3C, 3D, 4
		23.3	Supplementary equipment mobilised from OSRL 5 days prior to predicted impact.	
		23.4	Woodside maintains integrated fleet of vessels. Additional vessels can be sourced through existing contracts/frame agreements	1, 3A, 3C, 4
24	Management of Environmental Impact of the response risks	24.1	If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic primary producer habitats. Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified.	1
		24.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines.	

The resulting shoreline protection and deflection capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to shoreline protection and deflection at identified RPAs.

Under optimal conditions, during the surface release, the capability available exceeds the need identified. It indicates that the shoreline protection and deflection capability have the following expected performance:

- Existing capability allows for mobilisation and deployment of shoreline protection operations by day 2 (if required). Given that no shoreline contact is predicted (>10 g/m^2) until day 17.7, the existing capability is considered sufficient to mobilise and deploy protection at RPAs prior to hydrocarbon contact, guided by the ongoing operational monitoring.
- TRPs have been developed for identified RPAs that are predicted to be impacted except in international locations.

Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in **Section 6.3**.

5.4 Oiled wildlife response (including hazing)

Woodside would implement a response in accordance with the *Oiled Wildlife Operational Plan*. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Oiled wildlife operations would be implemented with advice and assistance from the Oiled Wildlife Advisor from the Department of Biodiversity Conservation and Attractions (DBCA).

Oiled wildlife response is undertaken in accordance with the Western Australian Oiled Wildlife Response Plan to ensure it is conducted in accordance with legislative requirements under the *Animal Welfare Act 2002*. If there is a net environmental benefit, oiled wildlife operations will be conducted 24 hours per day to reduce the time for rehabilitation and release of oiled wildlife. Hazing and pre-emptive capture techniques to keep non-oiled animals away from contaminated habitat in instances where it is deemed appropriate will be conducted in accordance with the Western Australian Oiled Wildlife Response Plan, specifically vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the oil and deterrence/hazing and pre-emptive capture will only be conducted if Woodside has licensed authority from DBCA and approval from the Incident Controller.

Shoreline access, if required, will be considered as part of the operational NEBA. Vehicular access would be restricted on dunes, turtle nesting beaches and in mangroves. Woodside retains specialist personnel to support and manage oiled wildlife operations, including trained and competent responders in Karratha and Perth. Additional personnel would be sourced through Woodside’s arrangements to support an oiled wildlife response as required.

5.4.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Modelling predicts minor shoreline impact from floating hydrocarbons ~ 10 g/m² on day 17.7 at Ningaloo Coast North and on day 24.6 at Pilbara Islands – Southern Group.
- No shoreline accumulation > 100 g/m² threshold is expected.
- The first receptors to receive entrained hydrocarbon contact at 100 ppb are Rankin Bank (probability of 2% after 18 hours) and Montebello Marine Park (probability of 20% after 34 hours).
- The offshore location of the release site is expected to initially result in low numbers of at-risk or impacted wildlife.
- Given there is no potential shoreline accumulation >100 g/m² and surface concentrations above 10 g/m² are limited, it is estimated that the oiled wildlife response would be between Level two and three, as defined in the West Australian Oiled Wildlife Response Plan WA OWRP (Table 5-7).

Table 5-5: Key at-risk species potentially in Priority Protection Areas and open ocean

Species	Open ocean
Marine turtles (including foraging and inter-nesting areas and significant nesting beaches)	✓
Whale sharks (migration to and from waters at Ningaloo)	✓
Seabirds and/or migratory shorebirds	✓
Cetaceans – migratory whales	✓
Cetaceans – dolphins and porpoises	✓
Dugongs	✓
Sea snakes	✓

The oiled wildlife response technique targets key wildlife populations at risk within Commonwealth open waters and the nearshore waters. Responding to oiled wildlife consists of eight key stages, as described in **Table 5-6**.

Table 5-6: Oiled wildlife response stages

Stage	Description
Stage 1: Wildlife first strike response	Gather situational awareness including potential wildlife assets at risk.
Stage 2: Mobilisation of wildlife resources	Resources include personnel, equipment and facilities.
Stage 3: Wildlife reconnaissance	Reconnaissance to identify potentially affected animals.
Stage 4: IAP wildlife sub-plan development	The IAP includes the appropriate response options for oiled wildlife, including wildlife priorities for protection from oiling; deterrence measures (see below); and recovery and treatment of oiled wildlife; resourcing of equipment and personnel. It includes consideration of deterrence practices such as 'hazing' to prevent fauna from entering areas potentially contaminated by spilled hydrocarbons, as well as dispersing, displacing or relocating fauna to minimise/prevent contact and provide time for clean-up.
Stage 5: Wildlife rescue and staging	This includes the different roles of finding oiled wildlife, capturing wildlife, and holding and/or transportation of wildlife to oiled wildlife facilities.
Stage 6: Establishment of an oiled wildlife facility	Treatment facilities would be required for the first-aid, cleaning and rehabilitation of affected animals. A vessel-based 'on-water' facility would likely need to be established to enable stabilisation of oiled wildlife before transport to a suitable treatment facility. Suitable staging sites in Dampier have been identified in the draft Regional Oiled Wildlife Response Operational Plan (OWROP), should a land-based site be required.
Stage 7: Wildlife rehabilitation	Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping and success tracking.
Stage 8: Oiled wildlife response termination	Once a decision has been made to terminate operations, the Incident Controller will stand down individual participating and supporting agencies.

Reconnaissance and primary response would be done during operational monitoring and surveillance activities. Where marine fauna is observed on water or transiting near or within the spill area, observations would be recorded through surveillance records. The shoreline assessments would be done in accordance with OM05, which would be used as a further tool to identify fauna and habitats contacted by hydrocarbons.

Staging sites would be established as forward bases for shoreline- or vessel-based field teams. Once recovered to a staging site, wildlife would be transported to the designated oiled wildlife facility or a temporary holding centre (before being transported to the oiled wildlife facility). Temporary holding centres are required when there is significant distance between a staging site and the oiled wildlife facility, to enable stabilisation of oiled animals. The oiled wildlife facility is the primary location where animals would be housed and treated. Sites proposed for staging a regional oiled wildlife response in Dampier have been identified.

To deploy a response that is appropriate to the nature and scale of the event, as well as scalable over time, Woodside would implement an oiled wildlife response in consultation with DBAC and use the capability outlined in the WA OWRP, with additional capability if required (e.g. volunteers) accessible through Woodside's *People & Global Capability Surge Labour Requirement Plan*.

The WA OWRP provides indicative oiled wildlife response levels (**Table 5-7**) and the resources likely to be needed at each increasing level of response.

Table 5-7: Indicative oiled wildlife response level (adapted from the WA OWRP, 2014)

OWR Level	Indicative personnel numbers	Indicative duration	Indicative number of birds (non-threatened species)	Indicative number of birds (threatened species)	Turtles (hatchlings, juveniles, adults)	Cetaceans	Pinnipeds	Dugongs
Level 1	6	< 3 days	1 to 2 per day < 5 total	None	None	None	None	None
Level 2	26	> 4 to 14 days	1 to 5 per day < 20 total	None	< 20 hatchlings No juv/adults	None	None	None
Level 3	59	> 4 to 14 days	5 to 10 per day	1 to 5 per day < 10 total	< 5 juv/adults < 50 hatchlings	None	< 5	None
Level 4	77	> 4 to 14 days	5 to 10 per day < 200 total	5 to 10 per day	< 20 juv/adults < 500 hatchlings	< 5, or known habitats affected	5 to 50	Habitat affected only
Level 5	116	> 4 to 14 days	10 to 100 per day > 200 total	10 to 50 per day	> 20 juv/adults > 500 hatchlings	< 5 dolphins	> 50	Dugongs oiled
Level 6	122	> 4 to 14 days	> 100 per day	10 to 50 per day	> 20 juv/adults > 500 hatchlings	> 5 dolphins	> 50	Dugongs oiled

Woodside has access to oiled wildlife equipment specified in **Table 5-8**. Each oiled fauna kit provides the capability to treat approximately 100 wildlife, and each containerised washing station can treat up to 250 wildlife for a five-day period. Therefore, the equipment in **Table 5-8** can treat up to 600 wildlife per day by day 6 (Level 5 OWR), The wildlife response strategy may need to be escalated, as guided by the operational monitoring.

Table 5-8: Equipment available in the timeframe to meet and exceed level 5 OWR

Type of Equipment and Number	Available to be mobilised
1 x Oiled fauna kit (Dampier)	Day 1
1 x Portable containerised washing station* (Fremantle) 1 x Oiled fauna kit (Karratha) 1 x Oiled fauna kit (Exmouth)	Day 2
1 x Oiled fauna kit	Day 3
1 x Portable containerised washing station 2 x Oiled fauna kits	Day 5
Oil Spill Response Limited (OSRL) has equipment to support intake and triage; cleaning and rehabilitation and a wildlife rehabilitation unit	Day 6

** Container treats up to 250 units for five days.*

5.4.2 Environmental performance based on need

Table 5-9: Environmental performance – oiled wildlife response

Environmental Performance Outcome		Oiled Wildlife Response is conducted in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP) to ensure it is conducted in accordance with legislative requirements to house, release or euthanise fauna under the *Animal Welfare Act 2002*.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
9	Wildlife response equipment	9.1	Contracted capability to treat 100 individual fauna for immediate mobilisation to RPAs.	1, 3A, 3B, 3C, 4
		9.2	Contracted capability to treat up to an additional 250 individual fauna within a five-day period.	
		9.3	National plan access to additional resources under the guidance of the DoT (up to a Level 5 oiled wildlife response as specified in the WA OWRP), with the ability to treat about 600 individual fauna by the time hydrocarbons contact the shoreline.	1, 3C, 4
		9.4	Three vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the hydrocarbons.	1, 3A, 3B, 4
		9.5	Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WAOWRP.	1, 3A, 4
10	Wildlife responders	10.1	2 OWR Team Members to lead the oiled wildlife operations who have completed an Oiled Wildlife Response Management course.	1, 2, 3B
		10.2	Wildlife responders to be accessed through resource pool and additional agreements with specialist providers.	1, 2, 3A, 3B, 3C, 4
		10.3	Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA.	1
		10.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
11	Management of environmental impact of the response risks	11.1	All oiled wildlife response sites zoned and marked before operations commence to prevent secondary contamination and minimise the mixing of clean and oiled waste	1, 3A, 3B

The resulting wildlife response capability has been assessed against the WCCS. No RPAs are contacted above response thresholds of hydrocarbons.

Under optimal conditions, during the surface release, the capability available meets the need identified. It indicates that the wildlife response capability has the following expected performance:

- Mobilisation and deployment of one central wildlife treatment and rehabilitation location at Dampier in accordance with WA OWRP.
- No additional capability will be required for this activity, given the oiled wildlife response will largely be limited to open water.
- Recovered wildlife from open water would be transported to a central treatment location at Dampier.
- The waste storage capacity is sufficient to meet the need (circa 1 m^3 waste generated per wildlife unit cleaned).

5.5 Waste management

Waste management is considered a support technique to wildlife response for this assessment[5]. Waste generated and collected during the response that will require handling, management and disposal may consist of:

- Liquids (hydrocarbons and contaminated liquids) collected during wildlife response, and/or
- Solids/semi-solids (oily solids, garbage, contaminated materials) and debris collected during wildlife response.

Expected waste volumes during an event are likely to vary depending on oil type, volume released, response techniques employed and how weathering of hydrocarbons. Waste management, handling and capacity should be scalable to ensure continuous response operations can be maintained.

All waste management activities will follow the *Environment Protection (Controlled Waste) Regulations 2004* and the waste will be managed to minimise final disposal volumes. Waste treatment techniques will consider contaminated solids treatment to allow disposal to landfill and solids with high concentrations of hydrocarbon will be treated and recycled where possible or used in clean fill if suitable.

The waste products would be transported from response locations to the nearest suitable staging area/waste transfer station for treatment, disposal or recycling. Waste will be transferred with appropriately licensed vehicles. Containers will be available for temporary waste storage and will be:

- Labelled with the waste type
- Provided with appropriate lids to prevent waste being blown overboard
- Bunded if storing liquid wastes.
- Processes will be in place for transfers of bulk liquid wastes and include:
  - Inspection of transfer hose undertaken prior to transfer
  - Watchman equipped with radio visually monitors loading hose during transfer
  - Tank gauges monitored throughout operation to prevent overflow.

The *Oil Spill Preparedness Waste Management Support Plan* details the procedures, capability and capacity in place between Woodside and its primary waste services contractor (Veolia Waste Management) to manage waste volumes generated from response activities.

5.5.1 Response need based on predicted consequence parameters

Table 5-10: Response Planning Assumptions – Waste Management

Response planning assumptions: Waste management	
Waste loading per m^3 oil recovered (multiplier)	Oiled wildlife response – approx. 1 m^3 of oily liquid waste generated for each wildlife unit cleaned.

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[5] Shoreline protection and deflection is not considered to give rise to significant waste quantities in itself – any significant quantities of liquid or solid waste recovered whilst undertaking this technique nearshore would be accounted for under shoreline clean-up waste volumes and, offshore, would be accounted for under containment and recovery waste volumes.

5.5.2 Environmental performance based on need

Table 5-11: Environmental performance – waste management

Environmental Performance Outcome		To minimise further impacts, waste will be managed, tracked and disposed of in accordance with laws and regulations.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
12	Waste Management	12.1	Contract with waste management services for transport, removal, treatment and disposal of waste.	1, 3A, 3B, 3C, 4
		12.2	Access to at least 675 m^3 of solid and liquid waste storage available within 4 days upon activation of 3rd party contract, if required.	
		12.3	Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal.	
		12.4	Teams will segregate liquid and solid wastes at the earliest opportunity.	
		12.5	Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract.	
		12.6	Open communication line to be maintained between IMT and waste management services to ensure the reliable flow of accurate information between parties.	1, 3A, 3B
		12.7	Waste management to be conducted in accordance with Australian laws and regulations.	1, 3A, 3B, 3C, 4
		12.8	Waste management services available and employed during response.	

The resulting waste management capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to waste management at identified RPAs.

Given that modelling predicts that there will be no floating oil at recoverable threshold concentrations and no shoreline impact at feasible clean-up threshold concentrations, the only waste management requirements will be for oiled wildlife response and the capability available therefore exceeds the need identified.

- Woodside's waste service provider has the capacity to treat up to 120,000 m^3 overall waste volumes. The waste management requirements are within Woodside's and its service providers existing capacity.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.5.
- The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered clearly disproportionate to the environmental benefit gained and/or not reasonably practicable for this activity.
- The waste management capability outlined in this section is part of the response developed to manage potential risks and impacts associated with the scenarios to ALARP, and there are no further additional, alternative and improved control measures other than those implemented that would provide further benefit.

5.6 Scientific monitoring

A scientific monitoring program (SMP) would be activated following a Level two or three 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 Environment that Maybe Affected (EMBA) and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the credible spill scenario or other identified unplanned hydrocarbon releases associated with the operational activities (refer to **Table 2-1**).

The outputs of the stochastic hydrocarbon spill modelling were used to assess the environmental risk of the hydrocarbon affected area as delineated by the ecological impact EMBA and socio-cultural EMBA based on exceedance of environmental and social-cultural hydrocarbon threshold concentrations (refer to Table 2-2 and see Section 4 and 6 of the Echo Yodel Subsea Decommissioning EP for further information on applicable thresholds and the EMBAs). The PAP worst-case credible spill scenario defines the EMBA and are the basis of the SMP approach presented in this section.

It should be noted that the resulting SMP receptor locations differ from the Response Protection Areas presented and discussed in **Section 3** of this document due to the applicability of different hydrocarbon threshold levels. The SMP would be informed by the data collected via the operational monitoring program (OMP) studies; however, it differs from the OMP in being a long-term program independent of, and not directing, the operational oil spill response or monitoring of impacts from response activities (refer to **Section 5** for operational monitoring overview).

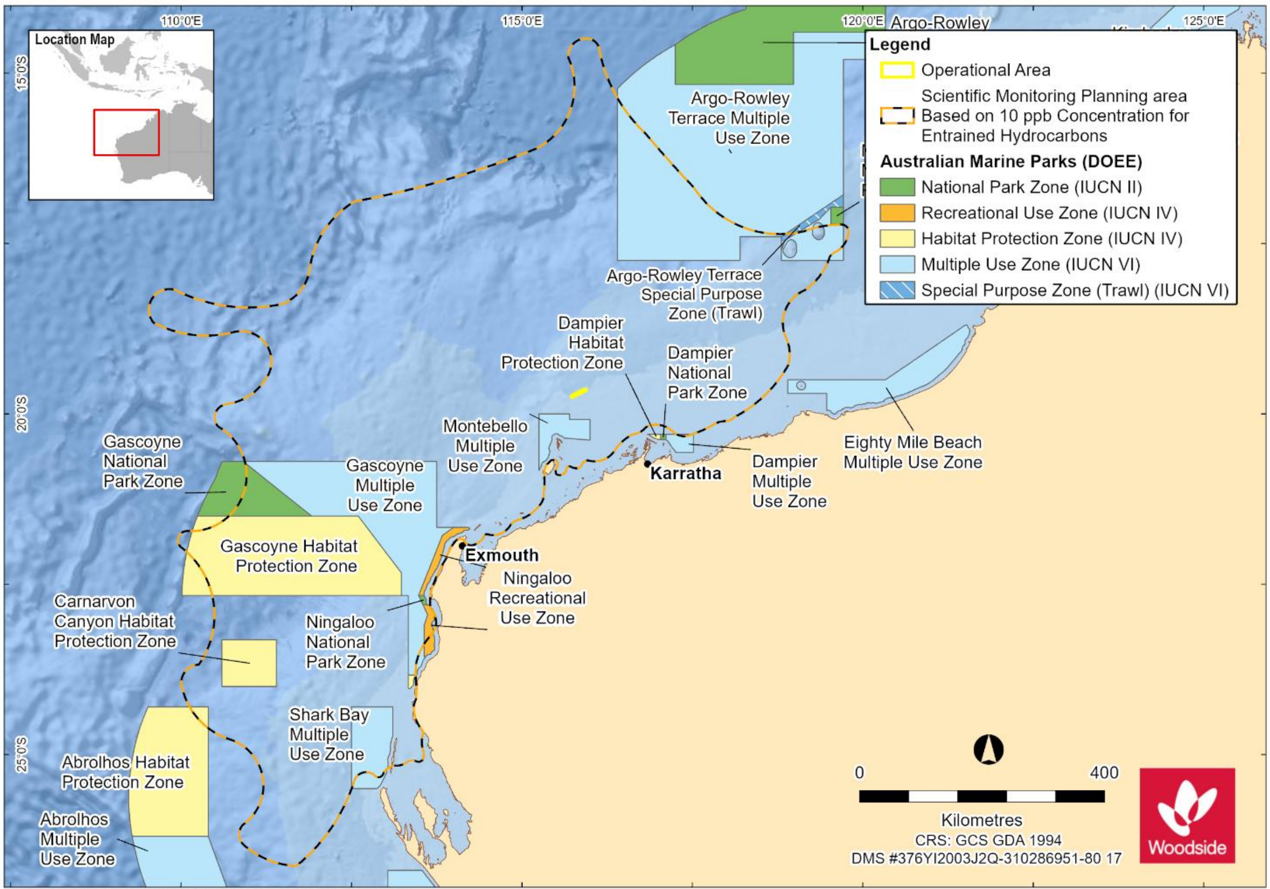
Key objectives of the Woodside oil spill SMP are:

- Assess the extent, severity and persistence of the environmental impacts from the spill event.
- Monitor subsequent recovery of impacted key species, habitats and ecosystems.

The SMP comprises ten targeted environmental monitoring programs to assess the condition of a range of physico-chemical (water and sediment) and biological (species and habitats) receptors including EPBC Act listed species, environmental values associated with protected areas and socio-economic values, such as fisheries. The ten SMPs are as follows:

- SM01 – Assessment of the presence, quantity and character of hydrocarbons in marine waters (linked to OM01 to OM03)
- SM02 – Assessment of the presence, quantity and character of hydrocarbons in marine sediments (linked to OM01 and OM05)
- SM03 – Assessment of impacts and recovery of subtidal and intertidal benthos
- SM04 – Assessment of impacts and recovery of mangroves/saltmarsh habitat
- SM05 – Assessment of impacts and recovery of seabird and shorebird populations
- SM06 – Assessment of impacts and recovery of nesting marine turtle populations
- SM07 – Assessment of impacts to pinniped colonies including haul-out site populations
- SM08 – Desktop assessment of impacts to other non-avian marine megafauna
- SM09 – Assessment of impacts and recovery of marine fish (linked to SM03)
- SM10 – Assessment of physiological impacts to important fish and shellfish species (fish health and seafood quality/safety) and recovery.

These SMPs have been designed to cover all key tropical and temperate habitats and species within Australian waters and broader, if required. A planning area for scientific monitoring is also identified to acknowledge potential hydrocarbon contact below the environmental threshold concentrations and beyond the EMBA. This planning area has been set with reference to the entrained low exposure value of 10 ppb detailed in NOPSEMA Bulletin #1 Oil Spill Modelling (2019), as shown in **Figure 5-1**.



Sources: Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 5-1: The planning area for scientific monitoring based on the area potentially contacted by the low (below ecological impact) entrained hydrocarbon threshold of 10 ppb in the event of the worst-case credible spill scenario (CS-01)

Please note that **Figure 5-1** represents the overall combined extent of the oil spill model outputs, based on a total of 100 replicate simulations over an annual period, and therefore represents the largest spatial boundaries of 100 oil spill combinations, not the spatial extent of a single spill.

5.6.1 Scientific monitoring deployment considerations

Table 5-12: Scientific monitoring deployment considerations

Scientific Monitoring Deployment Considerations	
Existing baseline studies for sensitive receptor locations predicted to be affected by a spill	PBAs of the following two categories: • PBAs within the predicted <10-day hydrocarbon contact time prediction: As part of this assessment, a desktop review was conducted of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within 10 days of a spill (based on the EMBA). Furthermore, the need to conduct baseline data collection to address data gaps and demonstrate spill response preparedness is assessed (refer to Annex D). In the scenario, that baseline data needs are identified, planning for baseline data acquisition is typically commenced pre-PAP and the execution of studies undertaken considers: receptor type, seasonality and temporal assessment requirements and location conditions. • PBAs predicted >10 days to hydrocarbon contact: As part of this assessment, a desktop review is conducted of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted >10 days' time of a hydrocarbon spill event and documented (refer to Table 5-13). In the event of a spill, the SMP activation (as per the Enfield Subsea Infrastructure Decommissioning Oil Pollution First Strike Response Plan) directs the SMP team to follow the steps outlined in the SMP Operational Plan. The steps include: the review of availability and type of existing baseline data, with particular reference to any Pre-emptive Baseline Areas (PBAs) identified as >10 days to hydrocarbon contact as predicted by forecast modelling trajectories. Such information is used to identify response phase PBAs and plan for the activation of SMPs for pre-emptive (i.e. pre-hydrocarbon contact) baseline assessment.
Pre-emptive Baseline in the event of a spill	Activation of SMPs in order to collect baseline data at sensitive receptor locations with predicted hydrocarbon contact time > 10 days (as documented in **ANNEX C**).
Survey platform suitability and availability	In the event of the SMP activation, suitable survey platforms are available and can support the range of equipment and data collection methodologies to be implemented in nearshore and offshore marine environments.
Trained personnel to implement SMPs suitable and available.	Access to trained personnel and the sampling equipment contracted for scientific monitoring via a dedicated scientific monitoring program standby contract.
Met-ocean conditions	The following met-ocean conditions have been identified to implement SMPs: • Waves < 1 m for nearshore systems • Waves < 1.5 m for offshore systems • Winds < 20 knots • Daylight operations only. SMP implementation will be planned and managed according to HSE risk reviews and the met-ocean conditions on a day to day basis by SMP operations.

5.6.2 Response planning assumptions

Table 5-13: Scientific monitoring response planning assumptions

Response Planning Assumptions	
PBAs	PBAs identified through the application of defined hydrocarbon impact thresholds during the Quantitative Spill Risk Assessment process and a consideration of the minimum time to contact at receptor locations fall into two categories: • PBAs for which baseline data are planned for and data collection may commence pre-PAP (≤ 10 days minimum time to contact), where identified as a gap. • PBAs (> 10 days minimum time to contact) for which baseline data may be collected in the event of an unplanned hydrocarbon release. Response phase PBAs are prioritised for SMP activities due to vulnerability (i.e. time to contact and environmental sensitivity) to potential impacts from hydrocarbon contact and an identified need to acquire baseline data. Time to hydrocarbon contact of > 10 days has been identified as a minimum timeframe within which it is feasible to plan and mobilise applicable SMPs and commence collection of baseline (pre-hydrocarbon contact) data, in the event of an unplanned hydrocarbon release from the Echo-Yodel Subsea Decommissioning. PBAs for Echo-Yodel Decommissioning are identified and listed in **ANNEX D**, Table D-1. The PBAs together with the situational awareness (from the operational monitoring) are the basis for the response phase SMP planning and implementation.
Pre-Spill	A review of existing baseline data for receptor locations with potential to be contacted by floating or entrained hydrocarbons at environmental thresholds within ≤10 days has identified the following: • Rankin Bank [6] • Glomar Shoals • Montebello Islands and Montebello State Marine Park • Pilbara Islands - Southern Island Group Australian Marine Parks (AMPs) potentially affected include: • Montebello AMP. Note: The Montebello Australian Marine Park (AMP) is located in offshore, open waters where hydrocarbon exposure is possible on surface waters and in the upper water column (entrained hydrocarbons).

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[6] Floating oil will contact submerged features in open ocean locations; therefore, only entrained hydrocarbon contact is predicted at ≤ 10 days.

Response Planning Assumptions	
In the Event of a Spill	Receptor locations with > 10 days to hydrocarbon contact, as well as the wider area, will be investigated and identified by the SMP team (in the Environment Unit of the Incident Control Centre (ICC)) as the spill event unfolds and as the situational awareness provided by the OMPs permits delineation of the spill affected area (for example, updates to the spill trajectory tracking). The full list is presented in **ANNEX D**, based on the PAP worst-case credible spill scenario (**Table 2-1**). To address the initial focus in a response phase SMP planning situation, receptor locations predicted to be contacted between > 10 days and 20 days have been identified as follows: • Argo-Rowley Terrace AMP • Ningaloo Coast (North and Middle including WHA, AMP and State marine park) • Muiron Islands (including WHA) • Gascoyne AMP The unfolding spill affected area predictions and confirmation of appropriate baseline data will determine the selection of receptor locations and SMPs to be activated in order to gather pre-emptive (pre-hydrocarbon contact) data. Refer to **ANNEX C** for further details on the process for scientific monitoring plan implementation and delivery. The timing of SMP activation and mobilisation of the individual SMPs to undertake data collection will be decided and documented by the Woodside SMP team following the process outlined in the SMP Operational Plan. In the event key receptors within geographic locations that are potentially impacted after ten days following a spill event or commencement of the spill and where adequate and appropriate baseline data are not available, there will be a response phase effort to collect baseline data for the following purposes: i. Priority will be given to the collection of baseline data for receptors predicted to be within the spill affected area prior to hydrocarbon contact. The process is initiated with the investigation of available baseline and time to hydrocarbon contact (>10 days which is sufficient time to mobilise SMP teams and acquire data before hydrocarbon contact). With reference to the Echo Yodel Subsea Decommissioning, priority would be focused on Ningaloo Coast north and middle and Muiron Islands. ii. Highly sensitive and/or valued habitats and communities in coastal waters will be prioritised for pre-emptive baseline surveys over open water areas of AMPs, such as Argo-Rowley Terrace AMP. iii. Collect baseline data for receptors predicted to be outside the spill affected area so reference datasets for comparative analysis with impacted receptor types can be assessed post-spill.
Baseline Data	• A summary of the spill affected area and receptor locations as defined by the EMBA for the PAP worst case credible spill scenario, presented in the Echo-Yodel Decommissioning EP (Section 6). • The key receptors at risk by location and corresponding SMPs based on the EMBAs for the PAP are presented in **ANNEX D**, as per the PAP credible spill scenario. This matrix maps the receptors at risk with their location and the applicable SMPs that may be triggered in the event of a Level two or three hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. Receptor locations and applicable SMPs are colour coded to highlight possible time to contact based on receptor locations identified as PBAs. • The status of baseline studies relevant to the PAP are tracked by Woodside through the maintenance of a Corporate Environment Environmental Baseline Database (managed by the Woodside Environmental Science team), as well as accessing external databases such as the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA)[7] (refer to **ANNEX C**).

5.6.3 Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP worst case credible spill scenarios. The range of strategies provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be moderate and the overall delivery effectiveness determined to be medium. The

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[7] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

SMP's main objectives can be met, with no additional, alternative or improved control measures providing further benefit.

5.6.4 Response planning: need, capability and gap – scientific monitoring

The receptor locations identified in **ANNEX D** provide the basis of the SMPs likely to be selected and activated. Once the Woodside SMP Delivery team and Standby SMP contractor have been stood up and the exact nature and scale of the spill becomes known, the SMPs to be activated will be confirmed as per the process set out in the SMP Operational Plan.

Scope of SMP Operations in the event of a hydrocarbon spill

Receptor locations of interest for the SMP during the response phase in the event of a spill are:

- Rankin Bank
- Glomar Shoals
- Montebello Islands and Montebello State Marine Park
- Pilbara Islands - Southern Island Group

Documented baseline studies are available for certain sensitive receptor locations including the Montebello Islands, Rankin Bank, Glomar Shoals, Pilbara Islands - Southern Island Group, and Montebello State Marine Park (**ANNEX D**, Table D-2). The SMP approach in the response phase would still deploy SMP teams to maximise the opportunity to collect pre-emptive baseline data at sensitive receptor locations, i.e., the sections of the WA Coast not immediately contacted to hydrocarbons. As the exact locations where hydrocarbon contact occurs may be unpredictable, SM01 would be mobilised as a priority to be able to detect hydrocarbons and track the leading edge of the spill to verify where hydrocarbon contact occurs which will assist with where SMP resources are a priority need to obtain pre-emptive baseline data.

The option analysis in **Section 6.4** considers ways to reduce the gap by considering alternate, additional, and/or improved control measures on each selected response strategy.

5.6.5 Environmental performance based on need

Table 5-14: Environment performance – scientific monitoring

Environmental Performance Outcome	Woodside can demonstrate preparedness to stand up the SMP to quantitatively assess and report on the extent, severity, persistence and recovery of sensitive receptors impacted from the spill event.			
Control measure		**Performance Standard**		**Measurement Criteria**
13	• Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the Health Safety Environment and Quality (HSEQ) Function.	13.1	SMP team comprises a pool of competent Environment Advisers (stand up personnel) who receive training regarding the SMP, SMP activation and implementation of the SMP on an annual basis.	• Training materials. • Training attendance registers. • Process that maps minimum qualification and experience with key SMP role competency and a tracker to manage availability of competent people for the SMP team including redundancy and rostering.
14	• Woodside has contracted SMP service provider to provide scientific personnel to resource a base capability of one team per SMP (SM01-SM10, see **ANNEX C**, Table C-2) as detailed in Woodside's SMP standby contractor Implementation Plan, to implement the oil spill scientific monitoring programs. The availability of relevant personnel is reported to Woodside on a monthly basis via a simple report on the base-loading availability of people for each of the SMPs comprising field work for data collection (SMP resourcing report register). • In the event of a spill and the SMP is activated, the base-loading availability of scientific personnel will be provided by SMP standby contractor for the individual SMPs and where gaps in resources are identified, SMP standby contractor/Woodside will seek additional personnel (if needed) from other sources including Woodside's Environmental Services Panel.	14.1	Woodside maintains the capability to mobilise personnel required to conduct scientific monitoring programs SM01 to SM10 (except desktop-based SM08): • Personnel are sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan. • Scientific Monitoring Program Implementation Plan describes the process for standing up and implementing the scientific monitoring programs. • SMP team stand up personnel receive training regarding the stand up, activation and implementation of the SMP on an annual basis.	• OSPU Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master. • SMP resource report of personnel availability provided by SMP contractor on monthly basis (SMP resourcing report register). • Training materials. • Training attendance registers. • Competency criteria for SMP roles. • SMP annual arrangement testing and reporting.
15	• Roles and responsibilities for SMP implementation are captured in **ANNEX C**, Table C-1) and the SMP team (as per the organisational structure of the ICC) is outlined in SMP Operational Plan. Woodside has a defined Crisis and Incident Management structure including Source Control, Operations, Planning and Logistics functions to manage a loss of well control response. • SMP Team structure, interface with SMP standby contractor and linkage to the ICC is presented in **ANNEX C**, Figure C-1. • Woodside has a defined Command, Control and Coordination structure for Incident and Emergency Management that is based on the Australasian Inter-Service Incident Management System (AIIMS) framework utilised in Australia. • Woodside uses an online Incident Management System (IMS) to coordinate and track key incident management functions. This includes specialist modelling programs, geographic information systems (GIS), as well as communication flows within the Command, Control and Coordination structure. • SMP activated via the First Strike Response Plan (FSRP). • Step by step process to activation of individual SMPs provided in the SMP Operational Plan. • All decisions made regarding SMP logged in the online IMS (SMP team members trained in using Woodside's online Incident Management System). • SMP component input to the ICC IAP as per the identified ICC timed sessions and the SMP IAP logged on the online IMS. • Woodside Environmental Science Team provide awareness training on the activation and stand-up of the Scientific Monitoring Programme (SMP) for the Environment Advisers in Woodside who are listed on the SMP team on an annual basis. • Woodside Environmental Science Team provide awareness training on the activation and stand-up of the SMP for the SMP Standby contractor. • Woodside Environmental Science Team co-ordinates an annual SMP arrangement testing exercise which the Standby SMP contractor SMP team participates in since 2016 (refer to the SMP Document Register).	15.1	• Woodside has established an SMP organisational structure and processes to stand up and deliver the SMP.	• SMP Oil Spill Scientific Monitoring Operational Plan. • SMP Implementation Plan. • SMP annual arrangement testing and reporting.

16	• Chartered and mutual aid vessels. • Suitable vessels would be secured from the Woodside support vessels, regional fleet of vessels operated by Woodside and other operators and the regional charter market. • Vessel suitability will be guided by the need to be equipped to operate grab samplers, drop camera systems and water sampling equipment (the individual vessel requirements are outlined in the relevant SMP methodologies (refer to **ANNEX C**, Table C-2). • Nearshore mainland waters could use the same approach as for open water. Smaller vessels may be used where available and appropriate. Suitable vehicles and machinery for onshore access to nearshore SMP locations would be provided by Woodside's transport services contract and sourced from the wider market. • Dedicated survey equipment requirements for scientific monitoring range from remote towed video and drop camera systems to capture seabed images of benthic communities to intertidal/onshore surveying tools such as quadrats, theodolites and spades/trowels, cameras and binoculars (specific survey equipment requirements are outlined in the relevant SMP methodologies (refer to **ANNEX C**, Table C-2)). Equipment would be sourced through the existing SMP standby contract with Standby SMP contractor for SMP resources and if additional surge capacity is required this would be available through the other Woodside Environmental Services Panel Contractors and specialist contractors. Standby SMP contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with marine sampling equipment suppliers and analytical laboratories (SMP resourcing report register). • Availability of SMP equipment for offshore/onshore scientific monitoring team mobilisation is within one week to ten days of the commencement of a hydrocarbon release. This meets the SMP mobilisation lead time that will support meeting the response objective of 'acquire, where practicable, the environmental baseline data prior to hydrocarbon contact required to support the post-response SMP.	16.1	Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 to SM10 (except desktop-based SM08): • Equipment are sourced through the existing standby contract with Standby SMP standby contractor, as detailed within the SMP Implementation Plan.	• OSPU Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master. • SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register). • SMP annual arrangement testing and reporting.
17	Woodside's SMP approach addresses the pre-PAP acquisition of baseline data for PBAs with ≤ 10 days if required following a baseline gap analysis process. Woodside maintains knowledge of Environmental Baseline data through: • Documentation annual reviews of the Woodside Baseline Environmental Studies Database, and specific activity baseline gap analyses. • Accessing external databases such as the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA) (refer to **ANNEX C**).	17.1	• Annual reviews of environmental baseline data. • PAP specific Pre-emptive Baseline Area baseline gap analysis.	• Annual review/update of Woodside Baseline Environmental Studies Database. • Desktop review to assess the environmental baseline study gaps completed prior to EP submission. • Accessing baseline knowledge via the SMP annual arrangement testing.

Environmental Performance Outcome	SMP plan to acquire response phase monitoring targeting pre-emptive data achieved.			
Control measure		**Performance Standard**		**Measurement Criteria**
18	Woodside's SMP approach addresses: • Scientific data acquisition for PBAs >10 days to hydrocarbon contact and activated in the response phase and • Transition into post-response SMP monitoring.	18.1	**PBA baseline data acquisition in the response phase** If baseline data gaps are identified for PBAs that has predicted hydrocarbon contact (contact time > 10 days), there will be a response phase effort to collect baseline data with priority in implementing SMPs given to receptors where pre-emptive baseline data can be acquired or improved. SMP team (within the Environment Unit of the ICC) contribute SMP component of the ICC Planning Function in development of the IAP.	• Response SMP plan. • Woodside's online Incident Management System Records. • SMP component of the Incident Action Plan.
		18.2	**Post Spill contact** For the receptors contacted by the spill in where baseline data are available, SMPs programs to assess and monitor receptor condition will be implemented post spill (i.e. after the response phase).	• SMP planning document. • SMP Decision Log. • IAPs.

Environmental Performance Outcome	Implementation of the SMP (response and post-response phases).			
Control measure		**Performance Standard**		**Measurement Criteria**
19	• Scientific monitoring will address quantitative assessment of environmental impacts of a level two or three spill or any release event with the potential to contact sensitive environmental receptors. The SMP comprises ten targeted environmental monitoring programs.	19.1	**Implementation of SM01**	Evidence SM01 has been triggered: • Documentation as per requirements of the SMP Operational Plan.

	• SMP supporting documentation: (1) Oil Spill Scientific Monitoring Operational Plan; (2) SMP Implementation Plan and (3) SMP Process and Methodologies Guideline. • The Oil Spill Scientific Monitoring Operational Plan details the process of SMP selection, input to the IAP to trigger operational logistic support services. Methodology documents for each of the ten SMPs are accessible detailing equipment, data collection techniques and the specifications required for the survey platform support. • The SMP standby contractor holds a Woodside SMP implementation plan detailing activation processes, linkage with the Woodside SMP team and the general principles for the planning and mobilisation of SMPs to deliver the individual SMPs activated. Monthly resourcing report are issued by the SMP standby contractor (SMP resourcing report register). All SMP documents and their status are tracked via SMP document register.		SM01 will be implemented to assess the presence, quantity and character of hydrocarbons in marine waters during the spill event in nearshore areas.	• Woodside's online Incident Management System Records. • SMP component of the IAP. • SMP data records from field.
		19.2	**Implementation of SM02 to SM10** SM02-SM10 will be implemented in accordance with the objectives and activation triggers as per **ANNEX C**, Table C-2.	Evidence SMPs have been triggered: • Documentation as per requirements of the SMP Operational Plan. • Woodside's online Incident Management System Records. • SMP component of the IAP. • SMP Data records from field.
		19.3	**Termination of SMP plans** The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMPs detailed in **ANNEX C**, Table C-2, and the Termination Criteria Decision-tree for Oil Spill Environmental Monitoring (**ANNEX C**, Figure C-3):	Evidence of Termination Criteria triggered: • Documentation and approval by relevant stakeholders to end SMPs for specific receptor types.

5.7 Incident management system

The Incident Management System is both a control measure and a measurement criterion. As a control measure the IMS function is to prompt, facilitate and record the completion of three key response planning processes detailed below. As a measurement criterion the IMS records the evidence of the timeliness of all response actions included in the environmental performance standards and the plans used of the PAP.

As the IMS does not directly remove hydrocarbons spilt into the marine environment there is no direct relationship to the response planning need.

5.7.1 Incident action planning

The ICC will be required to collect and interpret information from the scene of the incident to determine support requirements to the site based IMT, develop an IAP and assist the IMT with the execution of that plan. The site-based IC may request the ICC to complete notifications internally within Woodside, to stakeholders and government agencies as required. Depending on the type and scale of the incident either the ICC DM or IC will be responsible for ensuring the development of the IAP. Incident Action Planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time.

5.7.2 Operational net environmental benefit analysis process

In the event of a response, Woodside will confirm the response techniques adopted at the time of Environment Plan/Oil Pollution Emergency Plan (EP/OPEP) acceptance remain appropriate to reduce the consequences of the spill. This process verifies that there is a continuing net environmental benefit associated with continuing the response technique through the operational NEBA process. This process manages the environmental risks and impacts of response techniques during the spill response, an operational NEBA will be undertaken throughout the response, for each operational period.

The operational NEBA will consider the risks and benefits of conducting and response activity. For example, if vessels are required for access to nearshore or onshore areas, anchoring locations will be selected to minimise disturbance to benthic habitats. Vessel cleanliness would be commensurate with the receiving environment. The operational NEBA will consider the risks and benefits of conducting other response techniques.

The operational NEBA process is also used to terminate a response. Using data from operational and scientific monitoring activities the response to a hydrocarbon spill will be terminated in accordance with the termination process outlined in the Oil Pollution Emergency Arrangements (Australia). In effect the operational NEBA will determine whether there is net environmental benefit to continue response operations.

5.7.3 Stakeholder engagement process

Woodside will ensure stakeholders are engaged during the spill response in accordance with internal standards. This process requires that Woodside will:

- Undertake all required notifications (including government notifications) for stakeholders in the region (identified in the First-Strike Response Plan). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- In the event of a response, identify and engage with relevant stakeholders and continually assess and review.

5.7.4 Environmental performance based on need

Table 5-15: Environmental performance – incident management system

Environmental Performance Outcome		To support the effectiveness of all other control measures and monitor/record the performance levels achieved.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
20	Operational NEBA	20.1	Confirm that the response techniques adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within 24 hours.	1, 3A
		20.2	Record the evidence and justification for any deviation from the planned response activities.	
		20.3	Record the information and data from operational and scientific monitoring activities used to inform the NEBA.	
21	Stakeholder engagement	21.1	Prompt and record all notifications (including government notifications) for stakeholders in the region are made	
		21.2	In the event of a response, identification of relevant stakeholders will be re-assessed throughout the response period.	
		21.3	Undertake communications in accordance with: • Woodside Crisis Management Functional Support Team Guideline – Reputation • External Communication and Continuous Disclosure Procedure • External Stakeholder Engagement Procedure	
22	Personnel required to support any response	22.1	Action planning is an ongoing process that involves continual review to ensure techniques to control the incident are appropriate to the situation at the time.	1, 3B
		22.2	A duty roster of trained and competent people will be maintained to ensure that minimum manning requirements are met all year round.	3C
		22.3	Immediately activate the IMT with personnel filling one or more of the following roles: • Operations Duty Manager • D&C Duty Manager • Operations Coordinator • Deputy Operations Coordinator • Planning Coordinator • Logistics (materials, aviation, marine and support positions) • Management Support • Health and Safety Advisor • Environment Duty Manager • People Coordinator • Public Information Coordinator • Intelligence Coordinator • Finance Coordinator.	1, 2, 3B, 3C, 4
		22.4	Collect and interpret information from the scene of the incident to determine support requirements to the site based IMT, develop an IAP and assist with the execution of that plan.	
		22.5	Security and emergency management (S&EM) advisors will be integrated into ICC to monitor performance of all functional roles.	

		22.6	Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role.	
		22.7	Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed.	1, 2, 3A, 4
		22.8	Contribute to Woodside's response in accordance with the aims and objectives set by the Duty Manager.	1, 2, 3B, 3C, 4

5.8 Measurement criteria for all response techniques

Woodside ensures compliance with environmental performance outcomes and standards through four primary mechanisms. The performance tables aforementioned identify which of these four mechanisms monitors the readiness and records the effectiveness and performance of the control measures adopted.

1. The incident management system

The Incident Management System (IMS) supports the implementation of the Emergency & Crisis Management Procedure. The IMS provides a near real-time, single source of information for monitoring and recording an incident and measuring the performance of those control measures.

The Emergency & Crisis Management Procedure defines the management framework, including roles and responsibilities, to be applied to any size incident (including hydrocarbon spills). The organisational structure required to manage an incident is developed in a modular fashion and is based on the specific requirements of each incident. The structure can be scaled up or down.

The IAP process formally documents and communicates the:

- incident objectives
- status of assets
- operational period objectives
- response techniques (defined during response planning)
- effectiveness of response techniques.

The information captured in the IMS (including information from personal logs and assigned tasks/closeouts) confirms the response techniques implemented remain appropriate to reduce the consequences of the spill. The system also records all information and data that can be used to support the site-based IMT, development and the execution of the IAP.

2. The S&EM competency dashboard

The S&EM competency dashboard records the number of trained and competent responders that are available across Woodside, and some external providers, to participate in a response.

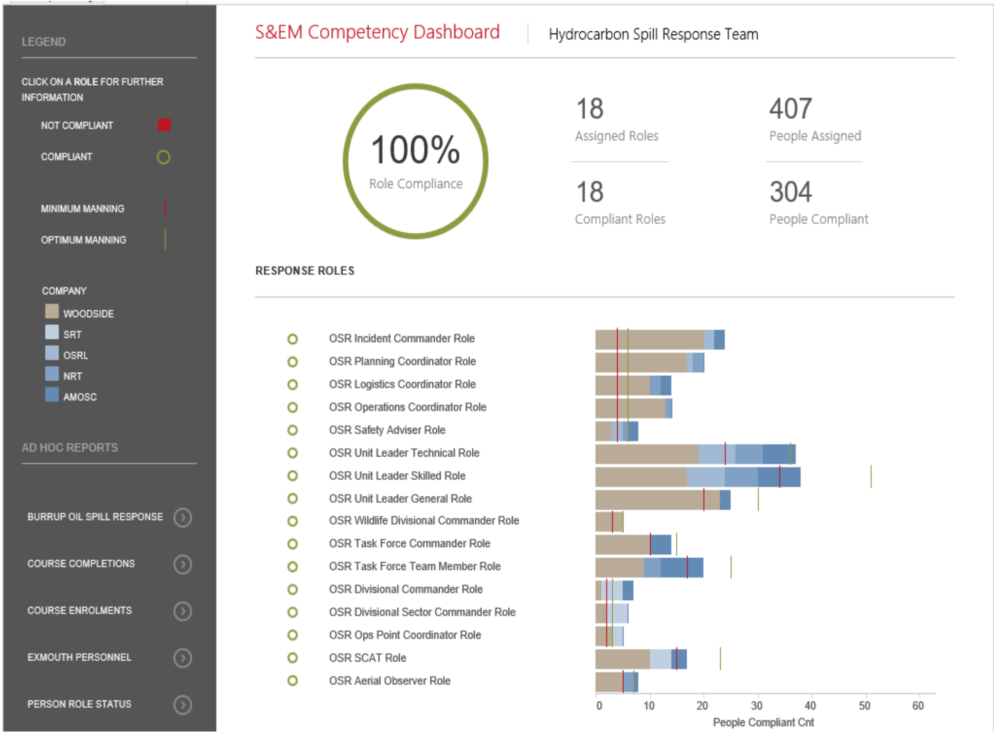
This number varies depending on expiry of competency certificates, staff attrition, internal rotations, leave and other absences. As such the Dashboard is designed to identify the minimum manning requirements and to identify sufficient redundancy to cater for the variances listed above.

Figure 5-2 shows the minimum manning numbers for the different hydrocarbon spill response roles and the number of qualified persons against those roles.

Woodside's pool of trained responders is composed of but not limited to personnel from the following organisations:

- Woodside internal
- Australian Marine Oil Spill Centre (AMOSC) core group

- AMOSC
- OSRL
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce.



LEGEND

CLICK ON A **ROLE** FOR FURTHER INFORMATION

NOT COMPLIANT 🟥

COMPLIANT ○

MINIMUM MANNING

OPTIMUM MANNING

COMPANY

- WOODSIDE
- SRT
- OSRL
- NRT
- AMOSC

AD HOC REPORTS

- BURRUP OIL SPILL RESPONSE
- COURSE COMPLETIONS
- COURSE ENROLMENTS
- EXMOUTH PERSONNEL
- PERSON ROLE STATUS

S&EM Competency Dashboard | Hydrocarbon Spill Response Team

100% Role Compliance

18 Assigned Roles

407 People Assigned

18 Compliant Roles

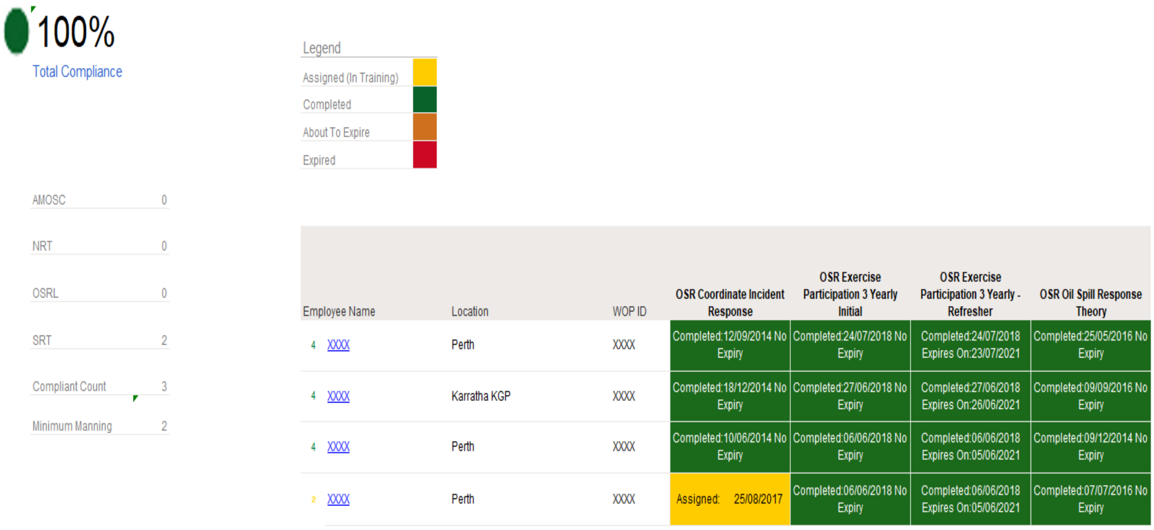
304 People Compliant

RESPONSE ROLES

○ OSR Incident Commander Role
○ OSR Planning Coordinator Role
○ OSR Logistics Coordinator Role
○ OSR Operations Coordinator Role
○ OSR Safety Adviser Role
○ OSR Unit Leader Technical Role
○ OSR Unit Leader Skilled Role
○ OSR Unit Leader General Role
○ OSR Wildlife Divisional Commander Role
○ OSR Task Force Commander Role
○ OSR Task Force Team Member Role
○ OSR Divisional Commander Role
○ OSR Divisional Sector Commander Role
○ OSR Ops Point Coordinator Role
○ OSR SCAT Role
○ OSR Aerial Observer Role

Figure 5-2: Example screenshot of the HSP competency dashboard

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also and shows that Woodside can meet the requirements of the environmental performance standard that relate to filling certain response roles. **Figure 5-3** shows deeper dive into the Ops Point Coordinator role and the training modules required to show competence.



100%
Total Compliance

Legend	
Assigned (In Training)	🟨
Completed	🟩
About To Expire	🟧
Expired	🟥

AMOSC	0
NRT	0
OSRL	0
SRT	2
Compliant Count	3
Minimum Manning	2

Employee Name	Location	WOP ID	OSR Coordinate Incident Response	OSR Exercise Participation 3 Yearly Initial	OSR Exercise Participation 3 Yearly - Refresher	OSR Oil Spill Response Theory
4 XXXX	Perth	XXXX	Completed:12/09/2014 No Expiry	Completed:24/07/2018 No Expiry	Completed:24/07/2018 Expires On:23/07/2021	Completed:25/05/2016 No Expiry
4 XXXX	Karratha KGP	XXXX	Completed:18/12/2014 No Expiry	Completed:27/06/2018 No Expiry	Completed:27/06/2018 Expires On:26/06/2021	Completed:09/09/2016 No Expiry
4 XXXX	Perth	XXXX	Completed:10/06/2014 No Expiry	Completed:06/06/2018 No Expiry	Completed:06/06/2018 Expires On:05/06/2021	Completed:09/12/2014 No Expiry
2 XXXX	Perth	XXXX	Assigned: 25/08/2017	Completed:06/06/2018 No Expiry	Completed:06/06/2018 Expires On:05/06/2021	Completed:07/07/2016 No Expiry

Figure 5-3: Example screenshot for the Ops Point Coordinator role

3. The hydrocarbon spill preparedness ICE assurance process

The Hydrocarbon Spill Response Team has developed a Hydrocarbon Spill Preparedness and Response Internal Control Environment (ICE) process to align and feed into the Woodside Management System Assurance process for hydrocarbon spill. The process tracks compliance over four key control areas:

1. **Plans** – Ensures all plans (including: Oil Pollution Emergency Arrangements, first strike response plans, operational plans, support plans and TRPs) are current and in line with regulatory and internal requirements.
2. **Competency** – Ensures the competency dashboard is up to date and there are the minimum competency numbers across ICC, CMT and hydrocarbon spill response roles. The hydrocarbon spill training plan and exercise schedule, including testing of arrangements is also tracked. The Testing of Arrangements (TOA) register tracks the testing of all hydrocarbon spill response arrangements, key contracts and agreements in place with internal and external parties to ensure compliance.
3. **Capability** – Tracks and monitors capability that could be required in a hydrocarbon incident, including but not limited to: integrated fleet[8] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CICC duty roster.
4. **Compliance & Assurance** – Ensures all regulator inspection outcomes are actioned and closed out, the global legislation register is up to date and that the key assurance components are tracked and managed. Assurance activities (including Audits) conducted on memberships with key Oil Spill Response Organisations (OSROs) including AMOSC and OSRL are also tracked and recorded in the ICE.

The ICE assurance process records how each commitment listed in the performance tables above is managed to ensure ongoing compliance monitoring. The level of compliance can be reviewed in real time and is reported on a monthly basis through the S&EM Function.

The completion of the assurance checks (over and above the ICE process) is also applied via the Woodside Integrated Risk & Compliance System and subject to the requirements of Woodside's Provide Assurance Procedure.

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[8] The Integrated fleet consists of vessels from multiple operators that have been contracted to Woodside to undertake a number of duties including hydrocarbon spill response.

4. The Hydrocarbon spill preparedness and response procedure

This procedure sets out how to plan and prepare for a liquid hydrocarbon spill to the marine environment. (Note: this procedure does not apply to scenarios relating to gas releases in the marine environment).

This procedure details the:

- requirement for an OPEP to be developed, maintained, reviewed and approved by appropriate regulators (where applicable), including:
    - defining how spill scenarios are developed on an activity specific basis
    - developing and maintaining all hydrocarbon spill related plans
    - ensuring the ongoing maintenance of training and competency for personnel
    - developing the testing of spill response arrangements
    - maintaining access to identified equipment and personnel.
- planning for hydrocarbon spill response preparedness
- accountabilities for hydrocarbon spill response preparedness
- spill training requirements
- requirements for spill exercising/testing of spill response arrangements
- spill equipment and services requirements.

The procedure also details the roles and responsibilities of the dedicated Woodside Hydrocarbon Spill Preparedness team. This team is responsible for:

- assuring Woodside hydrocarbon spill responders meet competency requirements
- establishing the competency requirements, annual training schedule and a training register of trained personnel
- establishing and maintaining the total numbers of trained personnel required to provide an effective response to any hydrocarbon spill incident
- ensuring equipment and services contracts are maintained
- establishing OPEPs
- establishing OPEAs
- determining priority response receptors
- determining ALARP
- ensuring compliance and assurance is undertaken in accordance with external and internal requirements.

6 ALARP EVALUATION

This section should be read in conjunction with **Section 5** which is the capability planned for this activity.

6.1 Monitor and evaluate – ALARP assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in **Section 5** with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.1.1.1 Alternative Control Measures

Alternative Control Measures considered
Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Aerostat (or similar inflatable observation platform) for localised aerial surveillance.	Lead time to Aerostat surveillance is disproportionate to the environmental benefit. The system also provides a very limited field of visibility around the vessel it is deployed from.	Long lead time to access (>10 days). Each system would require an operator to interpret data and direct vessels accordingly. Requires multiple systems for shoreline use.	Purchase cost per system approx. A$300,000.	This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation.	No

6.1.1.2 Additional Control Measures

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Additional personnel trained to use systems.	Current arrangement provides an environmental benefit in the availability of trained personnel facilitating access to monitoring data used to inform all other response techniques. No improvement required.	No improvement can be made, all personnel in technical roles e.g. intelligence unit are trained and competent on the software systems. Personnel are trained and exercised regularly. Use of the software and systems forms part of regular work assignments and projects.	Cost for training in-house staff would be approx. A$25,000.	This option is not adopted as the current capability meets the need.	No
Additional satellite tracking buoys to enable greater area coverage.	Increased capability does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place.	Tracking buoy on location at manned facility, additional needs are met from Woodside owned stocks in King Bay Support Base (KBSB) and Exmouth or can be provided by service provider.	Cost for an additional satellite tracking buoy would be A$200 per day or A$6000 to purchase.	This option is not adopted as the current capability meets the need, but additional units are available if required.	No
Additional trained aerial observers.	Woodside has access to a pool of trained, competent observers at strategic locations to ensure timely and sustainable response. Additional observers are available through current contracts with AMOSC and OSRL.	Aviation standards and guidelines ensure all aircraft crews are competent for their roles. Woodside maintains a pool of trained and competent aerial observers with various home base locations to be called upon at the time of an incident. Regular audits of oil spill response organisations ensure training and competency is maintained.	Cost for additional trained aerial observers would be A$2000 per person per day.	This option is not adopted as the current capability meets the need, but additional observers are available via response contractors if required.	No

6.1.1.3 Improved Control Measures

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Faster turnaround time from modelling contractor.	Improved control measure does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place.	External contractor on ICC roster to be called as soon as required. However initial information needs to be gathered by ICC team to request an accurate model. External contractor has person on call to respond from their own location.	Modelling service with a faster activation time would be achieved via membership of an alternative modelling service at an annual cost of A$50,000 for 24hr access plus an initial A$5000 per modelling run.	This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation.	No
Night time aerial surveillance.	The risk of undertaking the aerial observations at night is disproportionate to the limited environmental benefit. The images would be of low quality and as such the variable is not adopted.	Flights will only occur when deemed safe by the pilot. The risk of night operations is disproportionate to the benefit	No improvement can be made without risk to personnel health and safety and breaching Woodside's Golden Rules.	This option is not adopted as the safety considerations outweigh any environmental benefit gained.	No

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

		gained, as images from sensors (IR, UV, etc). will be low quality. Flight time limitations will be adhered to.			
Faster mobilisation time (for water quality monitoring).	Due to the restriction on accessing the spill location on Day one there is no environmental benefit in having vessels available from day one. The cost of having dedicated equipment and personnel is disproportionate to the environmental benefit. The availability of vessels and personnel meets the response need. Shortening the timeframes for vessel availability would require dedicated response vessels on standby in KBSB. The cost and organisational complexity of employing two dedicated response vessels (approximately $15M/year per vessel) is considered disproportionate to the potential environmental benefit to be realised by adopting this delivery options.	Operations are not feasible on day 1 as the hydrocarbon will take time to surface, and volatility has potential to cause health concerns within the first 24 hours of the response.	Cost for purchase of equipment approx. A$200,000. Ongoing costs per annum for cost of hire and pre-positioning for life of asset/activity would be larger than the purchase cost. Dedicated equipment and personnel, living locally and on short notice to mobilise. The cost would be approx. A$1 m per annum, which is disproportionate to the incremental benefit this would provide, assets are already available on day 1. 2 integrated fleet vessels are available from day 1, however these could be tasked with other operations.	This option is not adopted as the area could not be accessed earlier due to safety considerations. Additionally, the cost and complexity of implementation outweighs the benefits.	No

6.1.2 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.2 Source control via vessel SOPEP – ALARP assessment

Alternative, Additional and Improved options have been assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.2.1 Source Control via Vessel SOPEP – Control Measure Options Analysis

6.2.1.1 Alternative Control Measures

Alternative Control Measures considered
Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Option considered	Environmental consideration	Feasibility	Approx. Cost	Implemented
No reasonably practical alternative control measures identified.				N/A

6.2.1.2 Additional Control Measures

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Implemented
No reasonably practical alternative control measures identified.				N/A

6.2.1.3 Improved Control Measures

Improved Control Measures considered
Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Option considered	Environmental consideration	Feasibility	Approx. Cost	Implemented
No reasonably practical alternative control measures identified.				N/A

6.2.1.4 Selected Control Measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the activity.

- Alternative
    - None selected
- Additional
    - None selected
- Improved
    - None selected

6.3 Shoreline Protection & Deflection – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.3.1 Existing Capability – Shoreline Protection and Deflection

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, re-fuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.3.2 Response Planning: Echo Yodel Decommissioning MDO spill – Shoreline Protection and Deflection

Planning for shoreline protection is based upon identification of Response Protection Areas (RPAs) from stochastic modelling and the logistics associated with deploying protection at these locations. The response planning scenarios indicate that this would require effective mobilisation to priority shorelines and maintenance of protection until operational monitoring confirms that the locations were no longer at risk. Woodside has identified the RPAs from stochastic modelling results provided from specific scenarios.

The control measures selected provide capability to mobilise shoreline protection equipment by Day 2 (if required). Stochastic modelling scenarios indicate that first shoreline impact at Ningaloo Coast North (day 17.7). The existing capability is, therefore, considered sufficient to mobilise and deploy protection at RPAs prior to hydrocarbon contact, guided by predictive modelling, direct observation/surveillance and remote sensing methods (OM01, OM02 and OM03) employed from the outset of a spill to track the oil and assess receptors at risk. This will then trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04) if required. OM04 would only be undertaken in liaison with WA DoT. Tactical response plans exist for many of the RPAs identified.

Table 6-1 below outlines the capability required (number of RPAs predicted to be impacted) against the capability available (number of shoreline protection and deflection operations that can be mobilised and deployed). As can be seen from the table below. Woodside's capability exceeds the response planning need identified for shoreline protection and deflection operations.

Table 6-1: Response Planning – Shoreline Protection and Deflection

	Shoreline Protection & Deflection (SPD)	Day	Day	Day	Day	Day	Day	Day	Week	Week	Week	Month	Month	Month
		1	2	3	4	5	6	7	2	3	4	2	3	4
	Oil on shoreline (from stochastic modelling) m^3 – MDO (CS-01)	0	0	0	0	0	0	0	0	<1	<1	0	0	0
A	Capability Required													
A1	RPAs impacted by maximum accumulated volume – MDO (CS-01)	0	0	0	0	0	0	0	0	1	1	0	0	0
B	Capability Available (operations per day)													
B1	SPD operations available – per day (lower)	0	1	1	2	2	4	6	70	70	70	330	330	0
B2	SPD operations available – per day (upper)	1	2	3	4	6	8	10	84	84	84	336	336	0
C	Capability Gap (operations per day)													
C1	SPD operations gap – per day (lower)	0	0	0	0	0	0	0	0	0	0	0	0	0
C2	SPD operations gap – per day (upper)	0	0	0	0	0	0	0	0	0	0	0	0	0

A1 – the number of Response Protection Areas contacted at the maximum accumulated volume.

B1 and B2 – the upper and lower number of shoreline protection and deflection operations available (based on response planning assumptions in Section ***Error! Reference source not found.****).*

C1 and C2 – the gap between the upper and lower number of shoreline protection and deflection operations required in A1 compared to the operations available in B1 and B2

Pre-emptive mobilisation of equipment and personnel would commence as soon as practicable prior to oil contact. Additional resources would be mobilised depending on the scale of the event to increase the length or number of shorelines being protected.

A shoreline protection and deflection response would be launched and additional TRPs drafted only when operational monitoring (OM02 and OM03) and modelling (OM01) indicate that contact could occur at RPA(s) within 14 days. The outputs from the monitoring will inform the need for and/or direct any additional response techniques and, additionally, if/when the spill enters State Waters and control of the incident passes to WA DoT.

6.3.3 Shoreline Protection and Deflection – Control Measure Options Analysis

6.3.3.1 Alternative Control Measures

Alternative Control Measures Considered
Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Pre-position equipment at Response Protection Areas (RPAs)	Additional environmental benefit of having equipment prepositioned is considered minor. Equipment is currently available to protect RPAs and additional shorelines, within estimated minimum times until shoreline contact at RPAs, enabling mobilisation of the selected delivery options.	The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised. Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options. The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth.	Total cost to preposition protection/ deflection packages at each site of potential impact would be approx. A$6100 per package per day.	This option is not adopted as the existing capability meets the need.	**No**

6.3.3.2 Additional Control Measures

Additional Control Measures Considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Supplemented stockpiles of equipment in Exmouth to protect additional shorelines	Additional equipment would increase the number of receptor areas that could be protected from hydrocarbon contact. However, current availability of personnel and equipment is capable of protecting up to 30 km of shoreline, commensurate with the scale and progressive nature of shoreline impact. Additional stocks would be made available from international sources if long term up scaling were necessary. A reduction in environmental consequence from a ‘B’ rating (serious long-term impacts) is unlikely to be realised as a result of having more equipment available locally.	The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised. Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options. The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth.	Total cost for purchase supplemental protection and deflection equipment would be approx. A$455,000 per package.	This option is not adopted as the existing capability meets the need.	**No**
Additional trained personnel	The level of training and competency of the response personnel ensures the shoreline protection and deflection operation is delivered with minimum secondary impact to the environment. Training additional personnel does not provide an increased environmental benefit.	Additional personnel required to sustain an extended response can be sourced through the Woodside *People & Global Capability Surge Labour Requirement Plan*. Additional personnel sourced from contracted OSRO’s (OSRL/AMOSC) to manage other responders. Response personnel are trained and exercised regularly in shoreline response techniques and methods. All personnel involved in a response will receive a full operational/safety brief prior to commencing operations.	Additional Specialist Personnel would cost A$2000 per person per day.	This option is not adopted as the existing capability meets the need.	**No**

6.3.3.3 Improved Control Measures

Improved Control Measures considered
Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Faster response/ mobilisation time	Given modelling does not predict any shoreline impact until day 17.7 (CS-01) at Ningaloo Coast North, Woodside considers that there is sufficient time for deployment of protection and deflection operations prior to impact.	Response teams, trained personnel, contracted oil spill response service providers, government agencies and the associated mitigation equipment required to enact an initial protection and deflection response will be available for mobilisation within 24-48 hrs of activation. Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days.	The cost of establishing a local stockpile of new mitigation equipment (including protection and deflection boom) closer to the expected hydrocarbon stranding areas is not commensurate with the need.	This option is not adopted as the existing capability meets the need.	**No**

6.3.4 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.4 Oiled Wildlife Response – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.4.1 Oiled Wildlife Response – Control Measure Options Analysis

6.4.1.1 Alternative Control Measures

Alternative Control Measures Considered
Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented
Direct contracts with service providers	This option duplicates the capability accessed through AMOSC and OSRL and would compete for the same resources. Does not provide a significant increase in environmental benefit.	These delivery options provide increased effectiveness through more direct communication and control of specialists. However, no significant net benefit is anticipated.	Duplication of capability – already subscribed to through contracts with AMOSC and OSRL	This option is not adopted as the existing capability meets the need.	🟥 **No**

6.4.1.2 Additional Control Measures

Additional Control Measures Considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented
Additional wildlife treatment systems	The selected delivery options provide access to call-off contracts with selected specialist providers. The agreements ensure that these resources can be mobilised to meet the required response objectives, commensurate with the progressive nature of environmental impact and the time available to monitor hydrocarbon plume trajectories. Provides response equipment and personnel by Day 3. The additional cost in having a dedicated oiled wildlife response (equipment and personnel) in place is disproportionate to environmental benefit. These selected delivery options provide capacity to carry out an oiled wildlife response if contact is predicted; and to scale up the response if required to treat widespread contamination. As there is no impact predicted until day 17.7 at Ningaloo Coast North, the current capability meets the needs required and there is no additional environmental benefit in adopting the improvements.	The offshore location of the release site, with an earliest impact (below response thresholds) on day 17.7 at Ningaloo Coast North, provides sufficient opportunity for the ongoing monitoring and surveillance operations to inform the scale of the response. Additionally, given the low likelihood of such an event occurring and that the current capability meets the need, the cost of implementing measures to reduce the mobilisation time is considered disproportionate to the benefit. Numbers of oiled wildlife are expected to be low in the remote offshore setting of the oiled wildlife response, given the distance from known aggregation areas. Oiled wildlife response capacity would be addressed for open Commonwealth waters through the AMOSC arrangements, as informed by operational monitoring. The cost and organisational complexity of this approach is moderate, and the overall delivery effectiveness is high.	Additional wildlife response resources could total A$1700 per operational site per day.	This option is not adopted as the existing capability meets the need.	🟥 **No**
Additional trained wildlife responders	Current numbers meet the needs required and additional personnel are available through existing contracts with oil spill response organisations and environmental panel contractors. Numbers of oiled wildlife are expected to be low in the remote offshore setting of the oiled wildlife response, given the distance from known aggregation areas. The potential environmental benefit of training additional personnel is expected to be low.	The capability provides the capacity to treat approximately 600 wildlife units (primarily avian wildlife) by Day 6, with additional capacity available from OSRL. Additional equipment and facilities would be required to support ongoing response, depending on the scale of the event and the impact to wildlife. Materials for holding facilities, portable pools, enclosures and rehabilitation areas would be sourced as required.	Additional wildlife response personnel cost A$2000 per person per day	This option is not adopted as the existing capability meets the need.	🟥 **No**

6.4.1.3 Improved Control Measures

Improved Control Measures considered
Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented

Faster mobilisation time for wildlife response	Response time is limited by specialist personnel mobilisation time. Current timing is sufficient for expected first shoreline contact. This control measure provides increased effectiveness through faster mobilisation of specialists. However, no significant net environmental benefit is expected due to shoreline stranding times.	Pre-positioning vessels or equipment would reduce mobilisation time for oiled wildlife response activities. However, given the effectiveness of an oiled wildlife response is expected to be low, an earlier response would provide a marginal increase in environmental benefit. The selected delivery options provide the capacity to mobilise an oiled wildlife response capable of treating up to 600 wildlife from at least Day 6 and exceeds the estimated Level 1-2 oiled wildlife response thought to be applicable. This delivery option provides the maximum expertise pooled across the participating operators, backed up by the international resources provided by OSRL. The availability of vessels and personnel meets the response need.	Wildlife response packages to preposition at vulnerable sites identified through the deterministic modelling cost A$700 per package per day. The cost of having dedicated equipment and personnel available to respond faster is considered disproportionate to the environmental benefit.	This option is not adopted as the existing capability meets the need.	**No**

6.4.2 Selected control measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.5 Waste Management – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in Section 5 with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.5.1 Waste Management – Control Measure Options Analysis

6.5.1.1 Alternative Control Measures

Alternative Control Measures Considered

Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented
No reasonably practical alternative control measures identified.					

6.5.1.2 Additional Control Measures

Additional Control Measures Considered

Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented
Increased waste storage capability	The procurement of waste storage equipment options on the day of the event will allow immediate response and storage of collected waste. The environmental benefit of immediate waste storage is to reduce ecological consequence by safely securing waste, allowing continuous response operations to occur.	Access to Veolia's storage options provides the resources required to store and transport sufficient waste to meet the need. Access to waste contractors existing facilities enables waste to be stockpiled and gradually processed within the regional waste handling facilities. Additional temporary storage equipment is available through existing contract and arrangements with OSRL. Existing arrangements meet identified need for the PAP.	Cost for increased waste disposal capability would be approx. A$1300 per m^3. Cost for increased onshore temporary waste storage capability would be approx. A$40 per unit per day.	This option is not adopted as the existing capability meets the need.	No

6.5.1.3 Improved Control Measures

Improved Control Measures considered

Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Option considered	Environmental consideration	Feasibility	Approximate cost	Assessment conclusions	Implemented
Faster response time	The access to Veolia waste storage options provides the resources to store and transport waste, permitting the wastes to be stockpiled and gradually processed within the regional waste handling facilities. Bulk transport to Veolia's licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with Environmental Protection (Controlled Waste) Regulations 2004. The environmental benefit from successful waste storage will reduce pressure on the treatment and disposal facilities reducing ecological consequences by safely securing waste. In addition, waste storage and transport will allow continuous response operations to occur. This delivery option would increase known available storage, eliminating the risk of additional resources not being available at the time of the event. However, the environmental benefit of Woodside procuring additional waste storage is considered minor as the risk of additional storage not being available at the time of the event is considered low and existing arrangements provide adequate storage to support the response.	Woodside already maintains an equipment stockpile in Exmouth to enable shorter response times to incidents. This stockpile includes temporary waste storage equipment. Woodside has access to stockpiles of waste storage and equipment in Dampier and Exmouth through existing contracts and arrangements.	The incremental benefit of having a dedicated local Woodside owned stockpile of waste equipment and transport is considered minor and cost is considered disproportionate to the benefit gained given predicted shoreline contact times.	This option is not adopted as the existing capability meets the need.	No

6.5.2 Selected control measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.6 Scientific monitoring – ALARP assessment

Alternative, additional and improved options have been identified and assessed against the base capability described in **Section 5** with those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are clearly disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.6.1 Scientific monitoring – control measure options analysis

6.6.1.1 Alternative Control Measures

Alternative Control Measures considered

Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control

Ref	Control Measure Category	Option considered	Implemented	Environmental Consideration	Feasibility/Cost
SM01	System	Analytical laboratory facilities closer to the likely spill affected area	**No**	SM01 water quality monitoring requires water samples to be transported to NATA rated laboratories in Perth or interstate. Consider the benefit of laboratory access and transportation times to deliver water samples and complete lab analysis. There is a time lag from collection of water samples to being in receipt of results and confirming hydrocarbon contact to sensitive receptors). The environmental consideration of having access to suitable laboratory facilities in Exmouth or Karratha to carry out the hydrocarbon analysis would provide faster turnaround in reporting of results only by a matter of days (as per the time to transport samples to laboratories).	Laboratory facilities and staff available at locations closer to the spill affected area can reduce reporting times only to a moderate degree (days) with associated high costs of maintaining capability do not improve the environmental benefit.
SM01	System	Dedicated contracted SMP vessel (exclusive to Woodside)	**No**	Would provide faster mobilisation time of scientific monitoring resources, environmental benefit associated with faster mobilisation time would be minor compared to selected options.	Chartering and equipping additional vessels on standby for scientific monitoring has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated availability of vessels and resources within in the required timeframes. The selected delivery provides capability to meet the scientific monitoring objectives, including collection of pre-emptive data where baseline knowledge gaps are identified for receptor locations where spill predictions of time to contact are > 10 days. The effectiveness of this alternative control (weather dependency, availability and survivability) is rated as very low. The cost and organisational complexity of employing a dedicated response vessel is considered disproportionate to the potential environmental benefit by adopting these delivery options.

6.6.1.2 Additional Control Measures

Additional Control Measures considered

Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Ref	Control Measure Category	Option considered	Implemented	Environmental Consideration	Feasibility / Cost
SM01	System	Determine baseline data needs and provide implementation plan in the event of an unplanned hydrocarbon release	**Yes**	Address resourcing needs to collect post spill (pre-contact) baseline data as spill expands in the event of a loss of well control or instantaneous MDO release from the PAP activities.	Woodside relies on existing environmental baseline for receptors which have predicted hydrocarbon contact (above environment threshold) < 10 days and acquiring pre-emptive data in the event of an instantaneous MDO release from the PAP activities based on receptors predicted to have hydrocarbon contact > 10 days. Ensure there is appropriate baseline for key receptors for all geographic locations that are potentially impacted < 10 days of spill event, where practicable. Address resourcing needs to collect pre-emptive baseline as spill expands in the event of an instantaneous MDO release from the PAP activities.

6.6.1.3 Improved control measures

Improved control measures considered – no reasonably practicable improved Control Measures identified.

6.6.2 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP:

- Alternative:
  - None selected.
- Additional:
  - Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release.
- Improved:
  - None selected.

6.6.3 Operational plan

Key actions from the Scientific Monitoring Program Operational Plan for implementing the response are outlined in **Table 6-2**.

Table 6-2: Scientific monitoring program operational plan actions

Responsibility	Action
Activation	
Perth ICC Planning (ICC Planning – Environment Unit)	Mobilises SMP Lead/Manager and SMP Coordinator to the ICC Planning function.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	Constantly assesses all outputs from OM01, OM02 and OM03 (**Section 5** and **ANNEX B**) to determine receptor locations and receptors at risk. Confirm sensitive receptors likely to be exposed to hydrocarbons, timeframes to specific receptor locations and which SMPs are triggered. Review baseline data for receptors at risk.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	SMP co-ordinator stands up SMP standby contractor as the SMP Contractor. Stands up subject matter experts, if required.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager SMP Coordinator, SMP Standby Contractor, SMP Manager)	Establish if, and where, pre-contact baseline data acquisition is required. Determines practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times. Determines scope for preliminary post-contact surveys during the Response Phase. Determines which SMP activities are required at each location based on the identified receptor sensitivities.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, Standby Contractor, SMP Manager)	If response phase data acquisition is required, stand up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the ICC.

Responsibility	Action
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby Contractor, SMP Manager)	SMP contractor, SMP standby contractor to prepare the Field Implementation Plan. Prepare and obtain sign-off of the Response Phase SMP work plan and Field Implementation Plan. Update the IAP.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby Contractor, SMP Manager)	Liaise with ICC Logistics, and determine the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure. Engage with SMP Standby Contractor SMP Manager and ICC Logistics to establish mobilisation plan, secure logistics resources and establish ongoing logistical support operations, including: • vessels, vehicles and other logistics resources • vessel fit-out specifications (as detailed in the SMP Operational Plan) • equipment storage and pick-up locations • personnel pick-up/airport departure locations • ports of departure • land based operational centres and forward operations bases accommodation and food requirements.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby Contractor, SMP Manager)	Confirm communications procedures between Woodside SMP team, SMP Standby Contractor, SMP Manager, SMP Team Leads and Operations Coordinator (ICC).
Mobilisation	
Perth ICC Logistics	Engage vessels and vehicles and arrange fitting out as specified by the mobilisation Plan Confirm vessel departure windows and communicate with the SMP Contractor, SMP Duty Manager. Agree SMP mobilisation timeline and induction procedures with the Operations Coordinator (ICC).
Perth ICC Logistics	Coordinate with SMP Standby Contractor, SMP Duty Manager to mobilise teams and equipment according to the logistics plan and Sector induction procedures.
SMP Survey Team Leads	SMP Survey Team Leader(s) coordinate on-ground/on-vessel mobilisations and support services with the Operations Coordinator (ICC).

6.6.4 ALARP and Acceptability summary

ALARP and Acceptability Summary		
Scientific Monitoring		
ALARP Summary	X	All known reasonably practicable control measures have been adopted
	X	No additional, alternative and improved control measures would provide further benefit
	X	No reasonably practical additional, alternative, and/or improved control measure exists
	The resulting scientific monitoring capability has been assessed against the worst-case credible spill scenarios. The range of strategies provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be Moderate and the overall delivery effectiveness considered Medium. The SMP's main objectives can be met, with the addition of one alternative control measures to provide further benefit.	
Acceptability Summary	• The control measures selected for implementation manage the potential impacts and risks to ALARP. • In the event of a hydrocarbon spill for the PAP, the control measures selected, meet or exceed the requirements of Woodside Management System and industry best-practice. • Throughout the PAP, relevant Australian standards and codes of practice will be followed to evaluate the impacts from an instantaneous MDO release. • The level of impact and risk to the environment has been considered with regard to the principles of Environmentally Sustainable Development; and risks and impacts from a range of identified scenarios were assessed in detail. The control measures described consider the conservation of biological and ecological diversity, through both the selection of control measures and the management of their performance. The control measures have been developed to account for the worst-case credible case scenarios, and uncertainty has not been used as a reason for postponing control measures.	
On the basis from the impact assessment above and in Section 6 of the Echo Yodel Subsea Decommissioning EP, Woodside considers the adopted controls discussed manage the impacts and risks associated with implementing scientific monitoring activities to a level that is ALARP and acceptable.		

7 ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

The implementation of response techniques may modify the impacts and risks identified in the EP and response activities can introduce additional impacts and risks from response operations themselves. Therefore, it is necessary to complete an assessment to ensure these impacts and risks have been considered and specific measures are put in place to continually review and manage these further impacts and risks to ALARP and Acceptable levels. A simplified assessment process has been used to complete this task which covers the identification, analysis, evaluation and treatment of impacts and risks introduced by responding to the event.

7.1 Identification of impacts and risks from implementing response techniques

Each of the control measures can modify the impacts and risks identified in the Echo Yodel Subsea Decommissioning EP. These impacts and risks have been previously assessed within the scope of the EP. Refer to the EP for details regarding how these risks are being managed. They are not discussed further in this document.

- atmospheric emissions
- routine and non-routine discharges
- physical presence, proximity to other vessels (shipping and fisheries)
- routine acoustic emissions vessels
- lighting for night work/navigational safety
- invasive marine species
- collision with marine fauna
- disturbance to seabed
- vessel operations and anchoring
- *increase in entrained hydrocarbons.*

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- vessel operations and anchoring
- presence of personnel on the shoreline
- additional stress or injury caused to wildlife
- waste generation.

7.2 Analysis of impacts and risks from implementing response techniques

Table 7-1 compares the adopted control measures for this activity against the environmental values that can be affected when they are implemented.

Table 7-1: Analysis of risks and impacts

	Environmental Value						
	Soil & Groundwater	Marine Sediment Quality	Water Quality	Air Quality	Ecosystems/ Habitat	Species	Socio-Economic
Monitor and evaluate		✓	✓		✓	✓	
Source control		✓	✓		✓	✓	✓
Oiled wildlife					✓	✓	
Scientific monitoring	✓	✓	✓	✓	✓	✓	✓

7.3 Evaluation of impacts and risks from implementing response techniques

7.3.1 Vessel operations

During the implementation of response techniques, where water depths allow, it is possible that response vessels will be required to anchor (e.g. during shoreline surveys, protection and deflection or wildlife recovery). The use of vessel anchoring will be minimal and likely to occur when the impacted shoreline is inaccessible via road. Anchoring in the nearshore environment of sensitive receptor locations will have the potential to impact coral reef, seagrass beds and other benthic communities in these areas. Recovery of benthic communities from anchor damage depends on the size of anchor and frequency of anchoring. Impacts would be highly localised (restricted to the footprint of the vessel anchor and chain) and temporary, with full recovery expected.

7.3.2 Human presence

Human presence for shoreline assessment or oiled wildlife response may lead to the compaction of sediments and damage to the existing environment especially in sensitive locations such as mangroves and turtle nesting beaches. However, any impacts are expected to be localised with full recovery expected.

7.3.3 Waste generation

Implementing the selected response techniques will result in the generation of the following waste streams that will require management and disposal:

- Liquids (recovered oil/water mixture) recovered from oiled wildlife response.
- Semi-solids/solids (oily solids) collected during oiled wildlife response.
- Debris collected during oiled wildlife response.

If not managed and disposed of correctly, wastes generated during the response have the potential for secondary contamination similar to that described above, impacts to wildlife through contact with or ingestion of waste materials and contamination risks if not disposed of correctly onshore.

7.3.4 Additional stress or injury caused to wildlife

Additional stress or injury to wildlife could be caused through:

- capturing wildlife
- transporting wildlife

- stabilisation of wildlife
- cleaning and rinsing of oiled wildlife
- rehabilitation (e.g. diet, cage size, housing density)
- release of treated wildlife.

Inefficient capture techniques have the potential to cause undue stress, exhaustion or injury to wildlife, additionally pre-emptive capture could cause undue stress and impacts to wildlife when there are uncertainties in the forecast trajectory of the spill. During the transportation and stabilisation phases there is the potential for additional thermoregulation stress on captured wildlife. Additionally, during the cleaning process, it is important that personnel undertaking the tasks are familiar with the relevant techniques to ensure that further injury and the removal of water proofing feathers are managed and mitigated. Finally, during the release phase it’s important that wildlife is not released back into a contaminated environment.

7.4 Treatment of impacts and risks from implementing response techniques

In respect of the impacts and risks assessed the following treatment measures have been adopted. It must be recognised that this environmental assessment is seeking to identify how to maintain the level of impact and risks at levels that are ALARP and of an acceptable level rather than exploring further impact and risk reduction. It is for this reason that the treatment measures identified in this assessment will be captured in Operational Plans, TRPs and/or First Strike Response Plans.

7.4.1 Vessel operations and access to the nearshore environment

- Where existing fixed anchoring points are not available, locations will be selected to minimise impact to nearshore benthic environments with a preference for areas of sandy seabed where they can be identified (Performance Standard (PS) 8.1, PS 24.1).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 8.2, PS 24.2).

7.4.2 Human presence

- Shoreline access route (foot, car, vessel and helicopter) with the least environmental impact identified will be selected by a specialist in SCAT operations (PS 7.3).

7.4.3 Waste generation

- All oiled wildlife response sites zoned and marked before operations commence to prevent secondary contamination and minimise the mixing of clean and oiled waste (PS 11.1)

7.4.4 Additional stress or injury caused to wildlife

- Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA (PS 10.3).

8 ALARP CONCLUSION

An analysis of alternative, additional and improved control measures has been undertaken to determine their reasonableness and practicability. The tables in **Section 6** document the considerations made in this evaluation. Where the costs of an alternative, additional, or improved control measure have been determined to be clearly disproportionate to the environmental benefit gained from its adoption it has been rejected. Where this is not considered to be the case the control measure has been adopted.

The risks from a hydrocarbon spill have been reduced to ALARP because:

- Woodside has a significant hydrocarbon spill response capability to respond to the WCCS through the control measures identified.
- New and modified impacts and risks associated with implementing response techniques have been considered and will not increase the risks associated with the activity.
- A consideration of alternative, additional, and improved control measures identified any other control measures that delivered proportionate environmental benefit compared to the cost of adoption for this activity, ensuring:
  - All known, reasonably practicable control measures have been adopted.
  - No additional, reasonably practicable alternative and/or improved control measures would provide further environmental benefit.
  - No reasonably practical additional, alternative, and/or improved control measure exists.
- A structured process for considering alternative, additional, and improved control measures was completed for each control measure.
- The evaluation was undertaken based on the outputs of the WCCS so the capability in place is sufficient for all other scenario from this activity.
- The likelihood of the WCCS spill has been ignored in evaluating what was reasonably practicable.

9 ACCEPTABILITY CONCLUSION

Following the ALARP evaluation process, Woodside deems the hydrocarbon spill risks and impacts to have been reduced to an acceptable level by meeting all of the following criteria:

- Techniques are consistent with Woodside's processes and relevant internal requirements including policies, culture, processes, standards, structures and systems.
- Levels of risk/ impact are deemed acceptable by relevant persons (external stakeholders) and are aligned with the uniqueness of, and/or the level of protection assigned to the environment, its sensitivity to pressures introduced by the activity, and the proximity of activities to sensitive receptors, and have been aligned with Part 3 of the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*.
- Selected control measures meet requirements of legislation and conventions to which Australia is a signatory (e.g. MARPOL, the World Heritage Convention, the Ramsar Convention, and the Biodiversity Convention, etc.). In addition to these, other non-legislative requirements met include:
    - Australian International Union for Conservation of Nature reserve management principles for Commonwealth marine protected areas and bioregional marine plans.
    - National Water Quality Management Strategy and supporting guidelines for marine water quality).
    - Conditions of approval set under other legislation.
    - National and international requirements for managing pollution from ships.
    - National biosecurity requirements.
- Industry standards, best practices and widely adopted standards and other published materials have been used and referenced when defining acceptable levels. Where these are inconsistent with mandatory/ legislative regulations, explanation has been provided for the proposed deviation. Any deviation produces the same or a better level of environmental performance (or outcome).

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11 GLOSSARY AND ABBREVIATIONS

11.1 Glossary

Term	Description/Definition
ALARP	Demonstration through reasoned and supported arguments that there are no other practicable options that could reasonably be adopted to reduce risks further.
Availability	The availability of a control measure is the percentage of time that it is capable of performing its function (operating time plus standby time) divided by the total period (whether in service or not). In other words, it is the probability that the control has not failed or is undergoing a maintenance or repair function when it needs to be used.
Control	The means by which risk from events is eliminated or minimised.
Control effectiveness	A measure of how well the control measures perform their required function.
Control measure (risk control measure)	The features that eliminate, prevent, reduce or mitigate the risk to environment associated with PAP.
Credible spill scenario	A spill considered by Woodside as representative of maximum volume and characteristics of a spill that could occur as part of the PAP.
Dependency	The degree of reliance on other systems in order for the control measure to be able to perform its intended function.
Incident	An event where a release of energy resulted in or had (with) the potential to cause injury, ill health, damage to the environment, damage to equipment or assets or company reputation.
Performance outcome	A statement of the overall goal or outcome to be achieved by a control measure.
Performance standard	The parameters against which [risk] controls are assessed to ensure they reduce risk to ALARP. A statement of the key requirements (indicators) that the control measure has to achieve in order to perform as intended in relation to its functionality, availability, reliability, survivability and dependencies.
Preparedness	Measures taken before an incident in order to improve the effectiveness of a response.
Reasonably practicable	... a computation ... made by the owner, in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) [showing whether or not] that there is a gross disproportion between them ... made by the owner at a point of time anterior to the accident. (Judgement: Edwards v National Coal Board [1949]).
Receptors at risk	Physical, biological and social resources identified as at risk from hydrocarbon contact using oil spill modelling predictions.
Receptor areas	Geographically referenced areas such as bays, islands, coastlines and/or protected area (WHA, Commonwealth or State marine reserve or park) containing one or more receptor type.
Receptor Sensitivities	This is a classification scheme to categorise receptor sensitivity to an oil spill. The Environmental Sensitivity Index (ESI) is a numerical classification of the relative sensitivity of a particular environment (particularly different shoreline types) to an oil spill. Refer to the Woodside Oil Pollution Emergency Arrangements (Australia) for more details.
Regulator	NOPSEMA are the Environment Regulator under the Environment Regulations.
Reliability	The probability that at any point in time a control measure will operate correctly for a further specified length of time.

Term	Description/Definition
Response strategy	The key priorities and objectives to be achieved by the response plan. Measures taken in response to an event to reduce or prevent adverse consequences.
Survivability	Whether or not a control measure is able to survive a potentially damaging event is relevant for all control measures that are required to function after an incident has occurred.
Threshold	Hydrocarbon threshold concentrations applied to the risk assessment to evaluate hydrocarbon spills. These are defined as: surface hydrocarbon concentration ≥ 10 g/m^2; dissolved ≥ 100 ppb; and entrained hydrocarbon concentrations ≥ 500 ppb.
Environment that May Be Affected	The summary of quantitative modelling where the marine environment could be exposed to hydrocarbons levels exceeding hydrocarbon threshold concentrations.
Zone of Application	The zone in which Woodside may elect to apply dispersant. The zone is determined based on a range of considerations, such as hydrocarbon characteristics, weathering and metocean conditions. The zone is a key consideration in the Net Environmental Benefit Analysis for dispersant use.

11.2 Abbreviations

Abbreviation	Meaning
ABS	Above the seabed
ADIOS	Automated Data Inquiry for Oil Spills
AIIMS	Australasian Inter-Service Incident Management System
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AUV	Autonomous underwater vehicle
BAOAC	Bonn Agreement Oil Appearance Code
BP	Boiling point
CAR	Containment and recovery
CEDRE	Documentation, Research and Experimentation on Accidental Water Pollution
CERCLA	*Environmental Response, Compensation, and Liability Act*
CF	Conditional factor
CICC	Corporate Incident Coordination Centre
CMR	Commonwealth Marine Reserve
COP	Common Operating Picture
CS	Credible Scenario
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DGV	Default Guideline Values
DM	Duty Manager
DoT	Western Australia Department of Transport
DPaW	former Western Australian Department of Parks and Wildlife
DWH	Deepwater Horizon
D&C	Drilling and completions
EMBA	Environment that may be affected
EROD	Ethoxyresorufin-o-deethylase
FST	Functional Support Team
EMSA	European Maritime Safety Agency
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EP	Environment Plan
ESI	Environmental Sensitivity Index
ESP	Environmental Services Panel
FSP	First Strike Plan
FWADC	Fixed-wing aerial dispersant capability
GIS	Geographic information system

Abbreviation	Meaning
GPS	Global positioning system
GSI	Gonado-Somatic Index
GWF	Greater Western Flank
HSP	Hydrocarbon spill preparedness
IAP	Incident Action Plan
ICC	Incident Coordination Centre
IGEM	Industry Government Environmental Meta-database
IMS	Invasive marine species
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environment Conservation Association
ITOPF	International Tanker Owners Pollution Federation
KSAT	Kongsberg satellite
LSI	Liver Somatic Index
MARPOL	The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78)
MDO	Marine Diesel Oil
ME	Monitor and evaluate
MoU	Memorandum of Understanding
NEBA	Net environmental benefit analysis
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural resource damage assessment
NRT	National Response Team
OILMAP	Oil Spill Model and Response System
OPEA	Oil pollution emergency arrangements
OPEP	Oil Pollution Emergency Plan
OPGGSA	*Offshore Petroleum and Greenhouse Gas Storage Act*
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisation
OSTM	Oil spill trajectory modelling
OWR	Oiled wildlife response
OWRP	Oiled Wildlife Response Plan
OWROP	Regional Oiled Wildlife Response Operational Plan
PAH	Polycyclic aromatic hydrocarbon
PAP	Petroleum Activities Program
PBA	Pre-emptive Baseline Areas
PPA	Priority Protection Area
PPB	Parts per billion
PPM	Parts per million
RPA	Response Protection Area

Abbreviation	Meaning
SCAT	Shoreline contamination assessment techniques
SDA	Surface Dispersant Application
SDH	Sorbitol dehydrogenase
SHC	Shoreline clean-up
SIMAP	Integrated Oil Spill Impact Oil System
SME	Subject matter expert
SMP	Scientific monitoring program
SOP	Standard Operating Procedure
SQGV	Sediment Quality Guideline Values
S&EM	Security and emergency management
TRP	Tactical Response Plan
UAS	Unmanned aerial systems
UAV	Unmanned aerial vehicle
WAOWRP	West Australian Oiled Wildlife Response Plan
WCC	Woodside Communication Centre
WCCS	Worst-case credible scenario
WEL	Woodside Energy Limited
WHA	World Heritage Area
WMS	Woodside Management Systems
Woodside	Woodside Energy Limited
ZoA	Zone of Application

ANNEX A: NET ENVIRONMENTAL BENEFIT ANALYSIS DETAILED OUTCOMES

A NEBA has been conducted to assess the net environmental benefit of different response techniques to selected receptors in the event of an oil spill from the activity for release of MDO caused by a vessel collision in the Operational Area. The complete list of potential receptor locations within the EMBA within the activity is included in Section 4 of the EP.

The locations utilised for the NEBA were limited to the RPAs identified from modelling (see Section 3 for outline of selection). These include receptors which have potential for the following:

- Surface contact (>50 g/m²)
- Shoreline accumulation (>100 g/m²) – please note there is no shoreline accumulation at threshold for this scenario (CS-01). Modelling predicts that Ningaloo Coast North WHA and Pilbara Islands – Southern Island Group may be contacted at a threshold of ~10 g/m^2.
- Entrained contact (>100 ppb and <14 days)

More detailed NEBA assessment outcomes are available via this Link

Table A-1: NEBA assessment technique recommendations for MDO – CS-01

Receptor	Monitor and Evaluate	Source control via vessel SOPEP	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and Recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response
Open Ocean	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello Islands	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Muiron Islands MMA-WHA	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Ningaloo Coast North WHA	Yes	Yes	No	No	No	No	Potentially	No	No	No	Yes
Pilbara Islands - Southern Island Group	Yes	Yes	No	No	No	No	Potentially	No	No	No	Yes
Rankin Bank	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello MP	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello State Marine Park	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Muiron Islands	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Gascoyne MP	Yes	Yes	No	No	No	No	No	No	No	No	Yes

Overall assessment

Sensitive receptor (Sites identified in EP)	Monitor and Evaluate	Source control via vessel SOPEP	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and Recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response
Is this response Practicable?	Yes	Yes	No	No	No	No	Potentially	No	No	No	Yes
NEBA identifies Response potentially of Net Environmental Benefit?	Yes	Yes	No	No	No	No	Potentially	No	No	No	Yes

NEBA Impact Ranking Classification Guidance

To reduce variability between assessments, the following ranking descriptions have been devised to guide the workshop process:

Table A-3: NEBA impact ranking classifications

			Degree of impact [9]	**Potential duration of impact**	**Equivalent Woodside Corporate Risk Matrix Consequence Level**
Positive	**3P**	**Major**	Likely to prevent: • behavioural impact to biological receptors • behavioural impact to socio-economic receptors e.g. changes to day-today business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches) or regulatory designations.	Decrease in duration of impact by > 5 years	N/A
	2P	**Moderate**	Likely to prevent: • significant impact to a single phase of reproductive cycle of biological receptors • detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors.	Decrease in duration of impact by 1–5 years	N/A
	1P	**Minor**	Likely to prevent impacts on: • significant proportion of population or breeding stages of biological receptors • socio-economic receptors such as: ○ significant impact to the sensitivity of protective designation; or ○ significant and long-term impact to business/industry.	Decrease in duration of impact by several seasons (< 1 year)	N/A
	0	**Non-mitigated spill impact**	**No detectable difference to unmitigated spill scenario.**		
Negative	**1N**	**Minor**	Likely to result in: • behavioural impact to biological receptors • behavioural impact to socio-economic receptors e.g. changes to day-to-day business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches), or regulatory designations.	Increase in duration of impact by several seasons (< 1 year)	Increase in risk by one sub-category, without changing category (e.g. Minor (E) to Minor (D))
	2N	**Moderate**	Likely to result in: • significant impact to a single phase of reproductive cycle for biological receptors; or • detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Increase in duration of impact by 1–5 years	Increase in risk by one category (e.g. Minor (D) to Moderate (C or B))
	3N	**Major**	Likely to result in impacts on: • significant proportion of population or breeding stages of biological receptors • socio-economic receptors resulting in either: ○ significant impact to the sensitivity of protective designation; or ○ significant and long-term impact to business/industry.	Increase in duration of impact by > 5 years or unrecoverable	Increase in risk by two categories (e.g. Minor (E) to Major (A))

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[9] The maximum likely impact should be considered; for example, if a spill were to directly impact the behaviour that results in an impact to reproduction and/or the breeding population (such as fish failing to aggregate to spawn), then the score should be a 2 or 3 rather than a 1. Similarly, if a change in behaviour resulted in an increased risk of mortality of a population, then it should be scored as a 2 or 3.

ANNEX B: OPERATIONAL MONITORING ACTIVATION AND TERMINATION CRITERIA

Table B-1: Operational monitoring objectives, triggers and termination criteria

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 1 (OM01) Predictive Modelling of Hydrocarbons to Assess Resources at Risk	OM01 focuses on the conditions that have prevailed since a spill commenced, as well as those that are forecasted in the short term (one to three days ahead) and longer term. OM01 utilises computer-based forecasting methods to predict hydrocarbon spill movement and guide the management and execution of spill response operations to maximise the protection of environmental resources at risk. The objectives of OM01 are to: • Provide forecasting of the movement and weathering of spilled hydrocarbons. • Identify resources that are potentially at risk of contamination. • Provide simulations showing the outcome of alternative response options (booming patterns etc.) to inform on-going Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP.	OM01 will be triggered immediately following a Level 2/3 hydrocarbon spill.	The criteria for the termination of OM01 are: • The hydrocarbon discharge has ceased. • Response activities have ceased. • Hydrocarbon spill modelling (as verified by OM02 surveillance observations) predicts no additional natural resources will be impacted.
Operational Monitoring Operational Plan 2 (OM02) Surveillance and reconnaissance to detect hydrocarbons and resources at risk	OM02 aims to provide regular, ongoing hydrocarbon spill surveillance throughout a broad region, in the event of a spill. The objectives of OM02 are: • Verify spill modelling results and recalibrate spill trajectory models (OM01) • Understand the behaviour, weathering and fate of surface hydrocarbons • Identify environmental receptors and locations at risk or contaminated by hydrocarbons • Inform ongoing Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP • To aid in the subsequent assessment of the short- to long-term impacts and/or recovery of natural resources (assessed in SMPs) by ensuring that the visible cause and effect relationships between the hydrocarbon spill and its impacts to natural resources have been observed and recorded during the operational phase.	OM02 will be triggered immediately following a Level 2/3 hydrocarbon spill.	The termination triggers for the OM02 are: • 72 hours has elapsed since the last confirmed observation of surface hydrocarbons. • Latest hydrocarbon spill modelling results (OM01) do not predict surface exposures at visible levels.

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 3 (OM03) Monitoring of hydrocarbon presence, properties, behaviour and weathering in water	OM03 will measure surface, entrained and dissolved hydrocarbons in the water column to inform decision-making for spill response activities. The specific objectives of OM03 are as follows: • Detect and monitor for the presence, quantity, properties, behaviour and weathering of surface, entrained and dissolved hydrocarbons. • Verify predictions made by OM01 and observations made by OM02 about the presence and extent of hydrocarbon contamination. Data collected in OM03 will also be used for the purpose of longer-term water quality monitoring during SM01.	OM03 will be triggered immediately following a level 2/3 hydrocarbon spill.	The criteria for the termination of OM03 are as follows: • The hydrocarbon release has ceased. • Response activities have ceased. • Concentrations of hydrocarbons in the water are below available ANZECC/ ARMCANZ (2000) trigger values for 99% species protection.
Operational Monitoring Operational Plan 4 (OM04) Pre-emptive assessment of sensitive receptors at risk	OM04 aims to undertake a rapid assessment of the presence, extent and current status of shoreline sensitive receptors prior to contact from the hydrocarbon spill, by providing categorical or semi-quantitative information on the characteristics of resources at risk. The primary objective of OM04 is to confirm understanding of the status and characteristics of environmental resources predicted by OM01 and OM02 to be at risk, to further assist in making decisions on the selection of appropriate response actions and prioritisation of resources. Indirectly, qualitative/semi-quantitative pre-contact information collected by OM04 on the status of environmental resources may also aid in the verification of environmental baseline data and provide context for the assessment of environmental impacts, as determined through subsequent SMPs.	Triggers for commencing OM04 include: • Contact of a sensitive habitat or shoreline is predicted by OM01, OM02 and/or OM03. • The pre-emptive assessment methods can be implemented before contact from hydrocarbons (once a receptor has been contacted by hydrocarbons it will be assessed under OM05).	The criteria for the termination of OM04 at any given location are: • Locations predicted to be contacted by hydrocarbons have been contacted. • The location has not been contacted by hydrocarbons and is no longer predicted to be contacted by hydrocarbons (resources should be reallocated as appropriate).

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 5 (OM05) Monitoring of contaminated resources	OM05 aims to implement surveys to assess the condition of fauna and habitats contacted by hydrocarbons at sensitive habitat and shoreline locations. The primary objectives of OM05 are: • Record evidence of oiled fauna (mortalities, sub-lethal impacts, number, extent, location) and habitats (mortalities, sub-lethal impacts, type, extent of cover, area, hydrocarbon character, thickness, mass and content) throughout the response and clean-up at locations contacted by hydrocarbons to inform and prioritise clean-up efforts and resources, while minimising the potential impacts of these activities. Indirectly, the information collected by OM05 may also support the assessment of environmental impacts, as determined through subsequent SMPs.	OM05 will be triggered when a sensitive habitat or shoreline is predicted to be contacted by hydrocarbons by OM01, OM02 and/or OM03.	The criteria for the termination of OM05 at any given location are: • No additional response or clean-up of fauna or habitats is predicted. • Spill response and clean-up activities have ceased. OM05 survey sites established at sensitive habitat and shoreline locations will continue to be monitored during SM02. The formal transition from OM05 to SM02 will begin on cessation of spill response and clean-up activities.

ANNEX C: OIL SPILL SCIENTIFIC MONITORING PROGRAM

Oil spill environmental monitoring

The following provides some further detail on Woodside's oil spill scientific monitoring Program and includes the following:

- The organisation, roles and responsibilities of the Woodside oil spill scientific monitoring team and external resourcing.
- A summary table of the ten scientific monitoring programs as per the specific focus receptor, objectives, activation triggers and termination criteria.
- Details on the oil spill environmental monitoring activation and termination decision-making processes.
- Baseline knowledge and environmental studies knowledge access via geo-spatial metadata databases.
- An outline of the reporting requirements for oil spill scientific monitoring programs.

Oil spill scientific monitoring – delivery team roles and responsibilities

Woodside oil spill scientific monitoring delivery team

The Woodside science team are responsible for the delivery of the oil spill scientific monitoring. The roles and responsibilities of the Woodside scientific monitoring delivery team are presented in Table C-1 and the organisational structure and ICC linkage provided in Figure C-1.

Woodside oil spill scientific monitoring program – external resourcing

In the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors, scientific monitoring personnel and scientific equipment to implement the appropriate SMPs will be provided by SMP service providers who hold a standby contract for SMP (SMP Standby Contractor) via the Woodside Environmental Services Panel (ESP). In the event that additional resources are required, other consultancy capacity within the Woodside ESP will be used (as needed and may extend to specialist contractors such as research agencies engaged in long-term marine monitoring programs). In consultation with the SMP Standby Contractor and/or specialist contractors, the selection, field sampling and approach of the SMPs will be determined by the nature and scale of the spill.

Table C-1: Woodside and environmental services provider – oil spill scientific monitoring program delivery team key roles and responsibilities

Role	Location	Responsibility
Woodside Roles		
SMP Lead/ Manager	Onshore (Perth)	• Approves activated the SMPs based on operational monitoring data provided by the Planning Function. • Provides advice to the ICC in relation to scientific monitoring. • Provides technical advice regarding the implementation of scientific monitoring. • Approves detailed sampling plans prepared for SMPs. • Directs liaison between statutory authorities, advisors and government agencies in relation to SMPs.
SMP Co-ordinator	Onshore (Perth)	• Activates the SMPs based on operational monitoring data provided by the Planning Function. • Sits in the Planning function of the ICC. • Liaises with other ICC functions to deliver required logistics, resources and operational support from Woodside to support the Environmental Service Provider in delivering on the SMPs. Acts as the conduit for advice from the SMP Lead/Manager to the Environmental Service Provider. • Manages the Environmental Service Provider's implementation of the SMPs. • Liaises with the Environmental Service Provider on delivery of the SMPs. • Arranges all contractual matters, on behalf of Woodside, associated with the Environmental Service Provider's delivery of the SMPs.
Environmental Service Provider Roles		
SMP Standby Contractor – SMP Duty Manager/Project Manager (SMP Liaison Officer)	Onshore (Perth)	• Coordinates the delivery of the SMPs. • Provides costings, schedule and progress updates for delivery of SMPs. • Determines the structure of the Environmental Service Provider's team to necessitate delivery of the SMPs. • Verifies that HSE Plans, detailed sampling plans and other relevant deliverables are developed and implemented for delivery of the SMPs. • Directs field teams to deliver SMPs. • Arranges all contractual matters, on behalf of Environmental Service Provider, associated with the delivery of the SMPs to Woodside. • Manages sub-consultant delivery to Woodside. • Provides required personnel and equipment to deliver the SMPs.
SMP Field Teams	Offshore – Monitoring Locations	• Delivers the SMPs in the field consistent with the detailed sampling plans and HSE requirements, within time and budget. • Early communication of time, budget, HSE risks associated with delivery of the SMPs to the Environmental Service Provider – Project Manager. • Provides start up, progress and termination updates to the Environmental Service Provider – Project Manager (will be lead in-field by a party chief).

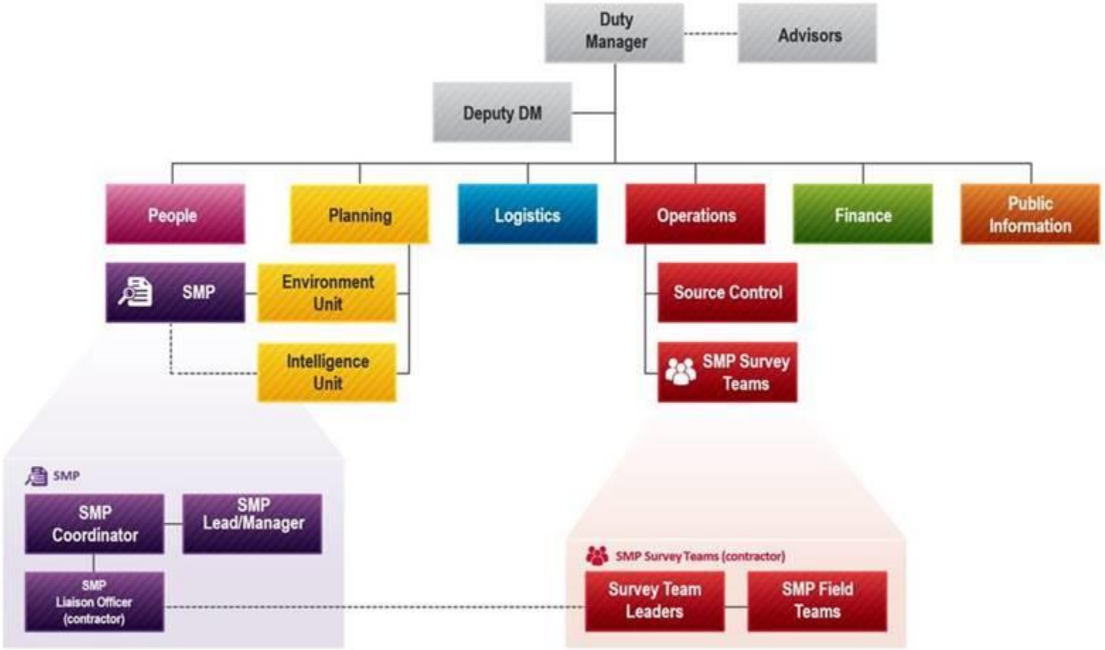

Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to ICC organisational structure

Table C-2: Oil Spill Environmental Monitoring: Scientific Monitoring Program - Objectives, Activation Triggers and Termination Criteria

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
Scientific monitoring program 1 (SM01) **Assessment of Hydrocarbons in Marine Waters**	SM01 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine waters following the spill and the response. The specific objectives of SM01 are as follows: • Assess and document the extent, severity and persistence of hydrocarbon contamination with reference to observations made during surveillance activities and/or in-water measurements made during operational monitoring. • Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs.	SM01 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors.	SM01 will be terminated when: • Operational monitoring data relating to observations and/or measurements of hydrocarbons on and in water have been compiled, analysed and reported. • The report provides details of the extent, severity and persistence of hydrocarbons which can be used for analysis of impacts recorded for sensitive receptors monitored under other SMPs. SMP monitoring of sensitive receptor sites: • Concentrations of hydrocarbons in water samples are below NOPSEMA guidance note (2019[10]) concentrations of 1 g/m² for floating, 10 ppb for entrained and dissolved. • Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in water have been documented at sensitive receptor sites monitored under other SMPs
Scientific monitoring program 2 (SM02) **Assessment of the Presence, Quantity and Character of Hydrocarbons in Marine Sediments**	SM02 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine sediments following the spill and the response. The specific objectives of SM02 are as follows: • Determine the extent, severity and persistence of hydrocarbons in marine sediments across selected sites where hydrocarbons were observed or recorded during operational monitoring. • Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs.	SM02 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • Response activities have ceased. • Operational monitoring results made during the response phase indicate that shoreline, intertidal or sub-tidal sediments have been exposed to surface, entrained or dissolved hydrocarbons (at or above 0.5 g/m² surface, five ppb for entrained/dissolved hydrocarbons and ≥ 1 g/m² for shoreline accumulation).	SM02 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Concentrations of hydrocarbons in sediment samples are below ANZECC/ ARMCANZ (2013[11]) sediment quality guideline values (SQGVs) for biological disturbance. • Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in sediments have been documented.
Scientific monitoring program 3 (SM03) **Assessment of Impacts and Recovery of Subtidal and Intertidal Benthos**	The objectives of SM03 are: • Characterise the status of intertidal and subtidal benthic habitats and quantify any impacts to functional groups, abundance and density that may be a result of the spill. • Determine the impact of the hydrocarbon spill and subsequent recovery (including impacts associated with the implementation of response options). Categories of intertidal and subtidal habitats that may be monitored include: • coral reefs • seagrass • macro-algae • filter-feeders. SM03 will be supported by sediment contamination records (SM02) and characteristics of the spill derived from OMPs.	SM03 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of PBAs of receptor locations identified by time to hydrocarbon contact >10 days, to target receptors and sites where it is possible to acquire pre-hydrocarbon contact baseline. • Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥ 1 g/m² for shoreline accumulation) for subtidal and intertidal benthic habitat.	SM03 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Overall impacts to benthic habitats from hydrocarbon exposure have been quantified. • Recovery of impacted benthic habitats has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.

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[10] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf

[11] Simpson SL, Batley GB and Chariton AA (2013). Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO and Water Science Report 08/07. Land and Water, pp. 132.

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
Scientific monitoring program 4 (SM04) **Assessment of Impacts and Recovery of Mangroves/Saltmarsh**	The objectives of SM04 are: • Characterise the status of mangroves (and associated salt marsh habitat) at shorelines exposed/contacted by spilled hydrocarbons. • Quantify any impacts to species (abundance and density) and mangrove/saltmarsh community structure. • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options). SM03 will be supported by sediment sampling undertaken in SM02 and characteristics of the spill derived from OMPs.	SM04 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact > 10 days. • Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m² surface, five ppb for entrained/dissolved hydrocarbons and ≥ 1 g/m² for shoreline accumulation) for mangrove/saltmarsh habitat.	SM04 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Impacts to mangrove and saltmarsh habitat from hydrocarbon exposure have been quantified. • Recovery of impacted mangrove/saltmarsh habitat has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 5 (SM05) **Assessment of Impacts and Recovery of Seabird and Shorebird Populations**	The Objectives of SM05 are to: • Collate and quantify impacts to avian wildlife from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population level. • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to seabirds and shorebird populations at targeted breeding colonies/staging sites/important coastal wetlands where hydrocarbon contact was recorded.	SM05 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact > 10 days. • Operational monitoring predicts shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at important bird colonies/ staging sites / important coastal wetland locations. OR • Records of dead, oiled or injured bird species made during the hydrocarbon spill or response.	SM05 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to seabird and shorebird populations from hydrocarbon exposure have been quantified. • Recovery of impacted seabird and shorebird populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 6 (SM06) **Assessment of Impacts and Recovery of Nesting Marine Turtle Populations**	The objectives of SM06 are to: • Quantify impacts of hydrocarbon exposure or contact on marine turtle nesting populations (including impacts associated with the implementation of response options). • Collate and quantify impacts to adult and hatchling marine turtles from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels (including impacts associated with the implementation of response options). • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to nesting marine turtle populations at known rookeries (including impacts associated with the implementation of response options).	SM06 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact > 10 days. • Predicted shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, five ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at known marine turtle rookery locations. OR • Records of dead, oiled or injured marine turtle species made during the hydrocarbon spill or response.	SM06 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to nesting marine turtle populations from hydrocarbon exposure have been quantified. • Recovery of impacted nesting marine turtle populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 7 (SM07) **Assessment of Impacts to Pinniped Colonies including Haul-out Site Populations**	The objectives of SM07 are to: • Quantify impacts on pinniped colonies and haul-out sites as a result of hydrocarbon exposure/contact. • Collate and quantify impacts to pinniped populations from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels.	SM07 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact > 10 days;. • Identified shoreline contact of hydrocarbons ((at or above 0.5 g/m² surface, ≥ 5 ppb for entrained/dissolved hydrocarbons and ≥ 1 g/m² for shoreline accumulation) at known pinniped colony or haul-out site(s) (i.e. most northern site is the Houtman Abrolhos Islands). OR • Records of dead, oiled or injured pinniped species made during the hydrocarbon spill or response.	SM07 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to pinniped populations from hydrocarbon exposure have been quantified. • Recovery of pinniped populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 8 (SM08)	The objective of SM08 is to provide a desk-based assessment which collates the results of OM02 and OM05 where observations relate to the mortality, stranding or oiling of mobile marine megafauna species not addressed in SM06 or SM07, including:	SM08 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring	SM08 will be terminated when the results of the post-spill monitoring have quantified impacts to non-avian megafauna. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
Desk-Based Assessment of Impacts to Other Non-Avian Marine Megafauna	• cetaceans • dugongs • whale sharks and other shark and ray populations • sea snakes • crocodiles. The desk-based assessment will include population analysis to infer potential impacts to marine megafauna species populations.	reports records of dead, oiled or injured non-avian marine megafauna during the spill/ response phase.	and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 9 (SM09) **Assessment of Impacts and Recovery of Marine Fish associated with SM03 Habitats**	The objectives of SM09 are: • Characterise the status of resident fish populations associated with habitats monitored in SM03 exposed/contacted by spilled hydrocarbons. • Quantify any impacts to species (abundance, richness and density) and resident fish population structure (representative functional trophic groups). • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options).	SM09 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented with SMO3.	SM09 will be undertaken and terminated concurrent with monitoring undertaken for SM03, as per the SMP termination criteria process • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 10 (SM10) **SM10 - Assessment of Physiological Impacts on Important Fish and Shellfish Species (fish health and seafood quality/safety) and Recovery**	SM10 aims to assess any physiological impacts to important commercial fish and shellfish species (assessment of fish health) and if applicable, seafood quality/safety. Monitoring will be designed to sample key commercial fish and shellfish species and analyse tissues to identify fish health indicators and biomarkers; for example: • Liver Detoxification Enzymes (ethoxyresorufin-O-deethylase (EROD) activity) • PAH Biliary Metabolites • Oxidative DNA Damage • Serum SDH • other physiological parameters, such as condition factor (CF), liver somatic index (LSI), gonadosomatic index (GSI) and gonad histology, total weight, length, condition, parasites, egg development, testes development, abnormalities. Seafood tainting may be included (where appropriate) using applicable sensory tests to objectively assess targeted finfish and shellfish species for hydrocarbon contamination. Results will be used to make inferences on the health of commercial fisheries and the potential magnitude of impacts to fishing industries.	SM10 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring (OM01, OM02 and OM05) indicates the following: • The hydrocarbon spill will or has intersected with active commercial fisheries or aquaculture activities. • Commercially targeted finfish and/or shellfish mortality has been observed/recorded. • Commercial fishing or aquaculture areas have been exposed to hydrocarbons (≥ 0.5 g/m² surface and ≥ 5 ppb for entrained/dissolved hydrocarbons). • Taste, odour or appearance of seafood presenting a potential human health risk is observed.	SM10 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Physiological impacts to important commercial fish and shellfish species from hydrocarbon exposure have been quantified. • Recovery of important commercial fish and shellfish species from hydrocarbon exposure has been evaluated. • Impacts to seafood quality/safety (if applicable) have been assessed and information provided to the relevant stakeholders and regulators for the management of any impacted fisheries. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.

Activation Triggers and Termination Criteria

Scientific monitoring program activation

The Woodside oil spill scientific monitoring team will be stood up immediately with the occurrence of a hydrocarbon spill (actual or suspected) Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors via the FSP for the PAP. The presence of any level of hydrocarbons in the marine environment triggers the activation of the oil spill scientific monitoring program (SMP). This is to ensure the full range of eventualities relating to the environmental, socio-economic and health consequences of the spill are considered in the planning and execution of the SMP. The activation process also takes into consideration the management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), AMPs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act) potentially exposed to hydrocarbons. With the first 24 to 48 hours of a spill event, such information will be sourced and evaluated as part of the SMP planning process guided by Appendix D (identified receptors vulnerable to hydrocarbon contact), the information presented in the Existing Environment section of the EP as well as other information sources such as the Woodside Baseline Environmental Studies Database.

The starting point for decision-making on what SMPs are activated and spatial extent of monitoring activities will be based on the predictive modelling results (OM01) in the first 24 to 48 hours until more information is made available from other operational monitoring activities such as aerial surveillance and shoreline surveys. PBAs (WHA, AMPs and State Marine Parks encompassing key ecological and socio-economic values) are a key focus of the SMP activation decision-making process, particularly, in the early spill event/response phase. As the operational monitoring progresses and further situational awareness information becomes available, it will be possible to understand the nature and scale of the spill. The SMP activation and implementation decision-making will be revisited on a daily basis to account for the updates on spill information. One of the priority focus areas in the early phase of the incident will be to identify and execute pre-emptive SMP assessments at key receptor locations, as required. The SMP activation and implementation decision tree is presented in Figure C-2.

Scientific monitoring program termination

The basis of the termination process for the active SMPs (SMPs 1 to 10) will include quantification of impacts, evaluation of recovery for the receptor at risk and consultation with relevant authorities, persons and organisations. Termination of each SMP will not be considered until the results (as presented in annual SMP reports for the duration of each program) indicate that the target receptor has returned to pre-spill condition.

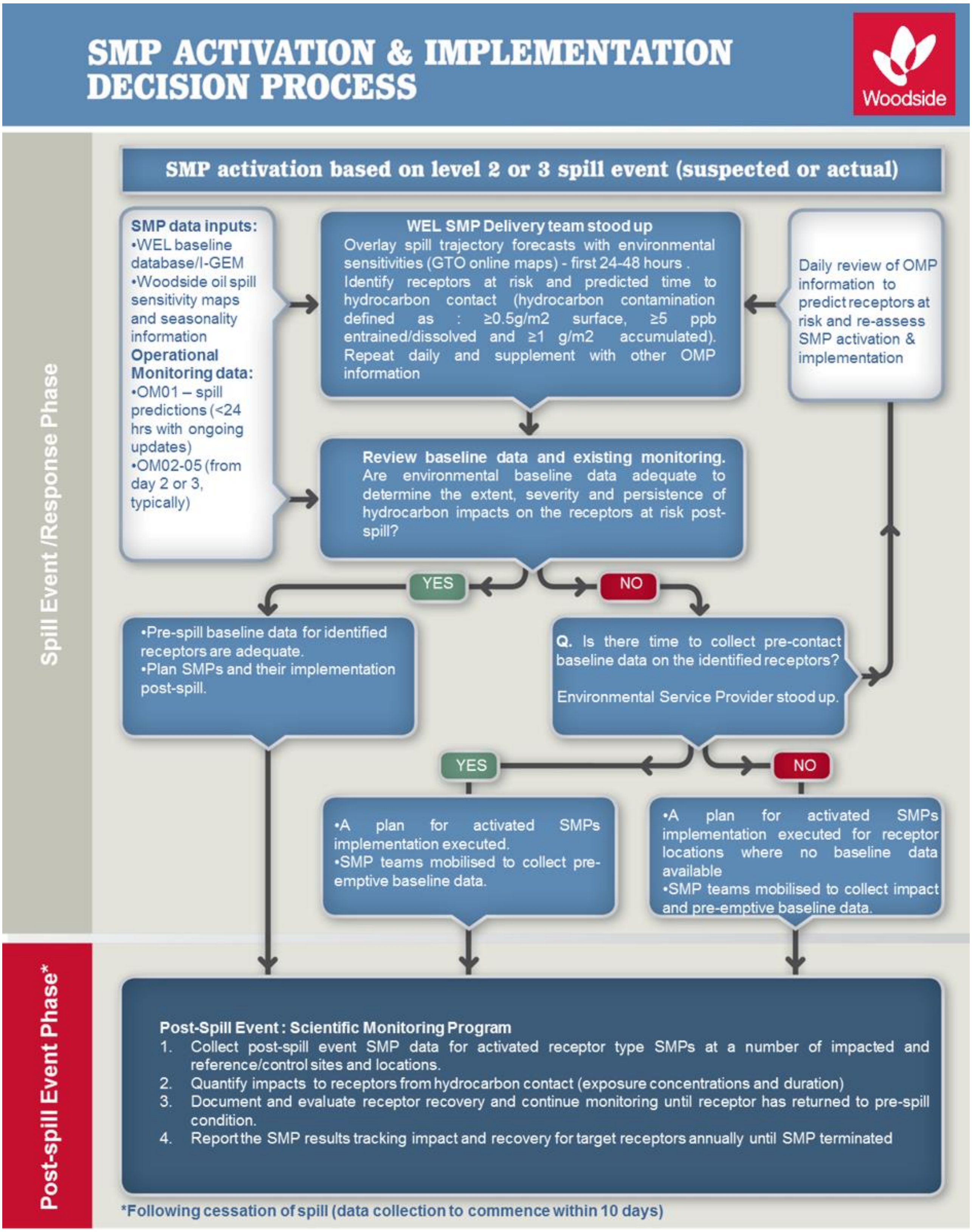
Once the SMP results indicate impacted receptor(s) have returned to pre-spill condition (as identified by Woodside) a termination decision-making process will be triggered and a number of steps will be undertaken as follows:

- Woodside will engage expert opinion on whether the receptor has returned to pre-spill condition (based on monitoring data). Subject Matter Expert (SMEs) will be engaged (via the Woodside SME scientific monitoring terms of reference to review program outcomes, provide expert advice and recommendations for the duration of each SMP.
- Where expert opinion agrees that the receptor has returned to pre-spill condition, findings will then be presented to the relevant authorities, persons and organisations (as defined by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulation 11A). Stakeholder identification, planning and engagement will be managed by Woodside's Reputation Functional Support Team (FST) and follow the stakeholder management FST guidelines. These guidelines outline the FST roles and responsibilities, competencies,

stakeholder communications and planning processes. An assessment of the merits of any objection to termination will be documented in the SMP final report.

- Woodside will decide on termination of SMP based on expert opinion and merits of any stakeholder objections. The final report following termination will include: monitoring results, expert opinion and stakeholder consultation including merits of any objections.
- Termination of SMPs will also consider applicable management objectives, species recovery plans, conservation advices and conservations plans for any WHA, AMPs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act).

The SMP termination decision-making process will be applied to each active SMP and an iterative process of decision steps continued until each SMP has been terminated (refer to decision-tree diagram for SMP termination criteria, Figure C-3).



SMP ACTIVATION & IMPLEMENTATION DECISION PROCESS

SMP activation based on level 2 or 3 spill event (suspected or actual)

SMP data inputs:
- WEL baseline database/I-GEM
- Woodside oil spill sensitivity maps and seasonality information

Operational Monitoring data:
- OM01 – spill predictions (<24 hrs with ongoing updates)
- OM02-05 (from day 2 or 3, typically)

WEL SMP Delivery team stood up
Overlay spill trajectory forecasts with environmental sensitivities (GTO online maps) - first 24-48 hours . Identify receptors at risk and predicted time to hydrocarbon contact (hydrocarbon contamination defined as : ≥0.5g/m2 surface, ≥5 ppb entrained/dissolved and ≥1 g/m2 accumulated). Repeat daily and supplement with other OMP information

Daily review of OMP information to predict receptors at risk and re-assess SMP activation & implementation

Review baseline data and existing monitoring. Are environmental baseline data adequate to determine the extent, severity and persistence of hydrocarbon impacts on the receptors at risk post-spill?

- Pre-spill baseline data for identified receptors are adequate.
- Plan SMPs and their implementation post-spill.

Q. Is there time to collect pre-contact baseline data on the identified receptors?

Environmental Service Provider stood up.

- A plan for activated SMPs implementation executed.
- SMP teams mobilised to collect pre-emptive baseline data.

- A plan for activated SMPs implementation executed for receptor locations where no baseline data available
- SMP teams mobilised to collect impact and pre-emptive baseline data.

Post-Spill Event : Scientific Monitoring Program
1. Collect post-spill event SMP data for activated receptor type SMPs at a number of impacted and reference/control sites and locations.
2. Quantify impacts to receptors from hydrocarbon contact (exposure concentrations and duration)
3. Document and evaluate receptor recovery and continue monitoring until receptor has returned to pre-spill condition.
4. Report the SMP results tracking impact and recovery for target receptors annually until SMP terminated

*Following cessation of spill (data collection to commence within 10 days)

Figure C-2: Activation and implementation decision-tree for oil spill environmental monitoring

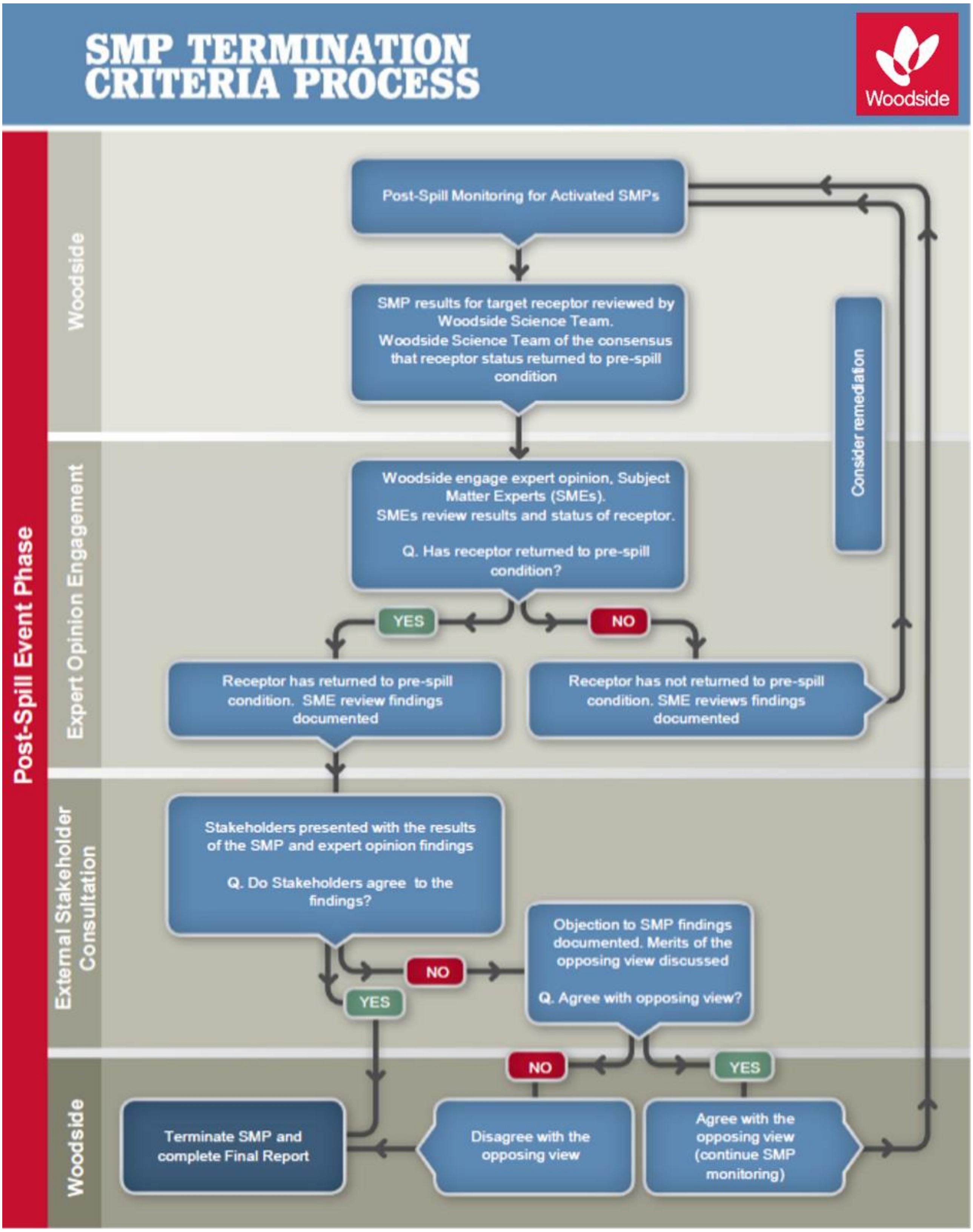


Figure C-3: Termination criteria decision-tree for oil spill environmental monitoring

Receptors at risk and baseline knowledge

In order to assess the baseline studies available and suitability for oil spill scientific monitoring, Woodside maintains knowledge of environmental baseline studies through the upkeep and use of its Environmental Knowledge Management System.

Woodside's Environmental Knowledge Management System is a centralised platform for scientific information on the existing environment, marine biodiversity, Woodside environmental studies, key environmental impact topics, key literature and web-based resources. The system comprises a number of data directories and an environmental baseline database, as well as folders within the 'Corporate Environment' server space. The environmental baseline database was set up to support Woodside's SMP preparedness and as a SMP resource in the event of an unplanned hydrocarbon spill. The environmental baseline database is subject to updates including annual reviews completed as part of the contracted SMP standby, SMP standby contract. This database is accessed pre-PAP to identify PBAs where hydrocarbon contact is predicted to occur < 10 days.

In addition to Woodside's Environmental Knowledge Management System, it is acknowledged that many relevant baseline datasets are held by other organisations (e.g. other oil and gas operators, government agencies, state and federal research institutions and non-governmental organisations). In order to understand the present status of environmental baseline studies a spatial environmental metadata database for Western Australia (Industry-Government Environmental Metadata, I-GEM) was established. IGEM was a collaboration comprising oil and gas operators (including Woodside), government and research agencies and other organisations. IGEM held data have now (in 2020) been integrated into the Department of Water and Environmental Regulation (WA) IMSA[12]. The IMSA is an online portal on information about marine-based environmental surveys in Western Australia. IMSA is a DWER project addressing the systematic capture and sharing of marine data created as part of an environmental impact assessment (EIA).

In the event of an unplanned hydrocarbon release, Woodside intends to interrogate the information on baseline studies status as held by the various databases (e.g. Woodside Environmental Knowledge Management System, IGEM and other sources of existing baseline data) to identify PBAs, i.e., receptors at risk where hydrocarbon contact is predicted to be > 10 days, and baseline data can be collected before hydrocarbon contact.

Reporting

For the scientific monitoring program relevant regulators will be provided with:

- annual reports summarising the SMPs deployed and active, data collection activities and available findings
- final reports for each SMP summarising the quantitative assessment of environmental impacts and recovery of the receptor once returned to pre-spill condition and termination of the monitoring program.

The reporting requirements of the scientific monitoring program will be specific to the individual SMPs deployed and terms of responsibilities, report templates, schedule, QA/QC and peer-review will be agreed with the contractors engaged to conduct the SMPs. Compliance and auditing mechanisms will be incorporated into the reporting terms.

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[12] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

ANNEX D: SCIENTIFIC MONITORING PROGRAM AND BASELINE STUDIES FOR THE PETROLEUM ACTIVITIES PROGRAM

Table D-1: Hydrocarbon spill environmental monitoring – scientific monitoring program scope for the Petroleum Activities Program based on worst-case credible MDO spill

Receptors to be Monitored	Applicable SMP	Receptor Areas - Potential Impact and Reference Scientific Monitoring Sites (marked X)																																					
		Kimberley AMP	Agro-Rowley Terrace AMP	Montebello AMP	Dampier AMP	Carnarvon Canyon AMP	Ningaloo AMP	Gascoyne AMP	Shark Bay Open Ocean (including AMP)	Abrolhos AMP	Jurien AMP	Two Rocks AMP	Perth Canyon AMP	Geographe AMP	South-west Corner AMP	Ashmore Reef and AMP	Seringapatam Reef	Scott Reef (North and South)	Mermaid Reef and AMP	Clerke Reef and State Marine Park	Imperieuse Reef and State Marine Park	Rankin Bank	Glomar Shoals	Rowley Shoals (including Sate Maine Park)	Fantome Shoal	Adele Island	Lacepede Islands	Montebello Islands (including State Marine Park)	Lowendal Islands (including State Nature Reserves)	Barrow Island (including State Nature Reserves, State Marine Park and Marine Management Area)	Muiron Islands (WHA, Marine Management Area)	Pilbara Islands - Southern Island Group (Serrurier, Thevenard and Bessieres Islands - State Nature Reserves)	Pilbara Islands - Northern Island Group (Sandy Island Passage Islands - State nature reserves)	Abrolhos Islands	Kimberley Coast	Dampier Peninsula	Northern Pilbara Shoreline	Ningaloo Coast (North/North West Cape, Middle and South) (WHA, and State Marine Park)	Shark Bay - Open Ocean Coast	Shark Bay (WHA, State Marine Park)	Ngari Capes State Marine Park
Habitat																																									
Water Quality	SM01	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Sediment Quality	SM02	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Coral Reef	SM03	X		X												X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	
Seagrass / Macro-Algae	SM03	X									X					X	X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deeper Water Filter Feeders	SM03	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						X							X			
Mangroves and Saltmarsh	SM04																											X						X	X	X	X	X		X	
Species																																									
Sea Birds and Migratory Shorebirds (significant colonies / staging sites / coastal wetlands)	SM05	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Turtles (significant nesting beaches)	SM06	X	X	X	X		X	X	X							X	X	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Pinnipeds (significant colonies / haul-out sites)	SM07									X	X	X			X																										X
Cetaceans - Migratory Whales	SM08	X	X	X	X		X	X	X	X	X	X	X	X	X			X									X	X	X	X	X			X	X	X		X		X	X
Oceanic and Coastal Cetaceans	SM08	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dugongs	SM08	X							X							X												X	X	X	X	X	X		X	X	X	X	X	X	
Sea Snakes	SM08	X		X	X			X	X	X						X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Whale Sharks	SM08			X			X	X										X										X	X	X	X							X			
Other Shark and Ray Populations	SM08, SM09	X	X	X	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Assemblages	SM09	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Socio-economic																																									
Fisheries - Commercial	SM10		X	X	X	X	X	X	X	X	X	X										X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	X	X
Fisheries - Traditional	SM10															X	X	X									X													X	
Tourism (incl. recreational fishing)	SM10	X		X			X	X	X		X			X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X

🟥	Receptor areas identified as Pre-emptive Baseline Areas (based on criteria of surface contact and/or entrained hydrocarbon contact ≤10 days (Offshore Australian Marine Parks contacted by hydrocarbons in this timeframe also noted)
▨	Receptor areas identified as Pre-Emptive Basline Areas in the response phase >10 days (based on criteria of surface contact and/or entrained hydrocarbon contact >10 days)
□	Receptor areas that may be identified as impact or reference sites in the event of major hydrocarbon release and would be identified as part of the SMP planning process

Document to be read in conjunction with Echo Yodel Subsea Decommissioning Environment Plan.

Table D-2: Baseline studies for the SMPs applicable to identified pre-emptive baseline areas for the PAP

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Montebello Islands	Rankin Bank & Glomar Shoal	Montebello AMP	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserve)
Benthic Habitat (Coral Reef)	SM03 Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**			
		1. Broad benthic habitat classifications and habitat maps for the Montebello islands by DBCA. 2. Coral monitoring at sites across Barrow Island, Lowendal and the Montebello islands. Most recent survey 2012. 3. Benthic community monitoring as part of DBCA Western Australian Marine Monitoring Program (2015-ongoing). 4. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013).	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	Coral Reefs & Filter Feeders 1. Montebello Marine Park, 2019, Identification and qualitative descriptions of benthic habitat. 2. Montebello Australian Marine Parks – 2019 – Baseline survey on benthic habitats. 3. Pluto Trunkline within Montebello Marine Park – Monitoring marine communities.	1. Benthic habitat mapping of the subtidal and intertidal habitats of the islands and shoals. Coral communities in shallow subtidal habitat, intertidal pavement. 2. Coral monitoring at Varanus and Airlie Islands (2000 to present) to identify corals, growth from and percentage cover 3. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013; 2016)
		Methods:			
		1. Habitat mapping. 2. Quantitative assessment details not available. 3. Drop camera. 4. Fixed long-term monitoring sites. Diver video transect. 5. Towed video, benthic trawl and sled.	1. Towed video transects, photo quadrats using towed video system. 2. Towed video transects, photo quadrats using towed video system. 3. Towed video transects, photo quadrats using towed video system. 4. Towed video transects, photo quadrats using towed video system.	1. ROV Transects. 2. Benthic habitat mapping, multibeam acoustic swathing. 3. ROV video.	1. ROV transects. 2. ROV transects and driver surveys 3. Towed video, benthic trawl and sled
		References and Data:			
		1. DBCA 2007. DATAHOLDER: DBCA. 2. RPS, 2012. DATAHOLDER: Santos. 3. DATAHOLDER: DBCA. 4. Pitcher et al. (2016). DATAHOLDER: CSIRO.	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et al. 2019. DATAHOLDER: AIMS. 4. Currey-Randall et al. 2019. DATAHOLDER: AIMS.	1. Advisian 2019. 2. Keesing 2019. 3. McLean et al. 2019.	1. Chevron 2010. DATAHOLDER: Chevron. 2. Quadrant Energy/Santos 2016 DATAHOLDER: Santos 3. CSIRO (2013; 2016). Roland Pitcher. DATAHOLDER
Benthic Habitat (Seagrass and Macro-algae)	SM03 Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**			
		1. Santos, macroalgae monitoring at sites across Lowendal and the Montebello islands in 2012. 2. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013).	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank.	N/A – see table D-1.	1. Benthic habitat mapping of the subtidal and intertidal habitats of the islands and shoals. Algae communities in shallow subtidal habitat, intertidal pavement. 2. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013; 2016)

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Montebello Islands	Rankin Bank & Glomar Shoal	Montebello AMP	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserve)
			3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.		
		Methods:			
		1. Quantitative assessment details not available. 2. Towed video, benthic trawl and sled.	1. Towed video transects, photo quadrats using towed video system. 2. Towed video transects, photo quadrats using towed video system. 3. Towed video transects, photo quadrats using towed video system. 4. Towed video transects, photo quadrats using towed video system.	N/A – see table D-1.	1. ROV transects. 2. Towed video, benthic trawl and sled
		References and Data:			
		1. RPS 2012. DATAHOLDER: Santos. 2. Pitcher et al. (2016). DATAHOLDER: CSIRO.	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et al. 2019. DATAHOLDER: AIMS. 4. Currey-Randall et al. 2019. DATAHOLDER: AIMS.	N/A – see table D-1.	1. Chevron 2010. DATAHOLDER: Chevron 2. CSIRO (2013, 2016). Roland Pitcher. DATAHOLDER
Benthic Habitat (Deeper Water Filter Feeders)	SM03 Quantitative assessment using image capture using towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**			
		N/A – see Table D-1.	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	N/A – see table D.1.	N/A – See **Table D-1**
		Methods:			
		N/A – see table D.1.	1. Towed video transects, photo quadrats using towed video system. 2. Towed video transects, photo quadrats using towed video system. 3. Towed video transects, photo quadrats using towed video system.	N/A – see table D.1.	N/A – See **Table D-1**

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Montebello Islands	Rankin Bank & Glomar Shoal	Montebello AMP	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserve)
			4. Towed video transects, photo quadrats using towed video system.		
		References and Data:			
		N/A – see table D.1.	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et al. 2019. DATAHOLDER: AIMS. 4. Currey-Randall et al. 2019. DATAHOLDER: AIMS.	N/A – see table D.1.	N/A – See **Table D-1**
Mangroves and Saltmarsh	SM04 Aerial photography and satellite imagery will be used in conjunction with field surveys to map the range and distribution of mangrove communities.	**Studies:**			
		1. Atmospheric correct and land cover classification, NW Cape. 2. Advanced Land Observing Satellite (ALOS) images taken in 2006, 2008, and 2010 by DBCA. Digital Aerial Photos were taken in 2009, and the area ground-truthed in 2006. 3. Ground truthing aerial photography to map the spatial extent of mangroves on the Montebello Islands. 4. Mangrove monitoring as part of DBCA Western Australian Marine Monitoring Program (ongoing).	N/A – see table D.1.	N/A – see table D.1.	Study conducted by URS (November 2008 to May 2009) to ground truth aerial photography taken between 2001 and 2009 and to identify mangrove species present in the area.
		Methods:			
		1. Modular Inversion Program. May 2017. 2. ALOS and Digital aerial photos, ground truthing, for Mangrove extent and mangrove relative canopy density. 3. Species Composition, LUX, canopy density. 4. Methods unknown.	N/A – see table D.1.	N/A – see table D.1.	1.Aerial Photography and Satellite imagery Species identification and community composition.
		References and Data:			
		1. EOMAP, 2017. DATAHOLDER: Woodside. 2. DBCA unpublished data. DATAHOLDER: DBCA. 3. Voga unpublish data DATAHOLDER: Voga Contact: [redacted] anchor handler vessel 4. DBCA. DATAHOLDER DBCA.	N/A – see table D.1.	N/A – see table D.1.	URS (2010) DATAHOLDER: Chevron Australia

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Montebello Islands	Rankin Bank & Glomar Shoal	Montebello AMP	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserve)
Seabirds	SM05 Visual counts of breeding seabirds, nest counts, intertidal bird counts at high tide.	**Studies:**			
		No recent studies. A DBCA/WAM study of terrestrial fauna of the islands was published in 2000 (Burbidge et al 2000). The most recent bird survey referenced in this review was 1998 by DBCA (DPaW, CALM).	N/A – see table D.1.	Present, in open water, no breeding habitat.	1. Migratory waterbirds relevant to the Wheatstone Project on behalf of URS in 2008 - 2009. 2. Quadrant Energy/Santos – Integrated Shearwater Monitoring Program (1994-2016). 3. Exmouth Sub-basin Avifauna Monitoring Program (2013-2014)
		Methods:			
		Bird observations and counts.	N/A – see table D.1.	N/A.	1. Ground counts, aerial surveys of wetlands by helicopter. 2. Burrow count and observation data, burrow density, colony stability, breeding participation, incubation effort and reproductive success has been determined. Tagging data 3. Aerial surveys and onshore island surveys.
		References and Data:			
		DBCA/WAM – Burbidge et al 2000.	N/A – see table D.1.	N/A.	1. Bamford, MJ & AR. 2011. DATAHOLDER: Chevron. 2. Quadrant Energy/Santos. DATAHOLDER:Santos 3. Quadrant Energy/Santos. DATAHOLDER:Santos
Turtles	SM06 Beach surveys (recording species, nests, and false crawls).	**Studies:**			
		1. LTM Study of Green, Flatback, Hawksbill turtles on beaches within the Barrow, Lowendal and Montebello Island Complex for Chevron. 2. Marine turtle monitoring as part of DBCA long-term turtle monitoring program (ongoing).	N/A – see table D.1.	Present, in open water, no nesting habitats.	1. Baseline marine turtle surveys 2009 (included the islands of Serrurier, Bessieres and Thevenard), Pendoley (2009). 2. Exmouth Islands Turtle Monitoring Program (2013 and 2014) 3. North West Shelf Flatback Turtle Conservation Program's 4. Inter-nesting distribution of flatback turtles and industrial development in Western Australia (Thevenard Island)
		Methods:			
		Nesting demographics (composition, spatial variability, seasonal distribution, post-nesting dispersion).	N/A – see table D.1.	N/A.	1. Beach/Nesting surveys (counts by species). 2. Beach/Nesting surveys (counts by species). 3. Nesting and tagging studies 4. Satellite tracking methods
		References and Data:			
		1. AMOSC/DPaW 2014. DATAHOLDER: Chevron. 2.DBCA.	N/A – see table D.1.	N/A.	1. Pendoley 2009. DATAHOLDER: Chevron. 2. Quadrant Energy/Santos.

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Montebello Islands	Rankin Bank & Glomar Shoal	Montebello AMP	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserve)
					DATAHOLDER: Santos 3. DBCA. DATAHOLDER: Pendoley Environment -Whittock, Pendoley and Hamann (2010-2011)
Fish	SM09 Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV).	**Studies:**			
		1. DBCA diver surveys 2009-2012. 2. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (approximately 8 to 20 m) in 2014 and deeper (20 to 60 m) in 2015 inside and outside sanctuary zones at the Montebello Islands and in the area from Cape Preston to the Montebello Islands in 2015. 3. Finfish monitoring as part of DBCA Western Australian Marine Monitoring Program (2015-ongoing).	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication – Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	1. CSIRO – Fish Diversity. 2. Fish species richness and abundance.	1.Pilbara Marine Conservation Partnership Stereo BRUVS drops in deep water (20-55m) offshore of Bessieres Island in 2016.
		Methods:			
		1. Diver Operated Video - species richness, community composition, and biomass were recorded from 2009-2012. 2. Stereo BRUVS. 3. Diver UVS.	1. BRUVs. 2. BRUVs. 3. BRUVs. 4. BRUVs.	Semi V Wing trawl net or an epibenthic sled. ROV Video.	Stereo BRUVs
		References and Data:			
		1. DBCA data. DATAHOLDER: DBCA. 2. CSIRO Data DATAHOLDER: CSIRO Data centre ([redacted] 3. DBCA.	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et al. 2019. DATAHOLDER: AIMS. 4. Currey-Randall et al. 2019. DATAHOLDER: AIMS.	1. Keesing 2019. 2. McLean et al. 2019.	CSIRO. DATAHOLDER: CSIRO ([redacted])

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ANNEX E: TACTICAL RESPONSE PLANS

TACTICAL RESPONSE PLANS
Exmouth
Mangrove Bay
Turquoise Bay
Yardie Creek
Muiron Islands
Jurabi to Lighthouse Beaches Exmouth
Ningaloo Reef - Refer to Mangrove/Turquoise bay and Yardie Creek
Exmouth Gulf
Shark Bay Area 1: Carnarvon to Wooramel
Shark Bay Area 2: Wooramel to Petite Point
Shark Bay Area 3: Petite Point to Dubaut Point
Shark Bay Area 4: Dubaut Point to Herald Bight
Shark Bay Area 5: Herald Bight to Eagle Bluff
Shark Bay Area 6: Eagle Bluff to Useless Loop
Shark Bay Area 7: Useless Loop to Cape Bellefin
Shark Bay Area 8: Cape Bellefin to Steep Point
Shark Bay Area 9: Western Shores of Edel Land
Shark Bay Area 10: Dirk Hartog Island
Shark Bay Area 11: Bernier and Dorre Islands
Abrohlos Islands: Pelseart Group
Abrohlos Islands: Wallabi Group
Abrohlos Islands: Easter Group
Dampier
Rankin Bank & Glomar Shoal
Barrow and Lowendal Islands
Pilbara Islands - Southern Island Group
Montebello Is - Stephenson Channel Nth
Montebello Is Champagne Bay & Chippendale channel
Montebello Is - Claret Bay
Montebello Is - Hermite/Delta Is Channel
Montebello Is - Hock Bay
Montebello Is - North & Kelvin Channel
Montebello Is - Sherry Lagoon Entrance
Withnell Bay
Holden Bay
King Bay

TACTICAL RESPONSE PLANS
No Name Bay / No Name Beach
Enderby Is -Dampier
Rosemary Island - Dampier
Legendre Is - Dampier
Karratha Gas Plant
KGP to Whitnell Creek
KGP to Northern Shore
KGP Fire Pond & Estuary
KGP to No Name Creek
Broome
Sahul Shelf Submerged Banks and Shoals
Clerke Reef (Rowley Shoals)
Imperieuse Island (Rowley Shoals)
Mermaid Reef (Rowley Shoals)
Scott Reef
Oiled Wildlife Response
Exmouth
Dampier region
Shark Bay

APPENDIX E. NOPSEMA REPORTING FORMS

NOPSEMA Recordable Environmental Incident Monthly Reporting Form

https://www.nopsema.gov.au/assets/Forms/A198750.doc

Report of an accident, dangerous occurrence or environmental incident

https://www.nopsema.gov.au/assets/Forms

APPENDIX F. STAKEHOLDER CONSULTATION

Echo Yodel Subsea Decommissioning Environment Plan

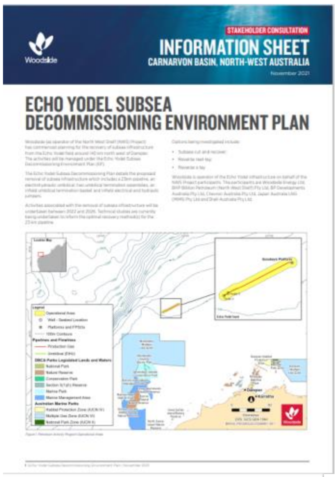
Date: December 2021

Revision: 5

TABLE OF CONTENTS

1. Consultation

1.1.1 Woodside Consultation Information Sheet (sent to all relevant stakeholders) (4 October 2021)



STAKEHOLDER CONSULTATION

INFORMATION SHEET

CARNARVON BASIN, NORTH-WEST AUSTRALIA

November 2021

ECHO YODEL SUBSEA DECOMMISSIONING ENVIRONMENT PLAN

1.2 Email sent to City of Karratha (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

We are consulting the City of Karratha individually and as a member of the Karratha Community Liaison Group. A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Echo Yodel Subsea Decommissioning Environment Plan

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.3 Email sent to Karratha Districts Chamber of Commerce (4 October, 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

We are consulting the KDCCI individually and as a member of the Karratha Community Liaison Group. A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
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Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal.

- General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.4 Email sent to Karratha Community Liaison Group members (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
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Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.

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Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.5 Email sent to Murujuga Aboriginal Corporation (4 October 2021)

Hi [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

We are consulting MAC as a member of the Karratha Community Liaison Group. A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
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Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,
Senior Corporate Affairs Adviser – Indigenous Affairs

1.6 Email sent to NYFL (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

We are consulting NYFL as a member of the Karratha Community Liaison Group. A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
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Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Kind Regards,
Senior Corporate Affairs Adviser – Indigenous Affairs

1.7 Email sent to following stakeholders (4 October 2021)

- Nickol Bay Sports Fishing Club
- King Bay Game Fishing Club
- Australian Border Force
- Department of Transport (Marine Pollution)
- Recfish West
- Department of Mines, Industry Regulation and Safety

Dear Stakeholder

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

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Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,
Corporate Affairs Adviser | Corporate Affairs Karratha

1.8 Email sent to Department of Industry, Science, Energy and Resources (DISR) (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

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Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.9 Email sent to APPEA (4 October 2021)

Dear Stakeholder,

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method.

	Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.10 Email sent to Australian Maritime Safety Authority (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Echo Yodel Subsea Decommissioning Environment Plan

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at:
Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

1.11 Email sent to adjacent title holders (4 October 2021)

Dear Titleholder

As operator of adjacent titles, we are sending this information to you.

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

An information sheet (also on our website), and Titleholder map is attached.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November2021.

Corporate Affairs Adviser | Corporate Affairs Karratha

1.12 Email sent to Australian Hydrographic Service (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.

Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at:
Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021

Corporate Affairs Adviser | Corporate Affairs Karratha

1.13 Email sent to Pilbara Trap and Pilbara Line Fishery Licence Holders (4 October 2021)

Dear Stakeholder,

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 – 130 m**The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers
Relevant Fisheries:	**State:** Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth**: Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL

and associated infrastructure					
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance • Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that

		required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling.	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:

If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.14 Email sent to Commonwealth Fisheries Association (4 October 2021)

Dear Stakeholder,

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 – 130 m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) 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.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached and available on our website. It provides background on the proposed activity, including a summary of potential key risk and associated management measures.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical . This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL

Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39' 04.585" S	19° 39' 04.585" S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44' 44.342" S	115° 44' 12.229" E	None will apply	WA-9-PL

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance

		• Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species

	via vessels ballast water or biofouling.	Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.15 Email sent to Tuna Australia (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 – 130 m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) 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.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached and available on our website. It provides background on the proposed activity, including a summary of potential key risk and associated management measures.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical . This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL

Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39' 04.585" S	19° 39' 04.585" S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44' 44.342" S	115° 44' 12.229" E	None will apply	WA-9-PL

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance

		• Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species

	via vessels ballast water or biofouling.	Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,
Corporate Affairs Adviser | Corporate Affairs Karratha

1.16 Email sent to Australian Southern Bluefin Industry Association (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 – 130 m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) 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.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached and on our website. It provides background on the proposed activity, including a summary of potential key risk and associated management measures.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical . This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL

Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery’s representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance

		• Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species

	via vessels ballast water or biofouling.	Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.17 Email sent to Director of National Parks (4 October 2021)

Dear Director of National Parks,

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

We note Australian Government Guidance on consultation activities and confirm that:

- The proposed activities are outside the boundaries of a proclaimed Australian Marine Parks, with the Operational area occurring 24km north of the Montebello Marine Park – Multiple Use Zone (Cwlth).
- We have assessed potential risks to Australian Marine Parks (AMPs) in the development of the proposed Environment Plan and believe that there are no credible risks as part of planned activities that have potential to impact the values of the Marine Parks.
- The worst-case credible spill scenario assessed in this EP is a collision between a project vessel and a third party. While considered credible, it is unlikely given the slow speeds of project vessels when relocating within the Operational Area. The maximum volume assumed in the assessment was therefore 1000 m^3 of marine diesel, which corresponds to rupture of the largest single tank inventory of a project vessel.
- In the highly unlikely event of an unplanned hydrocarbon release to the marine environment due to vessel collision, combined with the adopted controls, it is considered that any potential impact to water quality would be localised, low and temporary in nature in comparison to background levels.
- Through review of hydrocarbon spill modelling, and with consideration of a 10 ppb dissolved and entrained hydrocarbon threshold, the following AMPs may be contacted in the event of a spill:
  - Montebello Australian Marine Park
  - Gascoyne Australian Marine Park

- In most cases, the hydrocarbons that are predicted to reach these protected areas will be in an advanced state of weathering and at concentrations typically associated with lethal and sub-lethal impacts to only the most sensitive marine organisms.
- A Commonwealth Government-approved oil spill response plan will be in place for the duration of the activities, which will include notification to relevant agencies and organisations as to the nature and scale of the event, as soon as practicable following an occurrence. The Director of National Parks will be advised if an environmental incident occurs that may impact on the values of the Marine Park.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant Fisheries:	**State:** Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	**Water depth (m)**	**Latitude**	**Longitude**	**Exclusion zones**	**Permit area**
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.18 Email sent to Western Australian Fishing Industry Council (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 - 130m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method).

- Pipe supply vessels.
- Offshore support vessels.
- Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal.
- General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	**Water depth (m)**	**Latitude**	**Longitude**	**Exclusion zones**	**Permit area**
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	**Risk Description**	**Mitigation And / Or Management Measures**
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable.

	however they will be rapidly diluted and dispersed in the water column	
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance • Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.

Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling.	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Corporate Affairs Adviser | Corporate Affairs Karratha

1.19 Email sent to Australian Fisheries Management Association (AFMA) (4 October 2021)

Dear Stakeholder

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 – 130 m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) 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.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.

Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical . This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable
Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance • Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and

		government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture.	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling.	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Corporate Affairs Adviser | Corporate Affairs Karratha

1.20 Email sent to Australian Maritime Safety Authority (4 October 2021)

Echo Yodel Subsea Decommissioning Environment Plan

Dear AMSA

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL.

A consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The information sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Feedback:
If you have any feedback on these activities, please respond to Woodside at:
Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

1.21 Email sent to Department of Agriculture, Water and the Environment (4 October 2021)

Dear DAWE

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

We have also assessed biosecurity matters which are considered below. An information sheet (also on our website), and a map of Commonwealth fisheries is attached.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.

Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	State: Pilbara Line Fishery, Pilbara Trap Fishery Commonwealth: Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical and associated infrastructure	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping

Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Biosecurity:
With respect to the biosecurity matters, please note the following information below:

Environment description:	
	The Operational Area is located in Commonwealth waters in water depths approximately 125 m to 130 m deep on the outer continental shelf, consisting of relatively flat and featureless. The Operational Area is located in Commonwealth waters within the NWS Province, as defined under the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) (Commonwealth of Australia, 2006), in water depths of about 125 m to 130 m. Within the NWMR, the Operational Area lies within the NWS Province.
Potential IMS risk	IMS mitigation management
Accidental introduction or establishment of invasive marine species	Vessels are required to comply with the Australian Biosecurity Act 2015, specifically the Australian Ballast Water Management Requirements (as defined under the Biosecurity Act 2015) (aligned with the International Convention for the Control and Management of Ships' Ballast Water and Sediments) to prevent introducing IMS. Vessels will be assessed and managed to prevent the introduction of invasive marine species in accordance with Woodside's Invasive Marine Species Management Plan. Woodside's Invasive Marine Species Management Plan includes a risk assessment process that is applied to vessels undertaking Activities. Based on the outcomes of each IMS risk assessment, Management measures commensurate with the risk (such as the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

Best regards,
Corporate Affairs Adviser | Karratha Corporate Affairs

1.22 Email sent to Australian Maritime Safety Authority (25 October 2021)

Dear [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise the Australian Maritime Safety Authority (AMSA) that Woodside is preparing to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL, and would like to offer AMSA the opportunity to provide feedback on the activity.

Information is presented as follows:

- A Consultation Information Sheet providing additional information on the proposed activities is available on our website here
- The revised *Echo Yodel Subsea Decommissioning First Strike Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Woodside propose to submit an EP in December 2021. Should you require additional information or have a comment to make about the proposed activity, please contact me by close of business 26 November to allow us sufficient time to inform our activity planning and EP development.

Feedback can be submitted via email or letter to: Feedback@woodside.com.au or by phone at +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

We look forward to hearing from you.

Many thanks,

Hydrocarbon Spill Coordinator | Security & Emergency Management

1.23 Email sent to Department of Transport (DoT) (29 October 2021)

Dear [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise WA Department of Transport (DoT) that Woodside is preparing to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140km north west of Dampier, in permit area WA-9-PL, and would like to offer DoT the opportunity to provide feedback on the activity.

Information is presented as follows:

- A Consultation Information Sheet providing additional information on the proposed activities is available on our website here.
- The revised *Echo Yodel Subsea Decommissioning First Strike Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
- A summary of activity-specific information in response to DoT's consultation expectations as per its *Offshore Petroleum Industry Guidance Note* (July 2020) is included in the table below.

Woodside propose to submit an EP in December 2021. Should you require additional information or have a comment to make about the proposed activity, please contact me by close of business 26 November to allow us sufficient time to inform our activity planning and EP development.

Feedback can be submitted via email or letter to: Feedback@woodside.com.au or by phone at +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

We look forward to hearing from you.

Information Requested in the Offshore Petroleum Industry Guidance Note (July 2020)	Information Provided & Reference
Description of activity, including the intended schedule, location (including coordinates), distance to nearest landfall and map.	Included in the consultation information sheet
Worst case spill volumes.	Included in Appendix A of the First Strike Plan
Known or indicative oil type/properties.	Included in Appendix A of the First Strike Plan

<table>
<tr><td>Amenability of oil to dispersants and window of opportunity for dispersant efficacy.</td><td colspan="2">Dispersant is not deemed to be suitable for marine diesel spill.</td></tr>
<tr><td>Description of existing environment and protection priorities.</td><td colspan="2">Included in section 4 of the First Strike Plan</td></tr>
<tr><td>Details of the environmental risk assessment related to marine oil pollution - describe the process and key outcomes around risk identification, risk analysis, risk evaluation and risk treatment. For further information see the Oil Pollution Risk Management Information Paper (NOPSEMA 2017).</td><td colspan="2">Unplanned loss of containment events from the Petroleum Activities Program have been identified during the risk assessment process (presented in Section 7 of the EP). Further descriptions of risk, impacts and mitigation measures (which are not related to hydrocarbon preparedness and response) are provided in Section 7 of the EP. One unplanned events or credible spill scenarios for the Petroleum Activities Program has been selected as representative across types, sources and incident/response levels, up to and including the WCCS.

Table 2-1 of the OSPRMA presents the credible scenarios for the Petroleum Activities Program. One worst-case credible scenario (CS-01) has been used for response planning purposes for the activity as all other scenarios are of a lesser scale and extent. By demonstrating capability to meet and manage an event of this size and timescale, Woodside assumes relevant scenarios that are smaller in nature and scale can also be managed by the same capability.

Response performance outcomes have been defined based on a response to the WCCS.</td></tr>
<tr><td rowspan="3">Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines.</td><td rowspan="2"></td><td>Credible Scenario-01 – surface release of marine diesel after a vessel collision

1000 m^3 marine diesel – residue of 50 m^3 (5%)</td></tr>
<tr><td>Minimum time to shoreline contact (above 100 g/m^2) in days</td></tr>
<tr><td>Shoreline receptors</td><td>No shoreline receptors are impacted at response thresholds (>100 g/m^2).

Some contact below response threshold is, however, predicted as follows:
• Ningaloo Coast North (incl. WHA) – 17.7 days (10 g/m^2)
• Pilbara Islands - Southern Island Group – 24.6 days (10 g/m^2)</td></tr>
<tr><td>Details on initial response actions and key activation timeframes.</td><td colspan="2">Included in Section 2 and 3 of the First Strike Plan</td></tr>
</table>

Potential Incident Control Centre arrangements.	Included in Appendix E and F of the First Strike Plan
Potential staging areas / Forward Operating Base.	A Forward Operating Base can be established at Exmouth and/ or Dampier.
Details on response strategies.	Included in Section 2 and 3 of the First Strike Plan
Use of DoT equipment resources	Woodside has access to its own and contracted stockpiles of response equipment and acknowledges that potential use of DoT resources cannot be assumed and is at the discretion of DoT.
Details and diagrams on proposed IMT structure including integration of DoT arrangements as per this IGN.	Included in Appendix E and F of the First Strike Plan
Details on testing of arrangements of OPEP/OSCP.	• Level 1 Response – one Level 1 'First Strike' drill conducted within two weeks of activity commencement. • Level 2 Response – a minimum of one Emergency Management exercise per vessel per campaign. • Level 3 Response – 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. **Testing of Oil Spill Response Arrangements** There are a number of arrangements which in the event of a spill will underpin Woodside's ability to implement a response across its petroleum activities. In order to ensure each of these arrangements is adequately tested, the Hydrocarbon Spill Preparedness Capability and Competency Coordinator ensures tests are conducted in alignment with the Hydrocarbon Spill Arrangements Testing Schedule. Woodside's Hydrocarbon Spill Preparedness & Response Testing Schedule aligns with international good practice for spill preparedness & response management; the testing is compatible with the IPIECA Good Practice Guide and the Australian Emergency Management Institute Handbook. The Hydrocarbon Spill Arrangements Testing Schedule identifies the type of test which will be conducted annually for each arrangement, and how this type will vary over a five year rolling schedule. Testing methods may include (but are not limited to): audits, drills, field exercises, functional workshops, assurance reporting, assurance monitoring and reviews of key external dependencies.

	Activity specific Oil Spill Pollution First Strike Plans are developed to meet the response needs of that particular activity's Worst Credible Spill Scenario (WCCS). The ability to implement these plans may rely on specific arrangements or those common to other Woodside activities. Regardless of their commonality each arrangement will be tested in at least one of the methods annually. This ensures that personnel are familiar with spill response procedures, reporting requirements, and roles/ responsibilities. At the completion of testing a report is produced to demonstrate the outcomes achieved against the tested objectives. The report will include the lessons learned, any improvement actions and a list of the participants. Alternatively, an assurance report, assurance records, or audit report may be produced. These reports record findings and include any recommendations for improvement. Improvement actions and their close-out are actively recorded and managed. This is over and above the emergency management exercises conducted.
Additional comments	Please note some of the links in the document are still being finalised, and as such may show a reference error in the attached version.

Hydrocarbon Spill Coordinator | Security & Emergency Management

1.24 Follow up email sent to Fisheries Licence holder (27 October 2021)

Dear [redacted]

I hope this email finds you well.

I left a voicemail on your mobile today, to follow-up on the proposed activities for the Echo Yodel Subsea Decommissioning environment plan, which Woodside intends to submit to NOPSEMA in November 2021.

Please get in touch if you have any questions or would like to provide feedback on this activity. If you would like to discuss this activity, please give me a call on 9158 8940.

Kind regards
Corporate Affairs Adviser | Corporate Affairs Karratha

1.25 Follow-up email sent to Department of Agriculture, Water and the Environment (29 October 2021)

Dear DAWE,

Just following-up on our earlier email regarding Woodside's plan to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure.

Woodside intends to submit the plan to NOPSEMA in November 2021. If you would like to comment on the proposed activities or would like additional information, please contact us before 2 November, 2021.

Best regards,
Corporate Affairs Adviser | Corporate Affairs Karratha

1.26 Follow up email to Department of Primary Industries and Regional Development (29 October 2021)

Dear [redacted]

Just following-up on our earlier email regarding Woodside's plan to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure.

Woodside intends to submit the plan to NOPSEMA in November 2021. If you would like to comment on the proposed activities or would like additional information, please contact us before 2 November, 2021.

Best regards,
Corporate Affairs Adviser | Corporate Affairs Karratha

1.27 Email sent to Department of Primary Industries and Regional Development (4 October 2021)

Dear [redacted]

Woodside is planning to resubmit the Echo Yodel Subsea Decommissioning Environment Plan for the proposed removal of Echo Yodel subsea infrastructure, located approximately 140 km north west of Dampier, in permit area WA-9-PL.

The activity is planned to commence during 2022 and completed by 2026 in water depths between ~125 - 130m. **The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.**

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to the lowest reasonably practicable level.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

A map of relevant fisheries and consultation information sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of subsea infrastructure which includes a 23km pipeline, an electrohydraulic umbilical, two umbilical termination assemblies, an infield umbilical termination basket, a pig launcher and infield electrical and hydraulic jumpers.
Location:	~140 km northwest of Dampier
Approx. Water Depth (m):	~125 – 130 m
Schedule:	Activities associated with the removal of subsea infrastructure will be undertaken between 2022 and 2026. Timing of removal and recovery is subject to approvals, vessel availability and weather constraints.
Duration:	Between 2-6 months (cumulative) for the removal of the pipeline, depending on the recovery method. Approximately 50 days for removal of the electrohydraulic umbilical, umbilical termination assemblies, infield umbilical termination basket, pig launcher and infield control jumpers.
Exclusionary/Cautionary Zone:	The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. This includes a temporary 500m exclusion zone around the offshore support vessel for the duration of activities.
Relevant fisheries	**State**: Pilbara Line Fishery, Pilbara Trap Fishery **Commonwealth:** Nil
Vessels:	• Specialised recovery vessel (dependent on the recovery method). • Pipe supply vessels. • Offshore support vessels. • Pipe supply vessels will be used for transporting recovered pipeline onshore for disposal. • General support vessels are planned to be used for transporting equipment and materials to and from the operational area, and for general re-supply and support

Approximate locations:

Structure	Water depth (m)	Latitude	Longitude	Exclusion zones	Permit area
To be removed					
Eastern end of the umbilical	130	19° 39’ 04.585” S	115° 55’ 47.881” E	Temporary 500 m radius	WA-9-PL

and associated infrastructure					
Western end of the umbilical and associated infrastructure	125	19° 44’ 44.342” S	115° 44’ 12.229” E	Temporary 500 m radius	WA-9-PL
Eastern end of the Echo Yodel pipeline (SSIV)	130	19° 39’ 04.585” S	19° 39’ 04.585” S	None will apply	WA-9-PL
Western end of the Echo Yodel pipeline (Pipeline Inspection Gauge launcher)	125	19° 44’ 44.342” S	115° 44’ 12.229” E	None will apply	WA-9-PL

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable.

Seabed disturbance	Disturbance to the seabed from removal activities	• Anchoring may be required for pipeline recovery, depending on recovery method used. If required, anchors will be deployed to minimise seabed disturbance • Pipeline recovery – sediment relocation (using RoV or mass flow excavator) around the pipeline (e.g. to unbury sections of it) will be limited to that required to enable removal and recovery to vessel. • Electrohydraulic umbilical and associated infrastructure - localised sediment relocation around subsea infrastructure will be limited to that required to enable removal and recovery to vessel.
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • The Operational Area includes a radius of 1500 m either side of the Echo Yodel pipeline and electrohydraulic umbilical. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a	Appropriate spill response plans, equipment and materials will be in place and maintained.

	well or vessel collision resulting in a tank rupture.	Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling.	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Commercial fishing implications:
Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are four overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Woodside has provided information to the fishery's representative organisation (Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association, Tuna Australia) 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.

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

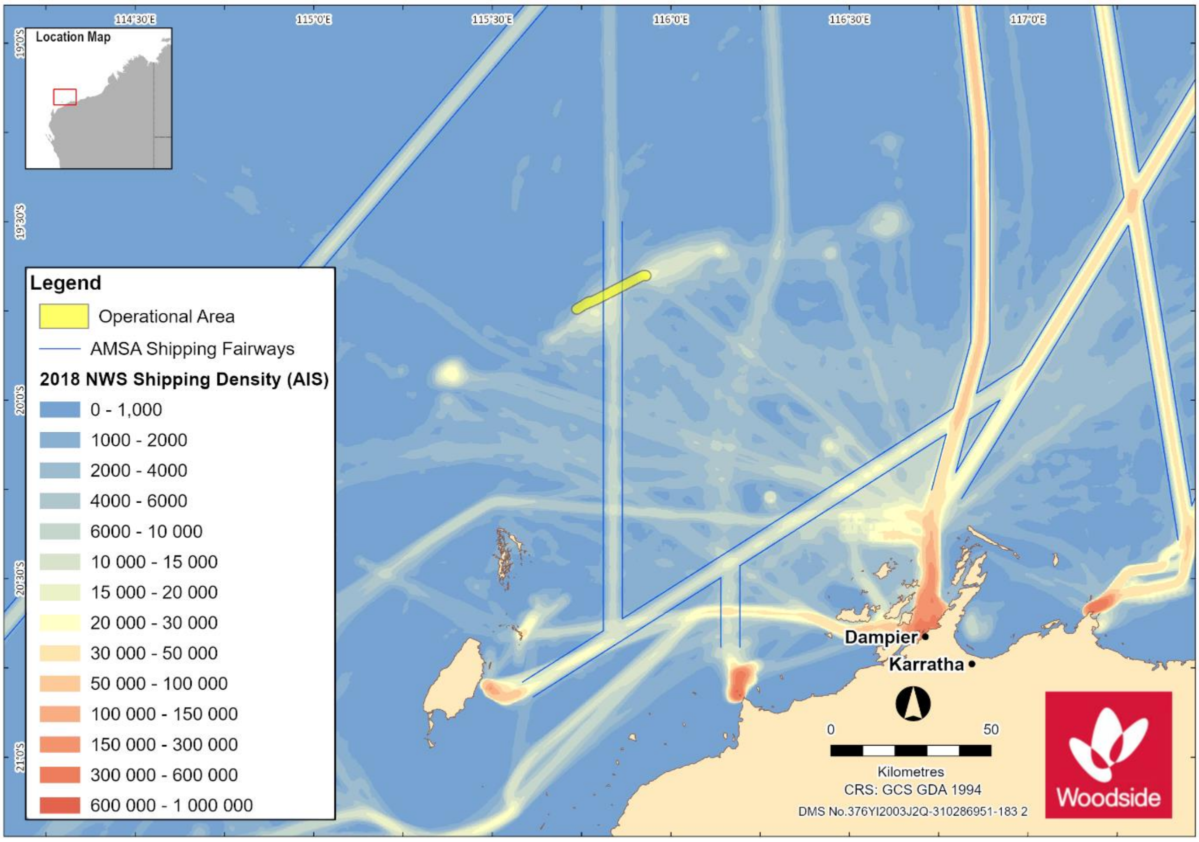
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 2 November 2021.

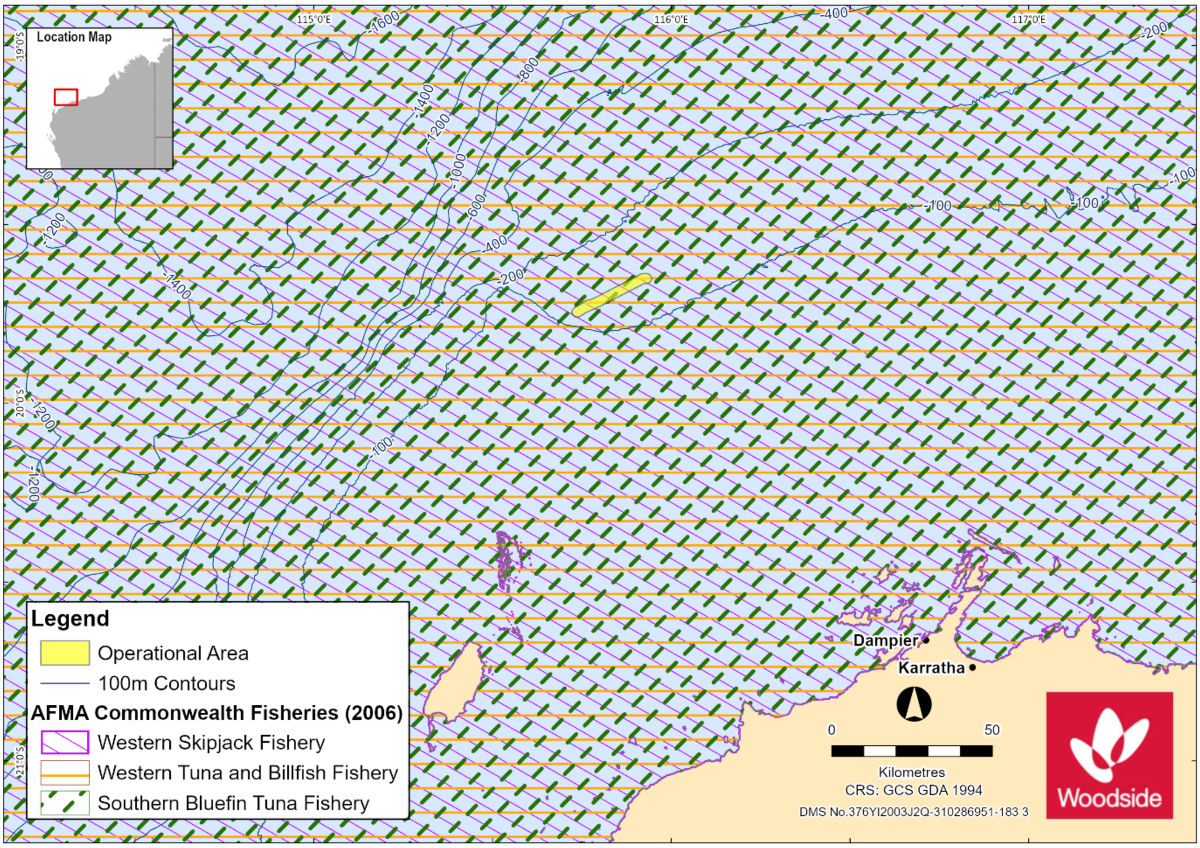
Best regards,

Corporate Affairs Adviser | Corporate Affairs Karratha

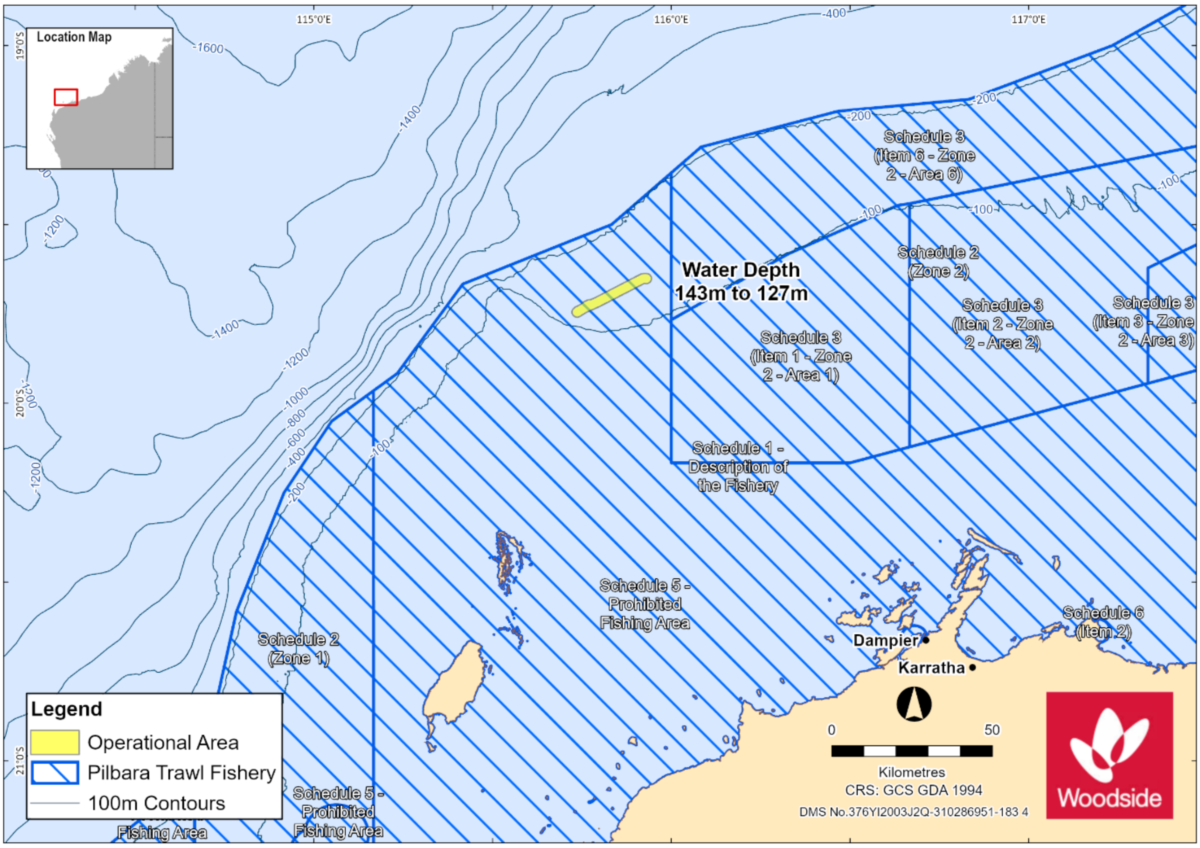
1.28 Shipping maps sent to Australian Maritime Safety Authority, Australian Hydrographic Service (4 October 2021)

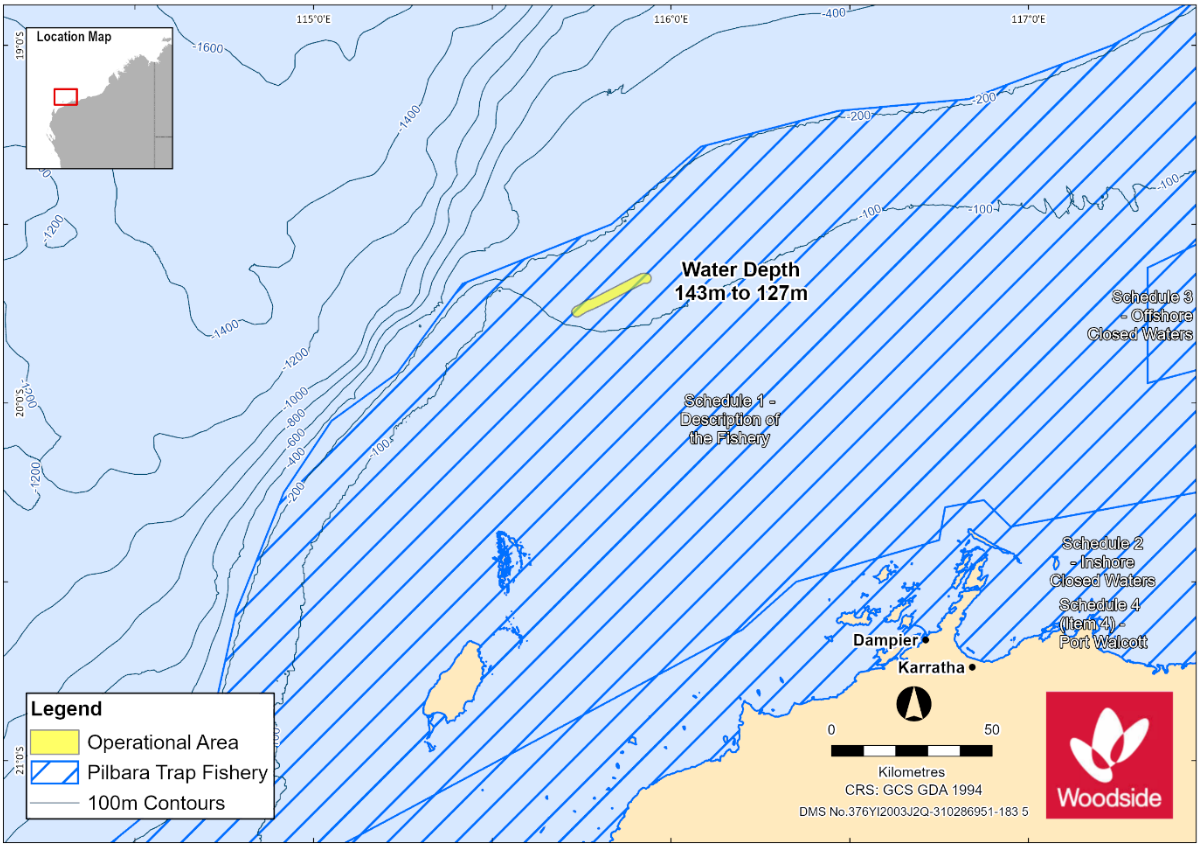


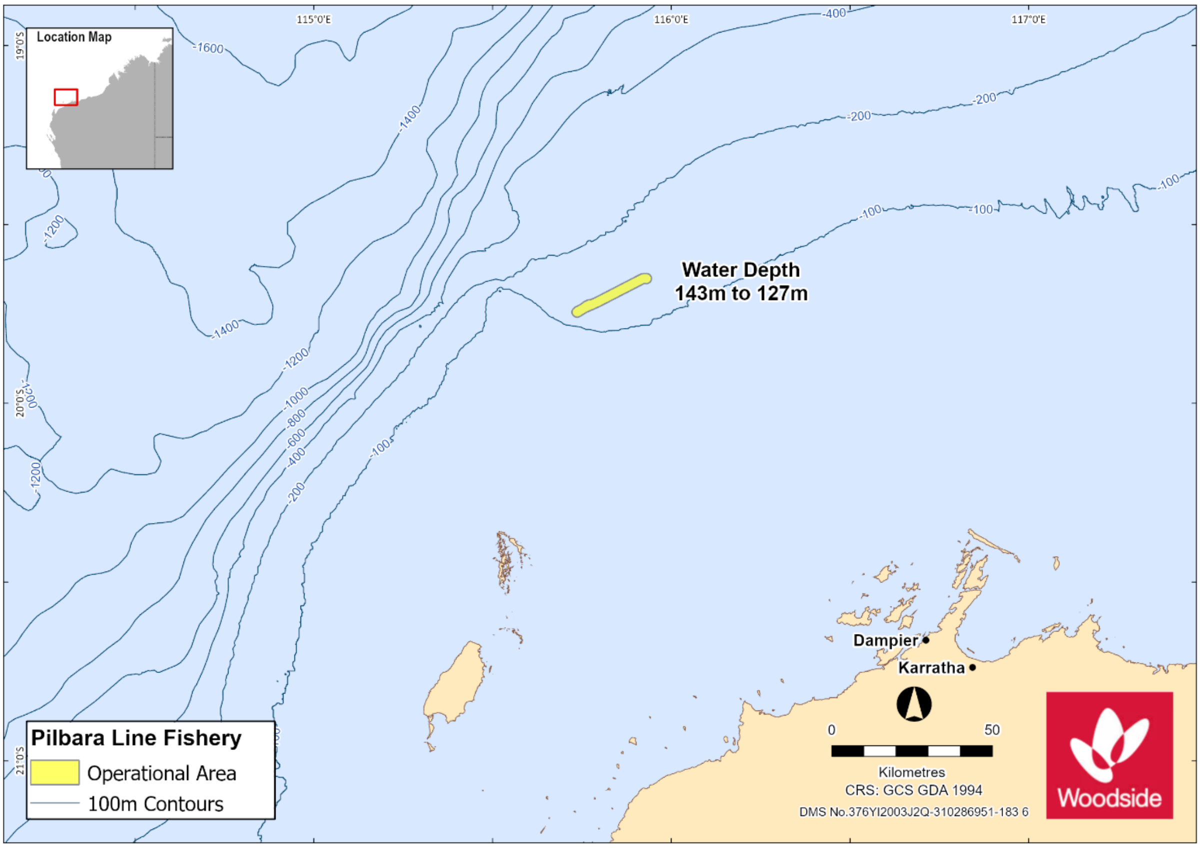
1.29 Commonwealth Fisheries maps sent to Australian Fisheries Management Association, Australian Southern Bluefin Industry Association, Tuna Australia, Department of Agriculture, Water and the Environment (4 October 2021)


Location Map
115°0'E
116°0'E
117°0'E
19°0'S
20°0'S
21°0'S
-1600
-400
-200
-800
-1400
-1200
-1000
-600
-400
-200
-100
-100
-100
-100
-1200
-1400
-1200
-1200
-100
Dampier
Karratha
Legend
Operational Area
100m Contours
AFMA Commonwealth Fisheries (2006)
Western Skipjack Fishery
Western Tuna and Billfish Fishery
Southern Bluefin Tuna Fishery
0
50
Kilometres
CRS: GCS GDA 1994
DMS No.376YI2003J2Q-310286951-183 3
Woodside

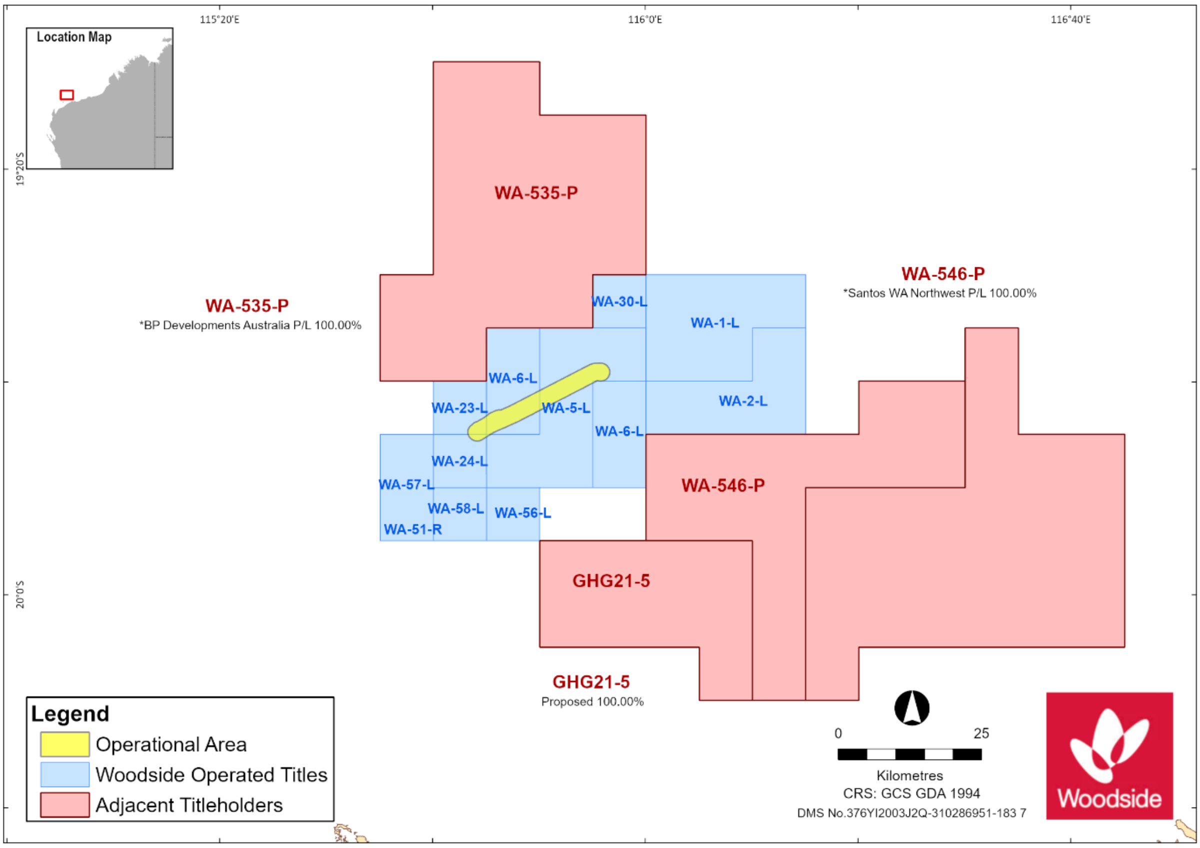
1.30 State fisheries maps sent to WAFIC, DPIRD, Pilbara Line and Pilbara Trap Fisheries Licence holders (4 October 2021)







1.31 Neighbouring title holders map sent to Santos and BP (4 October 2021)



APPENDIX G. DEPARTMENT OF ABORIGINAL AFFAIRS HERITAGE SEARCH RESULTS

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

2 Registered Aboriginal Sites in Shapefile - EMBA

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at AboriginalHeritage@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.

Status:

- **Registered Site**: The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972.*
- **Other Heritage Place which includes:**
  - **Stored Data / Not a Site:** The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972.*
  - **Lodged:** Information has been received in relation to the place, but an assessment has not been completed at this *stage* to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972.*

Access and Restrictions:

- **File Restricted = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- **File Restricted = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact AboriginalHeritage@dplh.wa.gov.au.
- **Boundary Restricted = No:** Place location is shown as accurately as the information lodged with the Registrar allows.
- **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- **Restrictions:**
  - **No Restrictions:** *Anyone* can view the information.
  - **Male Access Only:** Only *males* can view restricted information.
  - **Female Access Only:** *Only* females can view restricted information.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

Basemap Copyright

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

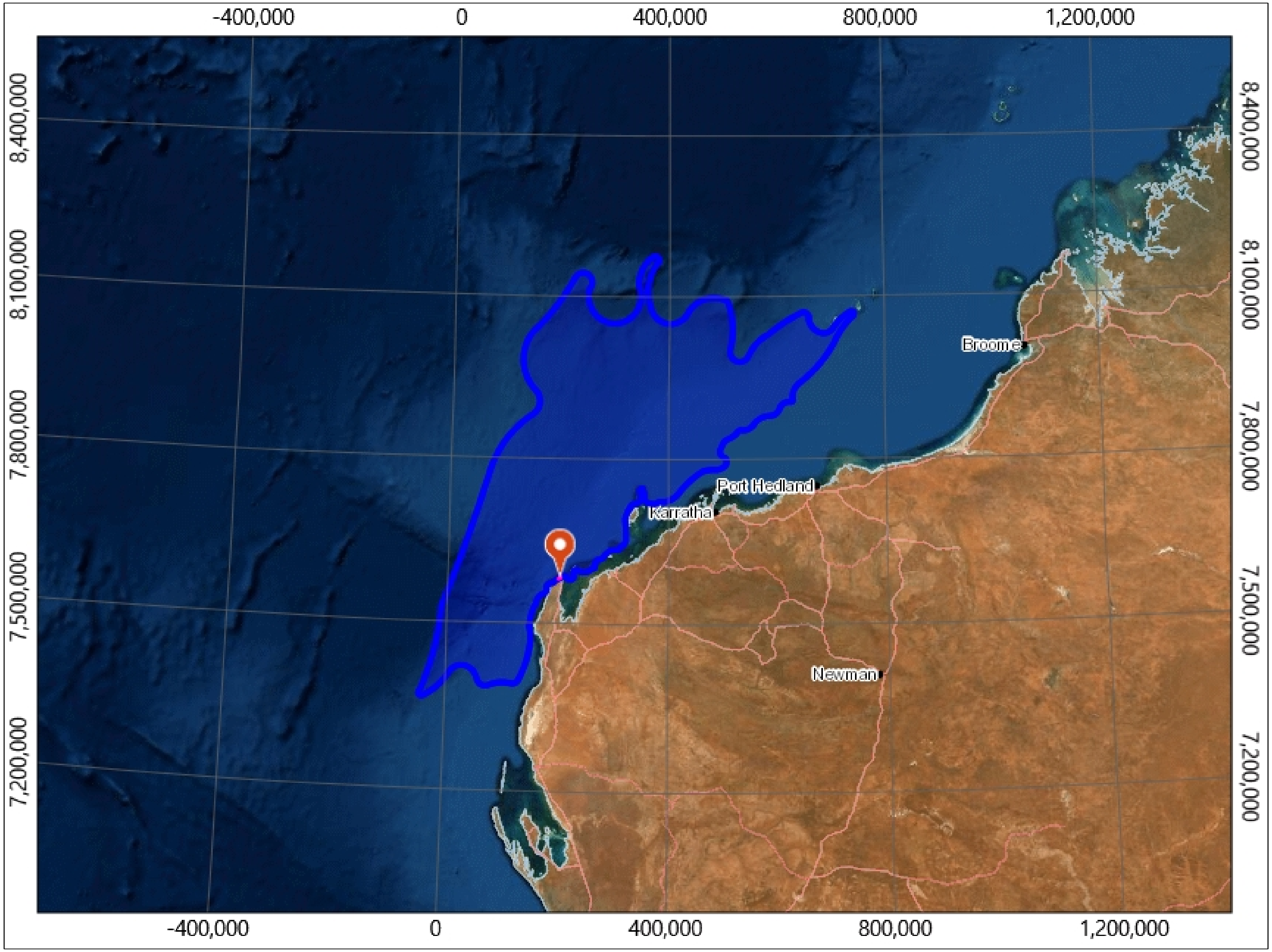
ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
10381	VLAMING HEAD	Yes	Yes	No Gender Restrictions	Registered Site	Ceremonial, Mythological	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	P01799
11401	5 Mile Well (Cape Range)	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Engraving, Painting, Quarry, Arch Deposit	*Registered Knowledge Holder names available from DAA	198638mE 7583655mN Zone 50 [Unreliable]	P00751

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites



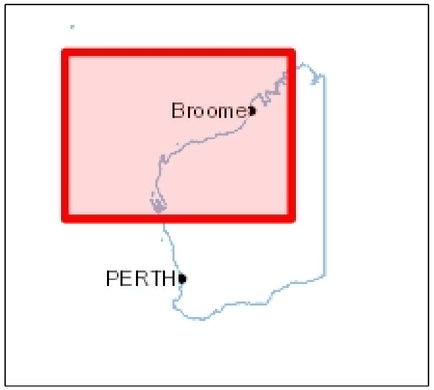
Legend

🟪	Registered Aboriginal Site
🟦	Search Area
●	Town
—	Road
—	River
☐	Local Government Authority

372.92 kilometres

Map Scale 1 : 11,300,000

MGA Zone 50 (GDA94)



Map created: 19/10/2021 2:59:37 PM by: GIS_NET_USER

Identifier: 571859

APPENDIX H. ECHO YODEL SUBSEA DECOMMISSIONING OIL POLLUTION FIRST STRIKE PLAN

Oil Spill Preparedness and Response Mitigation Assessment for the Echo Yodel Subsea Decommissioning Oil Pollution First Strike Plan

Security & Emergency Management
Hydrocarbon Spill Preparedness

December 2021
Revision 0

TABLE OF CONTENTS

ECHO YODEL SUBSEA DECOMISSIONING OIL POLLUTION FIRST STRIKE PLAN

SPILL FROM FACILITY INCLUDING SUBSEA INFRASTRUCTURE

(Note: Pipe laying and accommodation vessels are considered a "FACILITY" under Australian Regs).

LEVEL 1
CONTROL AGENCY: WOODSIDE
INCIDENT CONTROLLER: Person In Charge (PIC) with support from Onshore Team Leader (OTL)

LEVEL 2 & 3
CONTROL AGENCY: WOODSIDE
INCIDENT CONTROLLER: Corporate Incident Coordination Centre (CICC) DUTY MANAGER

SPILL FROM FACILITY ENTERING STATE WATERS

(Note: Pipe laying and accommodation vessels are considered a "FACILITY" under Australian Regs).

LEVEL 1
CONTROL AGENCY: WOODSIDE
INCIDENT CONTROLLER: CICC DUTY MANAGER

LEVEL 2 & 3
CONTROL AGENCY: Department of Transport (DoT)
INCIDENT CONTROLLER: DoT Incident Controller (IC)

SPILL FROM VESSEL

(Note: SOPEP should be implemented in conjunction with this document)

LEVEL 1
CONTROL AGENCY: Australian Marine Safety Authority (AMSA)

INCIDENT CONTROLLER: VESSEL MASTER (with response assistance from Woodside)

LEVEL 2 & 3
CONTROL AGENCY: AMSA (Commonwealth waters)
DoT (State Waters)
INCIDENT CONTROLLER: AMSA (with response assistance from Woodside)

See **Table A** below for a guidance to incident characteristics of Levels 1 to 3.

Guidance to Oil Spill Incident Levels

The most significant characteristic of the below guidance should be considered when determining level or escalation potential.

Table A: Guidance to the characteristics of incident Levels 1 to 3

Characteristic	Level 1 Indicators	Level 2 Indicators	Level 3 Indicators
General Description	Generally able to be resolved within 24-48 hours.	Generally, a response is required beyond 48 hours.	Response may extend beyond weeks.
Woodside Emergency Management (EM)/Crisis Management Team (CMT) Activation	Onsite Incident Controller (IC), e.g. vessel master, activated. Use of ICC support may be required.	Handover of Control from Onsite IC to Corporate Incident Coordination Centre (CICC) Duty Manager (DM) in Perth.	Includes Perth based CMT activation.
Number of Agencies	First-response agency and Incident Management Team (IMT).	Multi-agency response.	Agencies from across government and industry.
Environment	Isolated impacts or with natural recovery expected within weeks.	Significant impacts and recovery may take months.	Significant area and recovery may take months to years. Remediation required.
Economy	Business level disruption (i.e. Woodside).	Business failure or 'Channel' impacts.	Disruption to a sector.
Public Affairs	Local and regional media coverage (WA).	National media coverage.	International media coverage.

For guidance on credible spill scenarios and hydrocarbon characteristics refer to APPENDIX A.

For Spills Entering State Waters

If a spill arising from a vessel impacts State waters/shorelines, then the Western Australia Department of Transport (DoT), as Hazard Management Agency (HMA), will become the Control Agency for the response in State waters/shorelines only. In the event DoT become the Control Agency, they will appoint an Incident Controller (IC) and form a separate Incident Management Team to manage the response.

Whilst not applicable for this activity, i.e. a spill arising from a vessel, if assistance is requested by DoT, the coordination structure for Woodside to interface with DoT is shown in APPENDIX E – Coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State Waters/shorelines.

Initially Woodside would be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (see APPENDIX G). DoT's role as the Controlling Agency/HMA for spills arising from a vessel impacting State waters/shorelines does not negate the requirement for Woodside to have appropriate plans and resources in place to adequately respond to a Marine Hydrocarbon Spill incident in State waters/shorelines or to commence the initial response actions to a spill prior to DoT establishing incident control in line with DoT Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020):

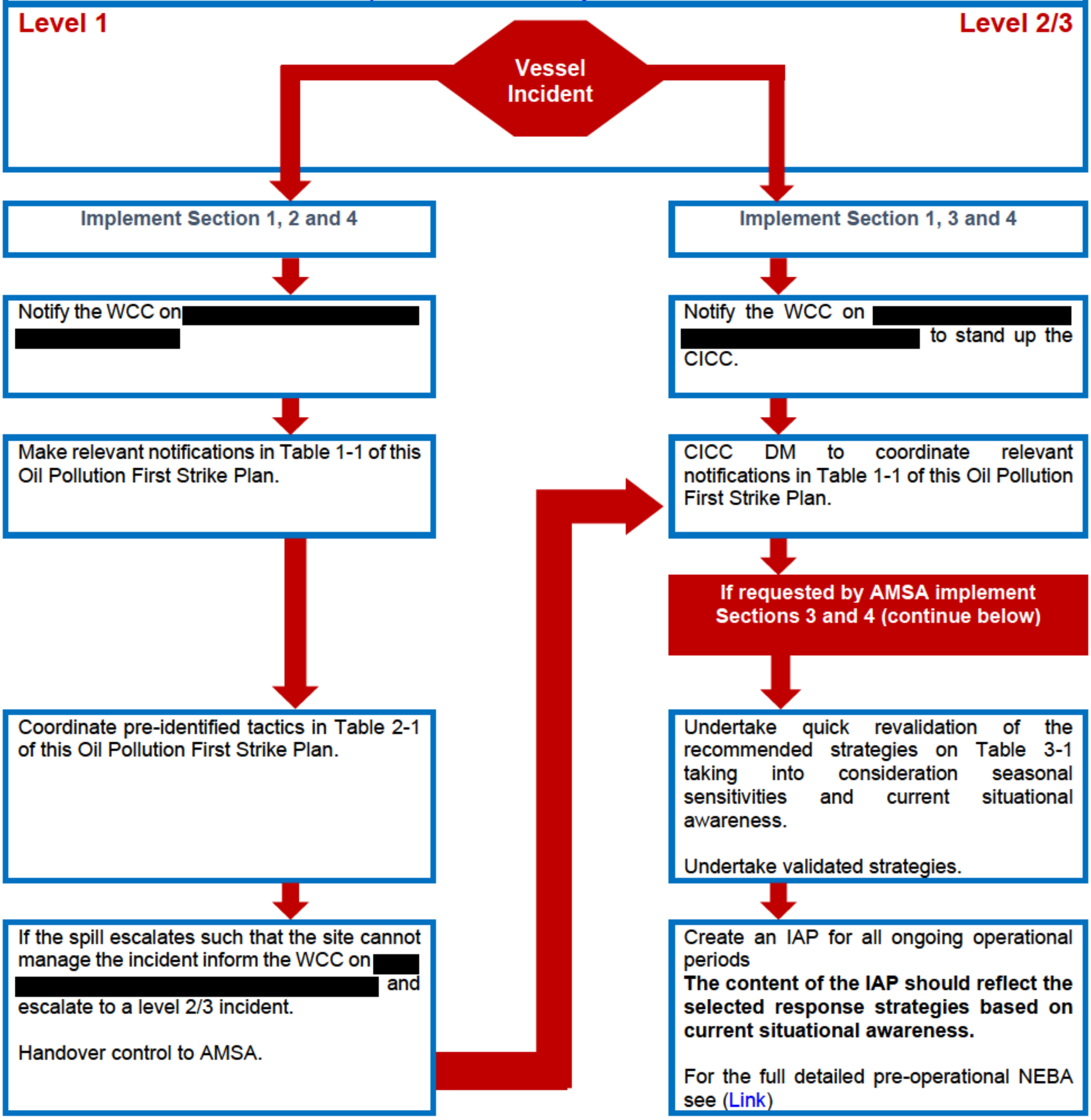
https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Woodside's Incident Management Structure for a Hydrocarbon Spill, including Woodside Liaison Officer's command structure within DoT can be seen at APPENDIX F.

Response Process Overview

Use the below to determine which parts of this plan are relevant to the incident.

For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A – Credible spill scenarios and hydrocarbon information



Level 1

Level 2/3

Vessel Incident

Level 1:

Implement Section 1, 2 and 4

Notify the WCC on [redacted]

Make relevant notifications in Table 1-1 of this Oil Pollution First Strike Plan.

Coordinate pre-identified tactics in Table 2-1 of this Oil Pollution First Strike Plan.

If the spill escalates such that the site cannot manage the incident inform the WCC on [redacted] and escalate to a level 2/3 incident.

Handover control to AMSA.

Level 2/3:

Implement Section 1, 3 and 4

Notify the WCC on [redacted] to stand up the CICC.

CICC DM to coordinate relevant notifications in Table 1-1 of this Oil Pollution First Strike Plan.

If requested by AMSA implement Sections 3 and 4 (continue below)

Undertake quick revalidation of the recommended strategies on Table 3-1 taking into consideration seasonal sensitivities and current situational awareness.

Undertake validated strategies.

Create an IAP for all ongoing operational periods
The content of the IAP should reflect the selected response strategies based on current situational awareness.

For the full detailed pre-operational NEBA see (Link)

1. NOTIFICATIONS (ALL LEVELS)

The Incident Controller or delegate must ensure the below notifications (**Table 1-1**) are completed within the designated timeframes.

For other environmental notifications required refer to the Echo Yodel Subsea Decommissioning Environmental Plan.

Table 1-1: Immediate Notifications

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
Notifications to be made for ALL LEVELS of spill ***(For spills from a vessel the following notifications must be undertaken by a Woodside (WEL) representative).***							
In the event of an incident between campaign vessels, activate relevant vessel Emergency Response Plans and/or Bridging Documents							
In the event of an incident impacting Goodwyn Alpha (GWA) live well infrastructure, also activate GWA Oil Pollution First Strike Plan							
Immediately	Vessel Master	Woodside Communication Centre (WCC)	Duty Manager	[redacted]92	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	
Within 2 hours	Woodside Site Rep (WSR)	National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA[1])	Incident notification office	[redacted]	Verbally notify NOPSEMA for spills >80L. Record notification using Initial Verbal Notification Form or equivalent and send to NOPSEMA as soon as practicable (cc to NOPTA and DMIRS).	App B Form 1	
Within 3 days	WSR				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS) NOPSEMA: [redacted]	App B Form 2	

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[1] Notification to NOPSEMA must be from a Woodside Representative.

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					NOPTA: [redacted] DMIRS: [redacted]		
As soon as practicable	CICC DM or Delegate	Woodside	Environment Duty Manager	As per roster	Verbally notify Duty Environment of event and seek advice on relevant performance standards from EP	Verbal	
As soon as practicable if spill is likely to extend into WA State waters.	CICC DM or Delegate	WA Department of Transport	DoT Duty Manager	08 9480 9924	Marine Duty Manager to verbally notify DoT that a spill has occurred and, if required, request use of equipment stored in Karratha. Follow up with a written POLREP as soon as practicable following verbal notification. Additionally, DoT to be notified if spill is likely to extend into WA State waters. Request DoT to provide Liaison to WEL IMT.	App B Form 5	
As soon as practicable	CICC DM or Delegate	Department of Agriculture, Water and the Environment (Director of National Parks)	Marine Park Compliance Duty Officer	0419 293 465	The Marine Park Compliance Duty Officer is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. This notification should include: • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP • contact details for the response coordinator	Verbal	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					- confirmation of access to relevant monitoring and evaluation reports when available.		
Without delay as per protection of the Sea Act, part II, section 11(1)	Vessel Master	Australian Maritime Safety Authority (AMSA)	Response Coordination Centre (RCC)	[redacted]	Verbally notify AMSA RCC of the hydrocarbon spill. Follow up with a written Marine Pollution Report (POLREP) as soon as practicable following verbal notification.	App B Form 3	
ADDITIONAL LEVEL 2/3 NOTIFICATIONS							
As soon as practicable if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA Department of Biodiversity, Conservation and Attractions	CICC DM or Delegate	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Duty Officer	[redacted]	Phone call notification	Verbal	
As soon as practicable	CICC DM or Delegate	AMOSC	AMOSC Duty Manager	[redacted]	Notify AMOSC that a spill has occurred and follow-up with an email from the **IC/CICC DM, CMT Leader or Oil Spill Preparedness Manager** to formally activate AMOSC. Determine what resources are required consistent with the AMOS Plan and detail in a Service Contract that will be sent to Woodside from AMOSC upon activation.	App B Form 4	
As soon as practicable	CICC DM or Delegate	Oil Spill Response Limited (OSRL)	OSRL Duty Manager	[redacted]	Contact OSRL duty manager and request assistance from technical advisor in Perth.	Notification: App B Form 6a	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					Send the completed notification form to OSRL as soon as practicable. For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable. The mobilisation form requires to be signed by a nominated callout authority from Woodside.	Mobilisation: App B Form 6b	
As soon as practicable if extra personnel are required for incident support	CICC DM or Delegate	Marine Spill Response Corporation (MSRC)	MSRC Response Manager	[redacted]	Activate the contract with MSRC (in full) for the provision of up to 30 personnel depending on what skills are required. Please note that provision of these personnel from MSRC are on a best endeavours basis and are not guaranteed.	Verbal	

2. LEVEL 1 RESPONSE

2.1 Mobilisation of response techniques

For the relevant hydrocarbon type, undertake quick revalidation of the recommended techniques and pre-identified tactics indicated with a 'Yes' in **Table 2-1**. Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under **Table 2-1** Operational Plan column.

All response techniques and pre-identified tactics have been identified from the pre-operational Net Environmental Benefits Analysis (NEBA) presented in the Echo Yodel Subsea Decommissioning EP Appendix D.

Table 2-1: Level 1 Response Summary

Response Techniques	Hydrocarbon Type	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil (MDO)					
Monitor and evaluate – tracking buoy (OM02)	Yes	If a vessel is on location, consider the need to deploy the oil spill Tracking buoy. If no vessel is on location, consider the need to mobilise oil spill tracking buoys from the KBSB Stockpile.	Operations	**DAY 1:** Tracking buoy deployed within two hours.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan.
Please consider instructing the CICC DM to activate or implement any of the following Pre-Identified tactics. The following tactics will assist in answering the '7 Questions of Spill Assessment' identified in Appendix C to increase situational awareness.						
Monitor and evaluate – predictive modelling (OM01)	Yes	Undertake initial modelling using the Rapid assessment oil spill tool and weathering fate analysis using ADIOS (or refer to the hydrocarbon information in APPENDIX A – Credible spill scenarios and hydrocarbon information	Intelligence or Environment	**DAY 1:** Initial modelling within six hours using the Rapid Assessment Tool.		Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan. *Planning to download immediately and follow steps*
	Yes	Send Oil Spill Trajectory Modelling (OSTM) form (APPENDIX B – Forms 7) to RPS Response team ([redacted]) and call RPS Response Duty Officer Phone [redacted]	Intelligence	**DAY 1:** Detailed modelling within four hours of RPS Response receiving information from Woodside.		
Monitor and evaluate – aerial surveillance (OM02)	Yes	Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in (APPENDIX B – Forms 8)	Logistics - Aviation	**DAY 1:** Two trained aerial observers. One aircraft available.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
Monitor and evaluate – satellite tracking (OM02)	Yes	The Intelligence duty manager should be instructed to stand up KSAT to provide satellite imagery of the spill. [redacted]	Intelligence	**DAY 1:** Service provider will confirm availability of an initial acquisition within two hours. Data received to be uploaded into		

Response Techniques	**Hydrocarbon Type** **Marine Diesel Oil (MDO)**	**Pre- Identified Tactics**	**Responsible**	**ALARP Commitment Summary**	**Complete ✓**	**Link to Operational Plans for notification numbers and actions**
	🟩			Woodside Common Operating Picture.		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**DAY 3:** Water quality assessments access and capability.		Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03 of The Operational Monitoring Operational Plan).
Monitor and evaluate – pre-emptive assessment of receptors at risk (OM04)	Potentially	Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two specialist for each of the Response Protection Areas (RPA) with predicted impacts.		Pre-emptive Assessment of Sensitive Receptors (OM04 of The Operational Monitoring Operational Plan).
Monitor and evaluate – shoreline assessment (OM05)	Potentially	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two specialists in SCAT for each of the RPAs with predicted impacts.		Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).

3. LEVEL 2/3 RESPONSE

3.1 Mobilisation of response techniques

For the relevant hydrocarbon type, undertake quick revalidation of the recommended techniques and pre-identified tactics indicated with a 'Yes' in **Table 3-1**. Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under **Table 3-1** Operational Plan column.

All response techniques and pre-identified tactics have been identified from the pre-operational Net Environmental Benefits Analysis (NEBA) presented in the Echo Yodel Subsea Decommissioning EP Appendix D.

Table 3-1: Level 2/3 Response Summary

Response Techniques	Hydrocarbon Type	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	MDO					
Please consider instructing the CICC DM to activate or implement any of the following Pre-Identified tactics. The following tactics will assist in answering the '7 Questions of Spill Assessment' identified in Appendix C to increase situational awareness.						
Monitor and evaluate – predictive modelling (OM01)	Yes	Undertake initial modelling using the Rapid assessment oil spill tool and weathering fate analysis using ADIOS (or refer to the hydrocarbon information in APPENDIX A – Credible spill scenarios and hydrocarbon information	Intelligence or Environment	**DAY 1:** Initial modelling within six hours using the Rapid Assessment Tool. Detailed modelling within four hours of RPS receiving information from Woodside.		Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan).
	Yes	Send Oil Spill Trajectory Modelling (OSTM) form (APPENDIX B – Forms 7) to RPS Response ([redacted]) and call RPS Response Duty Officer Phone [redacted]	Intelligence	**DAY 1:** Detailed modelling within 4 hours of RPS receiving information from Woodside.		
Monitor and evaluate – tracking buoy (OM02)	Yes	Confirm whether the vessel on location has deployed a tracking buoy.	Operations	**DAY 1:** Tracking buoy deployed within two hours.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan Deploy tracking buoy in accordance with APPENDIX D – Tracking buoy deployment instructions.
Monitor and evaluate – aerial surveillance (OM02)	Yes	Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in (APPENDIX B – Forms 8)	Logistics - Aviation	**DAY 1:** Two trained aerial observers. One aircraft available.		

Response Techniques	Hydrocarbon Type	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	MDO					
Monitor and evaluate – satellite tracking (OM02)	Yes	The Intelligence duty manager should be instructed to stand up Kongsberg Satellite Services (KSAT) to provide satellite imagery of the spill (email [redacted])	Intelligence	**DAY 1:** Service provider will confirm availability of an initial acquisition within two hours. Data received to be uploaded into Woodside Common Operating Picture.		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**DAY 3:** Water quality assessment access and capability Daily fluorometry reports will be provided to IMT.		Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03 of The Operational Monitoring Operational Plan).
Monitor and evaluate – pre-emptive assessment of receptors at risk (OM04)	Potentially	Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	**10 days prior to any predicted impacts:** In agreement with WA DoT, deployment of two specialists for each of the Response Protection Areas (RPA) with predicted impacts.		Pre-emptive Assessment of Sensitive Receptors (OM04 of The Operational Monitoring Operational Plan).
Monitor and evaluate – shoreline assessment (OM05)	Potentially	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	**10 days prior to any predicted impacts:** In agreement with WA DoT, deployment of two specialists in SCAT		Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).

Response Techniques	**Hydrocarbon Type** **MDO**	**Pre- Identified Tactics**	**Responsible**	**ALARP Commitment Summary**	**Complete ✓**	**Link to Operational Plans for notification numbers and actions**
				for each of the RPAs with predicted impacts.		
Surface Dispersant	No	This response strategy is not recommended.				
Mechanical Dispersion	No	This response strategy is not recommended.				
Containment and Recovery	No	This response strategy is not recommended.				
In-situ Burning	No	This response strategy is not recommended.				
Shoreline Protection and Deflection	Potentially	Equipment from Woodside, AMOSC and AMSA Western Australian Stockpiles mobilised. Consideration of mobilisation of interstate/international shoreline protection equipment (e.g. OSRL).	Logistics and Planning	**5 days prior to any predicted impacts:** In liaison with WA DoT activate relevant Tactical Response Plans 5 days prior to a predicted impact. In liaison with WA DoT, mobilise teams to RPAs 5 days prior to predicted impact. Equipment mobilised from closest stockpile. Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles.		Protection and Deflection Operational Plan *Logistics to download immediately and follow steps*

Response Techniques	Hydrocarbon Type	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	MDO					
Shoreline Clean Up	No	No shoreline impact at threshold.				
Oiled Wildlife Response	Yes	If oiled wildlife is a potential impact, request AMOSC to mobilise containerised oiled wildlife first strike kits and relevant personnel. Refer to relevant Tactical Response Plan for potential wildlife at risk. Mobilise AMOSC Oiled Wildlife Containers. Consider whether additional equipment is required from local suppliers.	Logistics and Planning	**DAY 5:** Contracted capability to treat up to an additional 250 individual fauna within a five-day period. Facilities for oiled wildlife rehabilitation are operational 24/7		Oiled Wildlife Response Operational Plan and relevant Tactical Response Plans
Scientific Monitoring (Type II)	Yes	Notify Woodside science team of spill event.	Environment			Oil Spill Scientific Monitoring Programme – Operational Plan

4. PRIORITY RECEPTORS

Note: DoT are the Control Agency to respond to all the sites listed below in a spill into State waters/shorelines.

Action: Provide DoT with all relevant Tactical Response Plans for these locations.

Based on hydrocarbon spill risk modelling results there are no identified Response Protection Areas (RPAs) impacted at response thresholds (100 g/m^2). Consideration should be given to other stakeholders in the vicinity of the operational location. **Table 4-3** indicates the assets within the vicinity of the Echo Yodel subsea infrastructure. Please note that impact thresholds (10 g/m^2 surface hydrocarbon concentration, 100 g/m^2 shoreline accumulation, and 100 ppb entrained hydrocarbon concentration) are used to determine the Environment that May be Affected (EMBA) identified in the Environment Plan and are lower than response thresholds (**Table 4-1**).

Table 4-1: Response Thresholds

Surface Hydrocarbon (g/m^2)	Description
>10	Predicted minimum threshold for commencing operational monitoring [2]
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [3]
100	Predicted optimum floating oil threshold for containment and recovery and surface dispersant application
100	Predicted minimum shoreline accumulation threshold for shoreline assessment operations
250	Predicted minimum threshold for commencing shoreline clean-up operations

Table 4-2: Receptors for Priority Protection with Potential Impact within 48 Hours

Receptor	Distance and Direction from Operational Area (km)	Minimum time to shoreline contact (above 100g/m^2) in days	Maximum shoreline accumulation (above 100g/m^2) in m^3	Tactical Response Plans (also available within the Data Directory)
N/A – No contact at or above impact threshold levels within 48 hours				

Hydrocarbon spill modelling results indicate the sensitive receptors listed below may have the potential to be contacted by hydrocarbons beyond 48 hours of a spill although these are predicted to be below feasible response thresholds:

- Ningaloo Coast North (incl. WHA) – 17.7 days at 11 g/m^2
- Pilbara Islands - Southern Island Group – 24.6 days at 13 g/m^2

Tactical Response plans for these locations can be accessed via the Oil Spill Portal - Tactical Response Plans [4].

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[2] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and/or control of the incident passes to WA DoT or AMSA.

[3] At 50g/m^2 containment and recovery and surface dispersant applica ion operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and displaying the spread of surface oil.

[4] The Tactical Response Plans contain the details of potential forward operating bases and staging areas.

Oil Spill Trajectory Modelling specific to the spill event will be required to determine the regional sensitive receptors to be contacted beyond 48 hours of a spill.

Table 4-3: Assets in the vicinity of the Echo Yodel Decommissioning operational area.

Asset	Approximate Distance and Direction from the Operational Area (km)	Operator
Goodwyn Alpha	0.1 km	Woodside
Wheatstone	40 km	Chevron
Pluto	46 km	Woodside
North Rankin Complex (NRC)	22 km	Woodside
Okha	54 km	Woodside
Angel	72 km	Woodside

Incident Command Centre: For Level 1 incidents the in-field team and asset operator will lead the response on-scene. For level 2/3 Incident the Incident Command Centre will be located in Perth at Woodside's Building. The Woodside CICC is fully equipped with communications equipment and technology to ensure the coordination of response activities for the overall response.

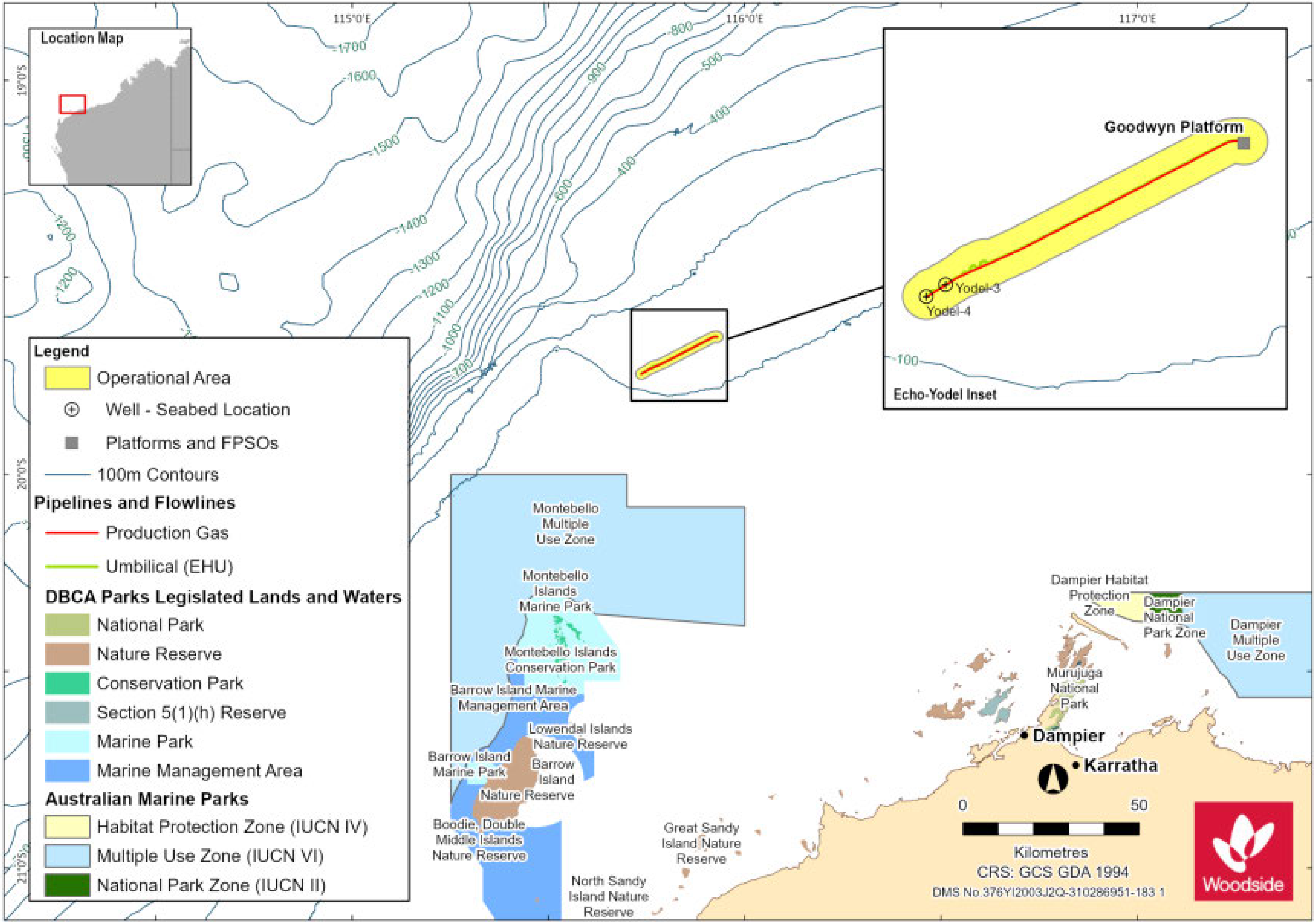


Figure 4-1: Operational Area and regional sensitive receptors

5. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in the Echo Yodel Subsea Decommissioning Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

For more detailed hydrocarbon information see the

Hydrocarbon Data Directory

Credible Spill Scenarios

Scenario	Product	Maximum Volumes	Suggested ADIOS2 Analogue*
CS-01 (WCCS) A short-term (instantaneous) surface release of MDO representing loss of vessel fuel integrity after a collision	MDO (API 37.2°)	1000 m^3 5% residual component of 50 m^3	Diesel Fuel Oil (Southern USA 1) API of 37.2
CS-02 Loss of containment caused by refuelling hose failure, coupling failure or operator error	MDO (API 37.2°)	8 m^3 5% residual component of 0.4 m^3	Diesel Fuel Oil (Southern USA 1) API of 37.2

*Initial screening of possible ADIOS2 analogues was done by considering hydrocarbons with similar APIs. Suggested selection was based on the closest distillation cut to WEL hydrocarbon. Only hydrocarbons with distillation cuts that showed results for > 380°C were included in selection process

.

MDO

MDO (API 37.2°) is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components.

In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent. The aromatic content of the oil is approximately 3%.

If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending upon the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of the oil have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction. It is predicted that 5% of product would remain after weathering from the representative marine diesel scenario.

Under the variable-wind case, where the winds are of greater strength, entrainment of marine diesel into the water column is indicated to be significant. Approximately 24 hours after the spill, around 72% of the oil mass is forecast to have entrained and a further 24% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (> ~6 m/s) (refer to **Figure A-0-1**).

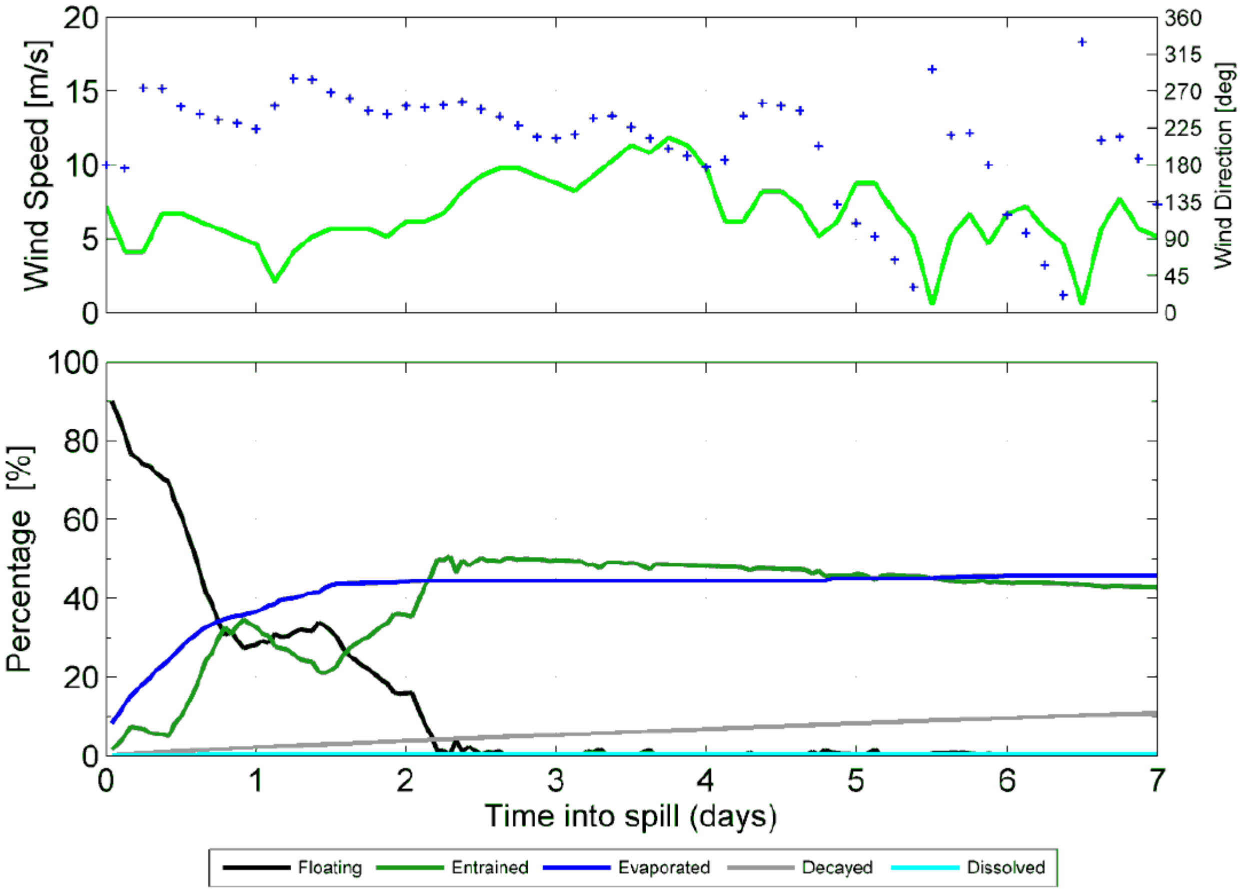


Figure A-0-1: Proportional mass balance plot representing the weathering of MDO spilled onto the water surface as a one-off release (50 m^3 over one hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature

Source: Data available from the APASA oil database (Diesel Fuel Oil (Southern USA 1997)). NOTE: This information is provided as guidance only. Spill event OSTM should be sought.

APPENDIX B – FORMS

Form No.	Form Name	Link
1	Record of Verbal Notification to Regulator Template	[redacted]
2	NOPSEMA Notification Template	[redacted]
3	Marine Pollution Report (POLREP – AMSA)	[redacted]
4	AMOSC Service Contract Note	[redacted]
5	Marine Pollution Report (POLREP – DoT)	[redacted]
6a	OSRL Initial Notification Form	[redacted]
6b	OSRL Mobilisation Activation Form	[redacted]
7	RPS Response Oil Spill Trajectory Modelling Request	[redacted]
8	Aerial Surveillance Observer Log	[redacted]

FORM 1

Record of initial verbal notification to NOPSEMA

(NOPSEMA ph: [redacted]

Date of call	
Time of call	
Call made by	
Call made to	

Information to be provided to NOPSEMA:

Date and Time of incident/time caller became aware of incident	
Details of incident	1. **Location** ____________________ 2. **Title**____________________ 3. **Hydrocarbon source** ☐ **Platform**____________________ ☐ **Pipeline** ____________________ ☐ **FPSO** ____________________ ☐ **Exploration drilling** ____________________ ☐ **Well** ____________________ ☐ **Other (please specify)** ____________________ 4. **Hydrocarbon type** ____________________ 5. **Estimated volume of hydrocarbon** ____________________ 6. **Has the discharge ceased?** ____________________ 7. **Fire, explosion or collision?** ____________________ 8. **Environment Plan(s)** ____________________ 9. **Other Details** ____________________
Actions taken to avoid or mitigate	

environmental impacts	
Corrective actions taken or proposed to stop, control or remedy the incident	

After the initial call is made to NOPSEMA, please send this record as soon as practicable to:

1. **NOPSEMA** [redacted]
2. **NOPTA** [redacted]
3. **DMIRS** [redacted]

FORM 2

[insert NOPSEMA Incident Report Form when printing]

[redacted]

FORM 3

[insert Marine Pollution Report (POLREP – AMSA) when printing]

[redacted]

FORM 4

[insert AMOSC Service Contract note when printing]

[redacted]

FORM 5

[insert Marine Pollution Report (POLREP – DoT) when printing]

[redacted]

FORM 6a

[insert OSRL Initial Notification Form when printing]

[redacted]

FORM 6b

[insert OSRL Mobilisation Activation Form when printing]

[redacted]

FORM 7

[insert RPS Response Oil Spill Trajectory Modelling Request form when printing]

[redacted]

FORM 8

[insert Aerial Surveillance Observer Log when printing]

[redacted]

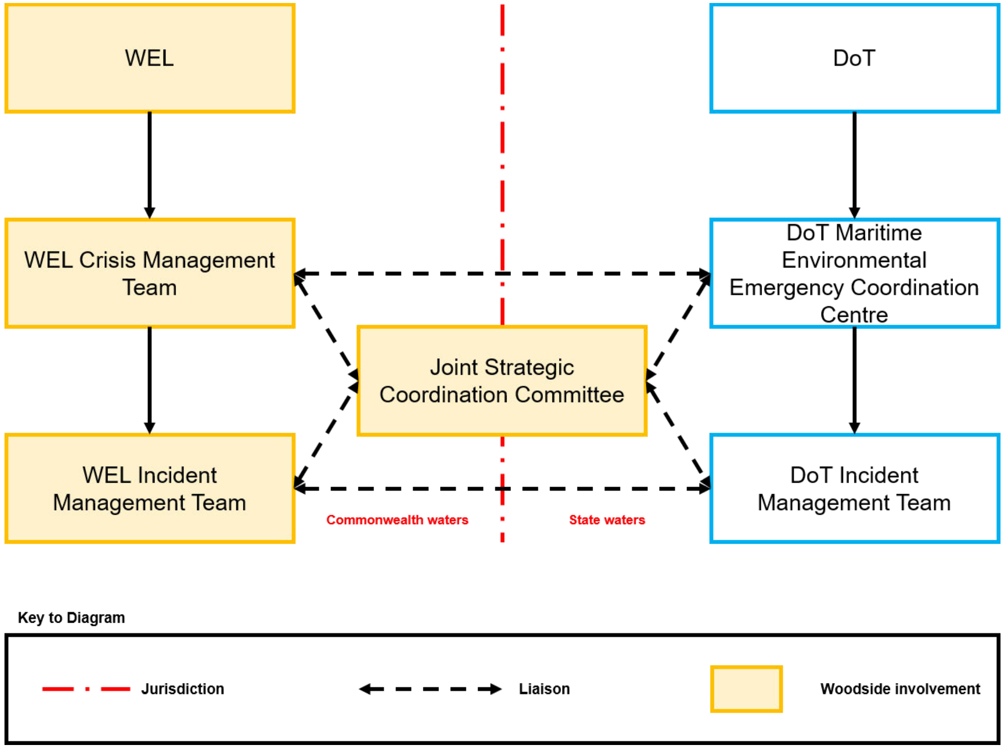
APPENDIX C – 7 QUESTIONS OF SPILL ASSESSMENT

WHAT IS IT? **Oil Type/name** **Oil properties** **Specific gravity/ viscosity/ pour point/ asphaltenes/ wax content/ boiling point**	
WHERE IS IT? Lat/Long Distance and bearing	
HOW BIG IS IT? Area Volume	
WHERE IT IS GOING? Weather conditions Currents and tides	
WHAT IS IN THE WAY? Resources at risk	
WHEN WILL IT GET THERE? Weather conditions Currents and tides	
WHAT'S HAPPENING TO IT? Weathering processes	

APPENDIX D – TRACKING BUOY DEPLOYMENT INSTRUCTIONS

(Insert [redacted] when printing)

APPENDIX E – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/SHORELINES[5]



The Control Agency for a Level 1 hydrocarbon spill in Commonwealth waters/shorelines resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder). The Control Agency for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident Controller and form a separate IMT to only manage the spill within State waters/shorelines.

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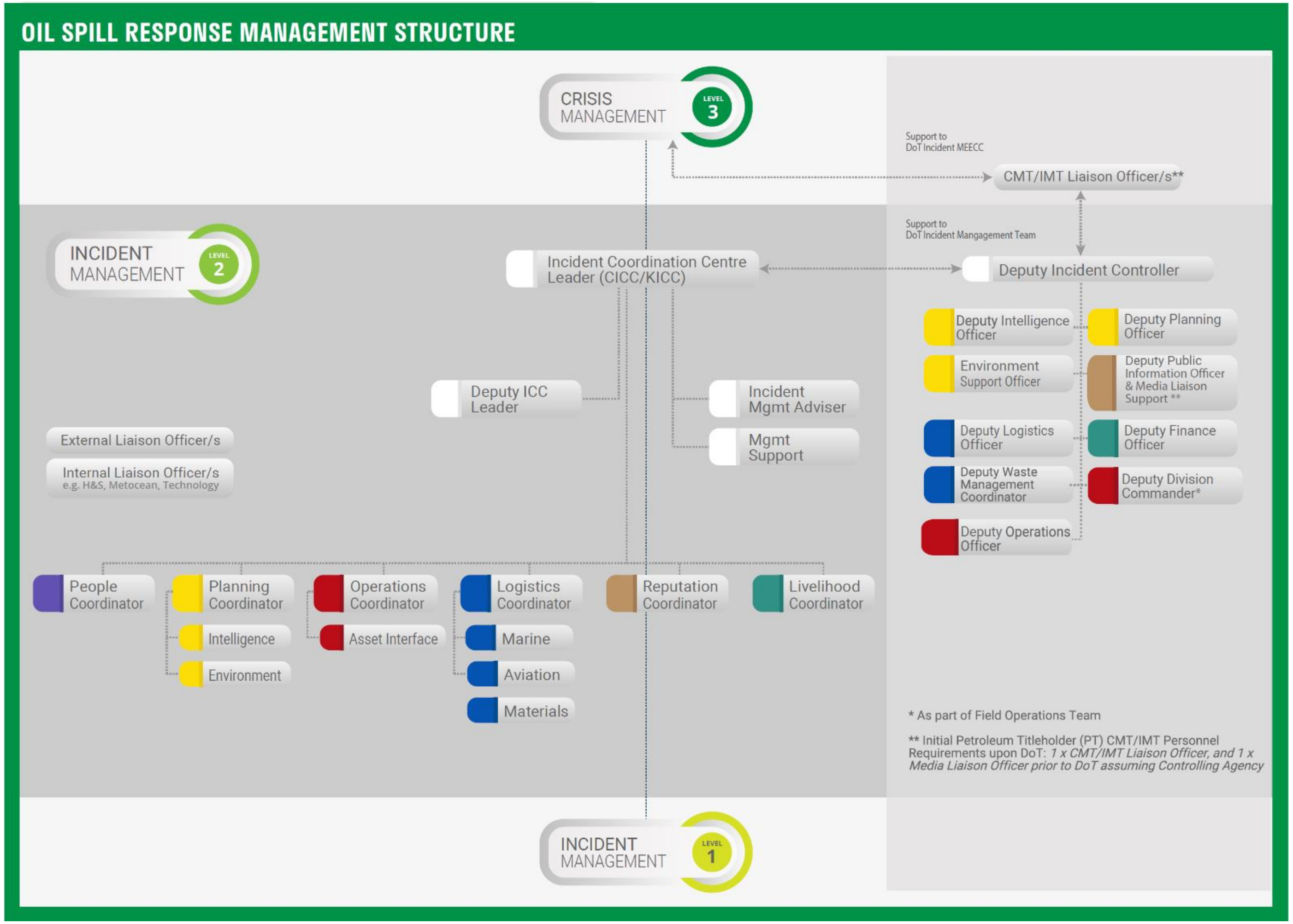
[5] Adapted from DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements July 2020. Note: For full structure up to Commonwealth Cabinet/Minister refer to Marine Oil Pollution: Response and Consultation Arrangements Section 6.5, Figure 3.

APPENDIX F – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside Incident Management Structure for Hydrocarbon Spill (including Woodside Liaison Officers Command Structure within DoT IMT if required).



* As part of Field Operations Team

** Initial Petroleum Titleholder (PT) CMT/IMT Personnel Requirements upon DoT: *1 x CMT/IMT Liaison Officer, and 1 x Media Liaison Officer prior to DoT assuming Controlling Agency*

APPENDIX G – WOODSIDE LIASON OFFICER RESOURCES TO DOT

Once DoT activates a State waters/shorelines IMT, Woodside will make available the following roles to DoT.

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
DoT MEECC	CMT Liaison Officer	CMT Leader Roster	• Provide a direct liaison between the CMT and the MEECC. • Facilitate effective communications and coordination between the CMT Leader and State Marine Pollution Coordinator (SMPC). • Offer advice to SMPC on matters pertaining to PT crisis management policies and procedures.	1
DoT IMT Incident Control	WEL Deputy Incident Controller	CICC Leader Reserve List Roster	• Provide a direct liaison between the PT IMT and DoT IMT. • Facilitate effective communications and coordination between the PT IC and the DoT IC. • Offer advice to the DoT IC on matters pertaining to PT incident response policies and procedures. • Offer advice to the Safety Coordinator on matters pertaining to PT safety policies and procedures, particularly as they relate to PT employees or contractors operating under the control of the DoT IMT.	1
DoT IMT Intelligence	Intelligence Support Officer/ Deputy Intelligence Officer	AMOSC Staff Member or AMOSC Core Group	• As part of the Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness. • Facilitate the provision of relevant modelling and predications from the PT IMT. • Assist in the interpretation of modelling and predictions originating from the PT IMT. • Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the PT IMT. • Facilitate the provision of relevant mapping from the PT IMT. • Assist in the interpretation of mapping originating from the PT IMT. • Facilitate the provision of relevant mapping originating from the DoT IMT to the PT IMT.	1
DoT IMT Intelligence – Environment	Environment Support Officer	CMT Environmental FST Duty Managers Roster	• As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process. • Assist in the interpretation of the PT OPEP and relevant TRP plans. • Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the PT IMT. • Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the PT IMT.	1
DoT IMT Planning-Plans/ Resources	Deputy Planning Officer	AMOSC Core Group/ CICC Planning Coordinator Reserve List and Planning Group 3	• As part of the Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans. • Facilitate the provision of relevant IAP and sub plans from the PT IMT. • Assist in the interpretation of the PT OPEP from the PT. • Assist in the interpretation of the PT IAP and sub plans from the PT IMT.	1

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[6] See [redacted]

Area	**WEL Liaison Role**	**Personnel Sourced from**[6]**:**	**Key Duties**	**#**
			• Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT. • Assist in the interpretation of the PT existing resource plans. • Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the PT IMT. **(Note this individual must have intimate knowledge of the relevant PT OPEP and planning processes)**	
DoT IMT Public Information-Media/ Community Engagement	Public Information Support and Media Liaison Officer/ Deputy Public Information Officer	Reputation (Media) FST Duty Manager Roster	• As part of the Public Information Team, provide a direct liaison between the PT Media team and DoT IMT Media team. • Facilitate effective communications and coordination between the PT and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information and Warnings team. • Offer advice to the DoT Media Coordinator on matters pertaining to PT media policies and procedures. • Facilitate effective communications and coordination between the PT and DoT Community Liaison teams. • Assist in the conduct of joint community briefings and events. • Offer advice to the DoT Community Liaison Coordinator on matters pertaining to the PT community liaison policies and procedures. • Facilitate the effective transfer of relevant information obtained from through the Contact Centre to the PT IMT.	1
DoT IMT Logistics	Deputy Logistic Officer	Services FST Logistics Team 2 Roster	• As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. • Facilitate the acquisition of appropriate supplies through the PTs existing OSRL, AMOSC and private contract arrangements. • Collects Request Forms from DoT to action via PT IMT. **(Note this individual must have intimate knowledge of the relevant PT logistics processes and contracts)**	1
DoT IMT Finance-Accounts/ Financial Monitoring	Deputy Finance Officer	CICC Finance Coordinator Roster	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through the PTs existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to the PT to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to the PT.	1
DoT IMT Operations	Deputy Operations Officer	CICC Operations Coordinator Roster	• As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident.	1

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
			• Facilitate effective communications and coordination between the PT Operations Section and the DoT Operations Section. • Offer advice to the DoT Operations Officer on matters pertaining to PT incident response procedures and requirements. • Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of PT and DoT response efforts.	
DoT IMT Operations – Waste Management	Facilities Support Officer/ Deputy Waste Management Coordinator	Services FST Logistics Team 2 and WEL Waste Contractor Roster	• As part of the Operations Team, assist the Waste Management Coordinator in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters. • Facilitate the disposal of waste through the PT's existing private contract arrangements related to waste management and in line with legislative and regulatory requirements. • Collects Request Forms from DoT to action via PT IMT.	1
DoT FOB Operations Command	Deputy On-Scene Commander/ Deputy Division Commander	AMOSC Core Group	• As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction. • Provide a direct liaison between the PT FOB and DoT FOB. • Facilitate effective communications and coordination between the PT Division Commander and the DoT Division Commander. • Offer advice to the DoT Division Commander on matters pertaining to PT incident response policies and procedures. • Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to PT employees or contractors. • Offer advice to the Safety Coordinator deployed in the FOB on matters pertaining to PT safety policies and procedures.	1
			Total Woodside personnel initially required in DoT IMT	11

DoT Liaison Officer Resources to Woodside

Once DoT activates a State waters/shorelines IMT, DoT will make available the following roles to Woodside.

Area	DoT Liaison Role	Personnel Sourced from:	Key Duties	#
WEL CMT	DoT Liaison Officer (prior to DoT assuming Controlling Agency) / Deputy Incident Controller – State waters (after DoT assumes Controlling Agency)	DoT	• Facilitate effective communications between DoT's SMPC/ Incident Controller and the Petroleum Titleholder's appointed CMT Leader / Incident Controller. • Provide enhanced situational awareness to DoT of the incident and the potential impact on State waters. • Assist in the provision of support from DoT to the Petroleum Titleholder. • Facilitate the provision technical advice from DoT to the Petroleum Titleholder Incident Controller as required.	1
WEL Reputation FST (Media Room)/ Public Information – Media	DoT Media Liaison Officer	DoT	• Provide a direct liaison between the PT Media team and DoT IMT Media team. • Facilitate effective communications and coordination between the PT and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information & Warnings team. • Offer advice to the PT Media Coordinator on matters pertaining to DoT and wider Government media policies and procedures.	1
			Total DoT Personnel Initial Requirement to Woodside	2