Julimar Operations Environment Plan

Operations Division
Revision 6
February 2021

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1 INTRODUCTION

1.1 Overview

Woodside Energy Julimar Pty Ltd (Woodside), as Titleholder under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (referred to as the Environment Regulations), on behalf of the Joint Venture detailed in **Section 1.6**, is operator of the Julimar Field Production System.

Operation of the Julimar Field Production System (including routine testing of the wells and subsea infrastructure performed from the Wheatstone Platform, See **Section 1.8**) includes:

- Julimar and Brunello wells (up to 14 wells)
- Inspection, Monitoring, Maintenance and Repair (IMMR) during operations
- Start-up activities for Julimar Phase 2 (Julimar Development Phase 2)

These 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, Woodside has submitted a revision of the Julimar Operations EP to NOPSEMA at least 14 days before the end of the five-year period from the original acceptance under Regulation 11 of the Environment Regulations (i.e. 6 July 2016 – NOSPEMA Reference A488977).

1.2 Purpose of the Environment Plan

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

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

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

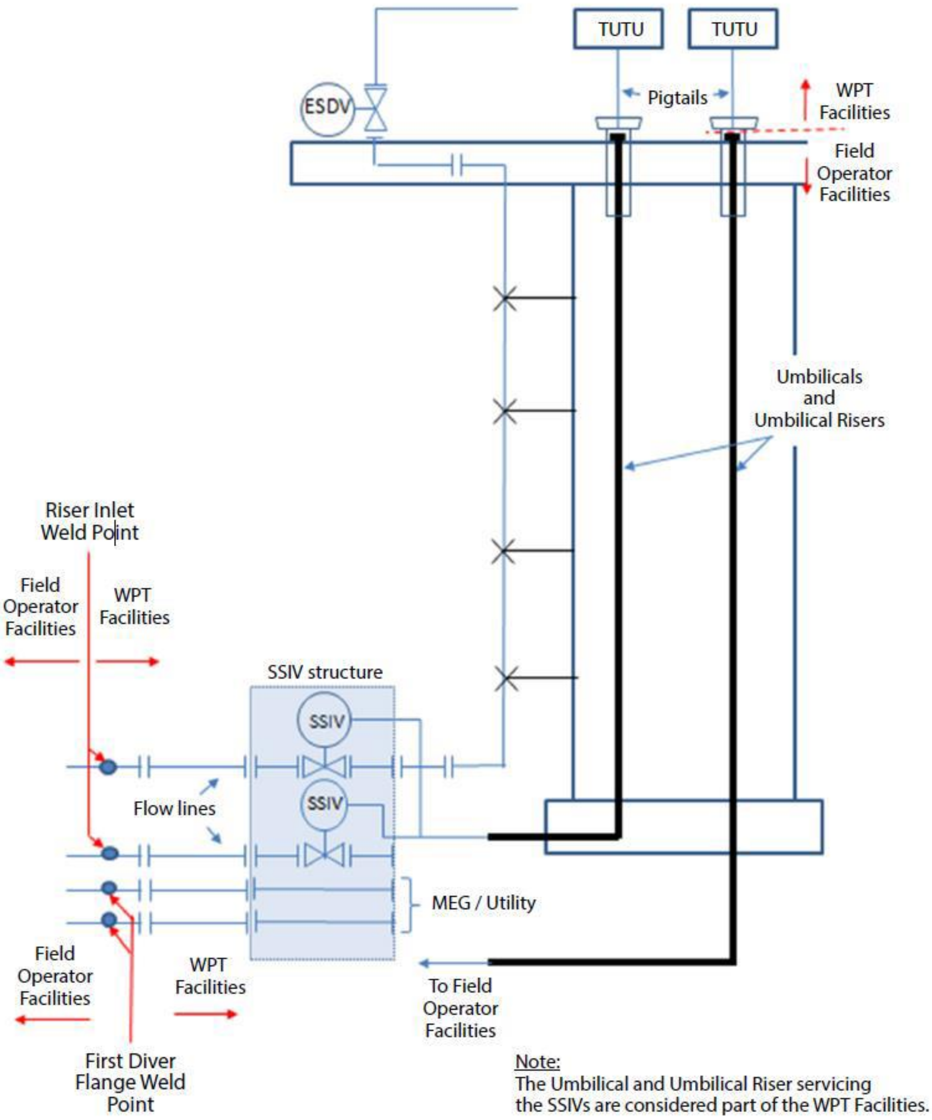
1.3 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3**, for a period of up to five years. The Operational Area, an area within 1500 m of the subsea infrastructure, defines the spatial boundary of the Petroleum Activities Program. This includes the start-up of Julimar Development Phase 2 (JDP2) wells and infrastructure and operations of the wells and subsea infrastructure up to the first weld upstream of the tie-in spool to the subsea isolation valve (SSIV) on the Julimar and Brunello flowlines (**Figure 1-1**).

Julimar-Brunello well fluids will be processed on the Chevron Australia Pty Ltd (Chevron) operated Wheatstone Platform (WA-3-IL); all activity, environmental impacts and risks downstream of the aforementioned flange on the SSIV (**Figure 1-1**) are excluded from the scope of this EP and are described in the *Start-Up and Operations Environment Plan: Wheatstone Project* (Chevron Doc. WS2-COP-00001).

Chevron operates the subsea infrastructure commencing with well unloading. Normal operational discharges from the Wheatstone Platform arising from production of hydrocarbons commingled from the Petroleum Activities Program with other production wells are included in the scope of the *Start-Up and Operations Environment Plan: Wheatstone Project*.

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



Note: ESDV = emergency shutdown valve, MEG = mono-ethylene glycol, SSIV = subsea isolation valve, TUTU = topside umbilical termination unit, WPT = Wheatstone Platform

Figure 1-1: Designation of Responsibility for Subsea Infrastructure between the Field Operator (Woodside Energy Julimar) and Wheatstone Platform Operator (Chevron), as Described in the Julimar-Brunello Field Operating Services Agreement

1.4 Environment Plan Summary

An EP Summary will be prepared based on the material provided in this EP. **Table 1-1** summarises the content that will be provided within the EP Summary, as required by Regulation 11(4).

Table 1-1: Environment Plan Summary

EP Summary Material Requirement	Relevant Section of this EP Containing EP Summary Material
The location of the activity	**Section 3**
A description of the receiving environment	**Section 4**
A description of the activity	**Section 3**
Details of the environmental impacts and risks	**Section 6**
The control measures for the activity	**Section 6**
The arrangements for ongoing monitoring of the titleholder's environmental performance	**Section 7.6**
Response arrangements in the oil pollution emergency plan	**Section 7.9**
Consultation already undertaken and plans for ongoing consultation	**Section 5**
Details of the titleholder's nominated liaison person for the activity	**Section 1.7.2**

1.5 Structure of the Environment Plan

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

Table 1-2: Environment Plan Process Phases, Applicable Environment Regulations and Relevant Section of the Environment Plan

Criteria for Acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
Regulation 10A(a): is appropriate for the nature and scale of the activity	Regulation 13: Environmental Assessment Regulation 14: Implementation strategy for the environment plan Regulation 16: Other information in the environment plan	The principle of 'nature and scale' applies throughout the EP	**Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 6.9**
Regulation 10A(b): demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable	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	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	**Section 1** **Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 6.9** **Appendix B**
Regulation 10A(c): demonstrates that the environmental impacts and risks of the activity will			

Criteria for Acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
be of an acceptable level	Regulation 16(a)–16(c): A statement of the titleholder's corporate environmental policy A report on all consultations between the titleholder and any relevant person		
Regulation 10A(d): provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria	Regulation 13(7): Environmental performance outcomes and standards	Environmental Performance Objectives (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: • systems, practices and procedures • performance monitoring • Oil Pollution Emergency Plan (OPEP) and scientific monitoring • ongoing consultation.	**Section 6.9** **Appendix D**
Regulation 10A(f): does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the EPBC Act	Regulation 13 (1)–13(3): 13(1) Description of the activity 13(2) Description of the environment 13(3) Without limiting [Regulation 13(2)(b)], particular relevant values and sensitivities may include any of the following: (a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act; (b) the national heritage values of a National Heritage place within the meaning of that Act; (c) the ecological character of a declared Ramsar wetland within the meaning of that Act; (d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act; (e) the presence of a listed migratory species within the meaning of that Act; (f) any values and sensitivities that exist in, or in relation to, part or all of:	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	**Section 3** **Section 4** **Section 6**

Criteria for Acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
	(i) a Commonwealth marine area within the meaning of that Act; or (ii) Commonwealth land within the meaning of that Act.		
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 in preparation of the EP	**Section 4**
Regulation 10A(h): complies with the Act and the regulations	Regulation 15: Details of the Titleholder and liaison person Regulation 16(c): Details of all reportable incidents in relation to the proposed activity.	All contents of the EP must comply with the Act and the regulations	**Section 1.5** **Section 7.8**

1.6 Description of the Titleholder

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

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

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

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

1.7 Details of Titleholder and Liaison Person

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

1.7.1 Titleholder

Woodside Energy Julimar Pty Ltd

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

ACN: 130 391 365

1.7.2 Nominated Liaison Person

Daniel Clery

Corporate Affairs Manager

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

E: feedback@woodside.com.au

1.7.3 Arrangements for Notifying Change

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

1.8 Operational Interface with the Wheatstone Platform

A contract for services has been entered between Chevron as operator of the Wheatstone Platform (WA-3-IL) and trunkline (WA-25-PL, TPL/25, PL99) and Woodside as operator of the Julimar-Brunello field (WA-49-L) and associated petroleum pipeline and flowlines (WA-26-PL, WA-29-PL) (the Julimar Field Production System). The contract regulates the operational interface between Julimar-Brunello, the Julimar Field Production System and the Wheatstone Platform by specifying field operating services, emergency response arrangements, communication and reporting requirements between Chevron and Woodside.

Under this contract for services Chevron provides field operating services from the Wheatstone Platform to Woodside, which are necessary for the recovery of production fluids from the Julimar Field Production System. The field operating services include, among other matters, operation and maintenance services for the Julimar Field Production System from Wheatstone Platform. This includes operation and maintenance services for all Julimar subsea field infrastructure, wells, well jumpers, subsea wellheads, subsea manifolds, umbilicals and terminations, flowlines and subsea trees upstream of the Julimar Field Production System endpoint (**Figure 1-1**). The contract also provides for Woodside to conduct vessel-based inspection, maintenance and repair of the Julimar subsea infrastructure. Chevron field operating services provided under the contract include, for example:

- operation of all field production system controls, valves, chokes and safety devices and monitoring of all the field production system sensors, alarm and instrument data as required by manuals provided by Woodside and consistent with general direction given by Woodside
- operation of all safety shutdown devices
- performing inspections and tests related to the field production system in accordance with applicable laws and regulations
- integrity and production testing of the Julimar Field Production System (including the subsea trees and system valves, downhole safety valves and the opening of surface controlled subsurface safety valves (SCSSV) and subsea isolation valves (SSIV), as well as the testing of SCSSVs and SSIVs and monitoring and control of the SSIVs through the Wheatstone Platform facilities emergency shutdown system

- performing well tests (including pressure build-up tests and blowdown operations), monitoring well parameters and adjusting normal well parameters in accordance with Woodside's operating manuals and applicable Wheatstone Platform manuals
- performing visual inspection of piping and equipment associated with the Julimar Field Production System and the route of the field production system at time intervals prescribed by applicable regulations.

Chevron has control of the Julimar Field Production System wells for the purpose of providing field operating services. Control of specific Julimar-Brunello wells is transferred back to Woodside during well work-overs/interventions and internal well work. Handover of control of the Julimar Field Production System or individual wells is undertaken according to a handover process between Chevron and Woodside, which involves confirming the status of the wells and infrastructure, and the transfer of relevant records and test results (with a handover certificate) to ensure system integrity is appropriately maintained.

In the addition to the above field operating services, Chevron also provides emergency response and maintenance services to Woodside and has agreed associated communication and reporting requirements.

Under the contract, Woodside retains commercial responsibility for all Julimar Field Production System operations that are not performed by Chevron from or on the Wheatstone Platform or which are not included in the field operating services provided by Chevron above.

These commercial arrangements do not alter the statutory obligations and responsibilities of the parties pursuant to the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) and Environment Regulations.

1.8.1 Field Operations Manual

Under the aforementioned contract, field operating services are provided by Chevron from the Wheatstone Platform central control room and in accordance with a Field Production System Operating Manual (FPSOM). The FPSOM is required by the contract and applies to the Field Operator facilities, up to, and including, the Julimar well centre. The manual was developed and is maintained by Woodside and the requirements executed by Chevron. It describes the requirements for operating the Julimar-Brunello field including reference to relevant operating and maintenance procedures. It also defines the relevant emergency response bridging documents and communication arrangements.

The manual does not include maintenance or specific operating procedures for the topsides equipment relevant to the Julimar-Brunello field production system, which is maintained in accordance with the requirements of the Chevron Operational Excellence Management System under the *Start-Up and Operations Environment Plan: Wheatstone Project.*

The *Julimar Subsea Inspection, Monitoring, and Maintenance (IMM) Plan* describes the inspection, monitoring and maintenance requirements for the Julimar Field Production System, which may be executed either by Woodside or Chevron (**Figure 1-2**). Communication between Woodside and Chevron is described in **Section 7.4**.

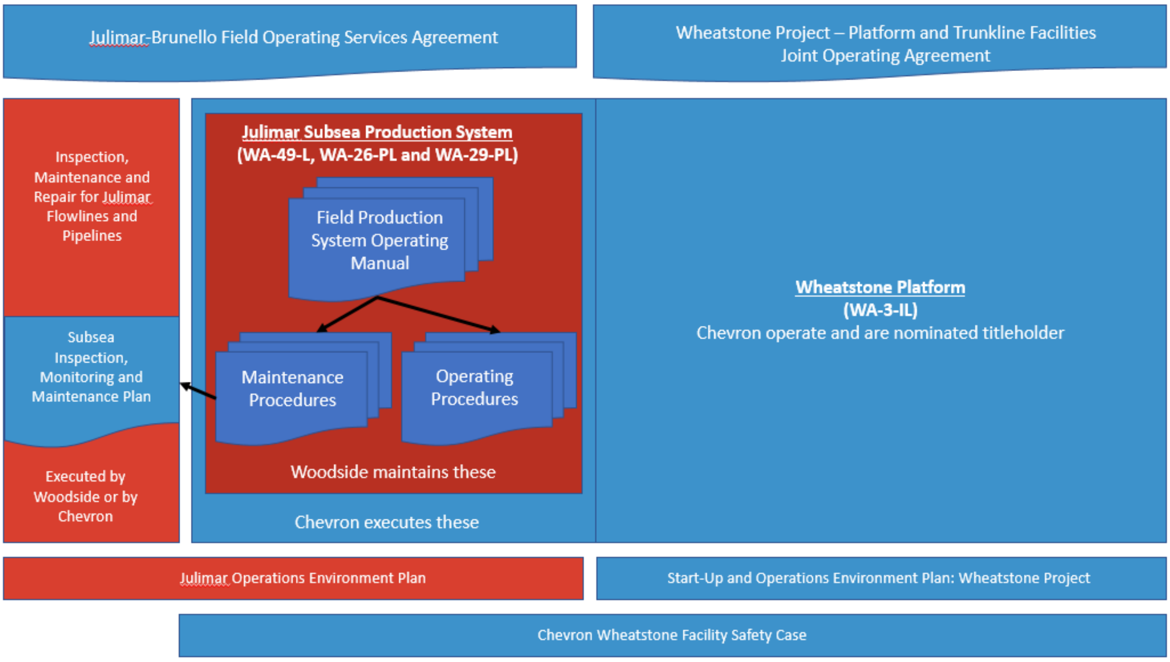


Figure 1-2: Agreements and Supporting Documentation for Operation of the Wheatstone Platform and Julimar Field Production System

1.9 Woodside Management System

The Woodside Management System (WMS) provides a structured framework of documentation to set common expectations governing how all employees and contractors at Woodside will work. Many of the standards presented in **Section 6** are drawn from the WMS documentation which comprises four elements: Compass and Policies; Expectations; Processes and Procedures; and Guidelines, as outlined below (and illustrated in **Figure 1-3**).

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

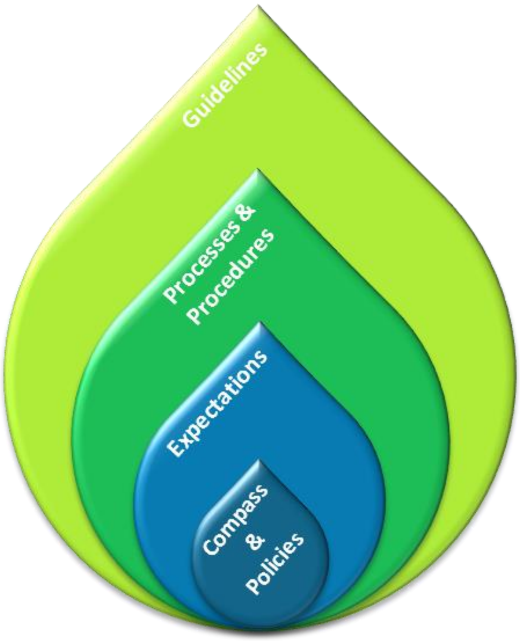


Figure 1-3: The Four Major Elements of the Woodside Management System Seed

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 1-4**. 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.

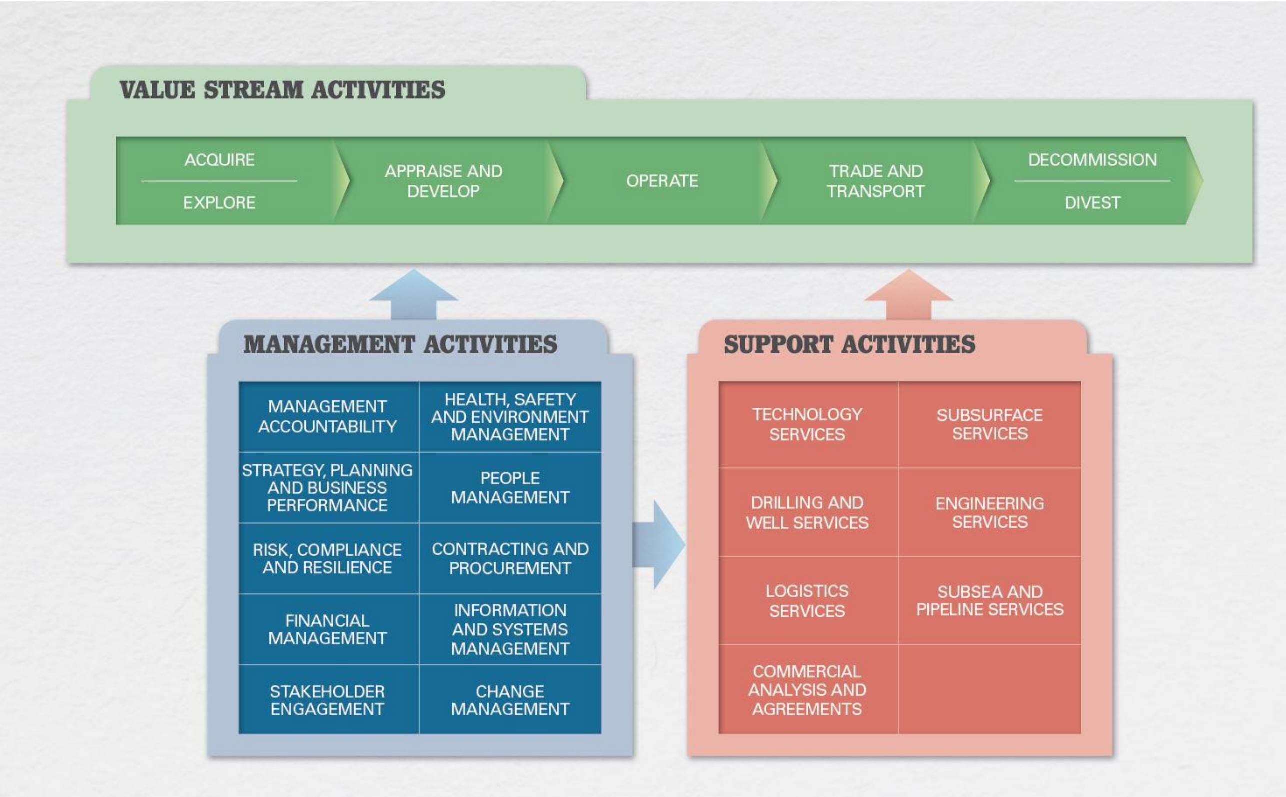


Figure 1-4: The Woodside Management System Business Process Hierarchy

1.9.1 Health, Safety, Environment and Quality Policy

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

1.10 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 the management of risks and impacts of the Petroleum Activities Program are detailed in **Appendix B**. This EP will not be assessed under the WA *Environment Protection Act 1986* as the activity does not occur on State land or within State Waters.

1.10.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) (OPGGS Act) applies to exploration and production activities beyond 3 nautical miles (nm) of the mainland (and islands) to the outer extent of the Australian Exclusive Economic Zone (EEZ) at 200 nm.

One of the final petroleum activities managed under the Environment Regulations for a petroleum title is decommissioning. Under subsection 270(3) of the OPGGS Act, before a title can be relinquished, all property brought into a title area must be removed or arrangements that are satisfactory to NOPSEMA must be made in relation to the property. The requirement for complete removal as a base case under the Act is also provided for in subsection 572(3). While there are no immediate plans for decommissioning (the scope of this EP is for production operations) the equipment has been designed for full removal. Subsection 572(2) provides that while structures, equipment and other property remain in the title area, they must be maintained in good condition and repair (See **Section 3.9)**.

Alternative arrangements that may be satisfactory are ones that deliver equal or better environmental, safety and well integrity outcomes compared to complete removal, and that the approach chosen complies with all other legislative and regulatory requirements. This is outlined in the Offshore Petroleum Decommissioning Guideline (Department of Industry, Innovation and Science [DIIS], 2018).

Timely and effective planning for decommissioning is ongoing throughout the asset's lifecycle and includes planning for decommissioning of property at the end of production and decommissioning of disused or redundant property at appropriate points throughout the life of an asset. Woodside's Decommissioning Management Procedure requires decommissioning activities to be defined 2 – 5 years out from End of Field Life (EOFL). EOFL for the Julimar Field Production System is estimated to be 2042. Therefore, no EOFL decommissioning activities for the infrastructure are planned for the life of this 5-year EP.

Under the OPGGS Act, the Environment Regulations apply to petroleum activities in Commonwealth Waters and are administered by NOPSEMA.

The objective of the Environment Regulations is to ensure petroleum activities are:

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

1.10.2 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

One of the objectives EPBC Act is to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined under Part 3 of the Act as “Matters of National Environmental Significance” (MNES). The EPBC Act sets a regime which aims to ensure actions taken on (or impacting upon) Commonwealth land or waters are consistent with the principles of Ecologically Sustainable Development (ESD). 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.

In relation to offshore petroleum activities in Commonwealth waters, in accordance with the “Streamlining Offshore Petroleum Approvals Program (the Program), requirements under the Act are now administered by NOPSEMA, commencing February 2014. The Program requires any offshore petroleum activities, authorised by the OPGGS Act to be conducted in accordance with an accepted EP. The definition of ‘environment’ in the Program covers all matters protected under Part 3 of the EPBC Act.

1.10.2.1 Offshore Project Approval

The Julimar Brunello Gas Development Project was referred for assessment under the EPBC Act in 2011 (2011/5936). A decision by the Environment Minister determined that the action is not a controlled action, provided it is undertaken in a particular manner. The measures / conditions that are considered relevant to the scope of this EP are provided in **Table 1-3**.

Table 1-3: Conditions from EPBC 2011/5936 Relevant to the Petroleum Activities Program

Condition Number	Condition	Relevant Section of the EP
1	An Oil Spill Contingency Plan and an Environment Plan as described in the referral and additional information must be approved by the relevant authority and in place prior to the proposed action commencing	This EP and **Appendix D**
2	Procedures and equipment systems for ensuring well control must meet best practice industry standards and must be implemented prior to the proposed action commencing. This includes the installation of a minimum of two well barriers as specified in the referral and additional information	**Section 6.8.2**
3	The oil spill preparedness and response measures and equipment described in the referral and additional information must be in place prior to the proposed action commencing	**Appendix D**
4	To minimise risks of a hydrocarbon release during decommissioning, decommissioning activities must be taken into account in the Environmental Plan, as specified in the referral	Due to expected EOFL there is no decommissioning activity in this EP (**Section 1.10.1**)

1.10.2.2 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 relation to offshore petroleum activities in Commonwealth waters, these requirements are now administered by NOPSEMA in accordance with commitments set out 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 Environment Plan that proposes activities that will result in unacceptable impacts to a listed threatened species or ecological community.
- NOPSEMA will not accept an Environment Plan 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 Environment Plan.

1.10.2.3 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs) 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 Commonwealth Government must not perform functions or exercise powers in relation to these parks that are inconsistent with management plans (s362 of the EPBC Act). Relevant AMPs are described in **Section 4.8.1**. The *North-west Marine Parks Network Management Plan* (DNP, 2018) describes the requirements for management.

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

- Special Purpose Zone (IUCN category VI): managed to allow specific activities through special purpose management arrangements while conserving ecosystems, habitats and native species. The zone allows or prohibits specific activities
- Sanctuary Zone (IUCN category Ia): managed to conserve ecosystems, habitats and native species in as natural and undisturbed a state as possible. The zone allows only authorised scientific research and monitoring
- National Park Zone (IUCN category II): managed to protect and conserve ecosystems, habitats and native species in as natural a state as possible. The zone only allows non-extractive activities unless authorised for research and monitoring
- Recreational Use Zone (IUCN category IV): managed to allow recreational use, while conserving ecosystems, habitats and native species in as natural a state as possible. The zone allows for recreational fishing, but not commercial fishing
- Habitat Protection Zone (IUCN category IV): managed to allow activities that do not harm or cause destruction to seafloor habitats, while conserving ecosystems, habitats and native species in as natural a state as possible
- Multiple Use Zone (IUCN category VI): managed to allow ecologically sustainable use while conserving ecosystems, habitats and native species. The zone allows for a range of sustainable uses, including commercial fishing and mining where they are consistent with park values.

Subsea IMMR (**Section 3.9**) activities may occur within the Montebello Marine Park Multiple Use Zone (IUCN category VI). In accordance with the *North-west Marine Parks Network Management Plan* (DNP, 2018), petroleum activities including transportation of minerals by pipeline, and oil spill response are permittable subject to approval in Multiple Use Zone (IUCN category VI) and Special Purpose Zone Trawl (IUCN category VI). Proposed mining operations conducted under usage rights that existed immediately before the declaration of a marine park do not require approval.

Petroleum activities (including environmental monitoring in connection with a particular petroleum activity) occurring within these zones are approved by a class approval (DNP, 2018). Conditions of the Class Approval that are considered relevant to the scope of this EP are provided in Table 1-4.

Table 1-4: Conditions of Class Approval relevant to the Petroleum Activities Program

Condition Number	Condition	Relevant Section of the EP
1	The Approved Actions must be conducted in accordance with: (a) an Environment Plan accepted under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009; - (b) the EPBC Act; (c) the EPBC Regulations (d) the North-west Network Management Plan; (e) any prohibitions, restrictions or determinations made under the EPBC Regulations by the Director of National Parks; and (f) all other applicable Commonwealth and state laws (to the extent those laws are capable of operating concurrently with the laws and instruments described in paragraphs (a) to (e)).	Conditions 1a, b, c and f are met by the submitted EP. 1d the impacts on the marine park values have been considered **Section 6.6** and **6.7**. 1e Consultation has been undertaken with the Director of National Parks and no prohibitions, restrictions or determinations have been made (**Section 5**)
2	If requested by the Director of National Parks, an Approved Person must notify the Director prior to conducting Approved Actions within Approved Zones.	**Section 6.9** describes requirements to notify the DNP prior to activities within the Montebello Multiple Use Zone.
3	If requested by the Director of National Parks, an Approved Person must provide the Director with information relating to undertaking the Approved Actions (or gathered while undertaking the Approved Actions), that is relevant to the Director's management of the Approved Zones.	If requested by the Director of National Parks, information relating to undertaking the Approved Actions (or gathered while undertaking the Approved Actions), that is relevant to the Director's management of the Approved Zones will be provided.

1.10.2.4 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 1-5**.

Table 1-5: 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	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**.

	(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.	3.03 (c): Relevant stakeholder consultation and feedback received in relation to impacts and risks to the Ningaloo World Heritage Property are outlined in **Section 4**. 3.04, 3.05 and 3.06: Principles are considered to be met by the acceptance of this EP.

Note: Section 1 – General Principles and Section 2 – Management Planning of Schedule 5 of the EPBC Regulations 2000 are not considered relevant to the scope of this EP and therefore have not been included.

2 ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process taken by Woodside to prepare this EP, once the activity was defined as a petroleum activity. The process describes the activity, the existing environment, followed by the environmental risk management methodology used to identify, analyse and evaluate risks to meet ALARP levels and acceptability requirements, and develop EPOs and EPSs. This section also describes Woodside's risk management methodologies as applied to implementation strategies for the activity.

Regulation 13(5) of the Environment Regulations requires the EP to include details of the environmental impacts and risks for the Petroleum Activities Program, and an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact and risk. The objective of the risk assessment process described in this section is to identify risks and associated impacts of an activity, so they can be assessed, and appropriate control measures applied to eliminate, control or mitigate the impact/risk to ALARP, and to 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:

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

In this Section, potential impacts from planned activities are termed 'impacts', and 'risks' are associated with unplanned events with the potential for environmental impact (should the risk be realised), with such impacts termed potential 'consequences'.

2.2 Environmental Risk Management Methodology

2.2.1 Woodside Risk Management Process

Woodside recognises that risk is inherent to its business and that effective management of risk is vital to delivering on company objectives, success and continued growth. Woodside is committed to managing risk proactively and effectively. The objective of Woodside's risk management system is to provide a consistent process for recognising and managing risks across Woodside's business. Achieving this objective includes ensuring risks consider impacts across these 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. Woodside's WMS risk management procedures, guidelines and tools provide guidance of 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 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**. A description of each step and how it is applied to the scopes of this activity is provided in **Section 2.2** to **Section 2.12**.

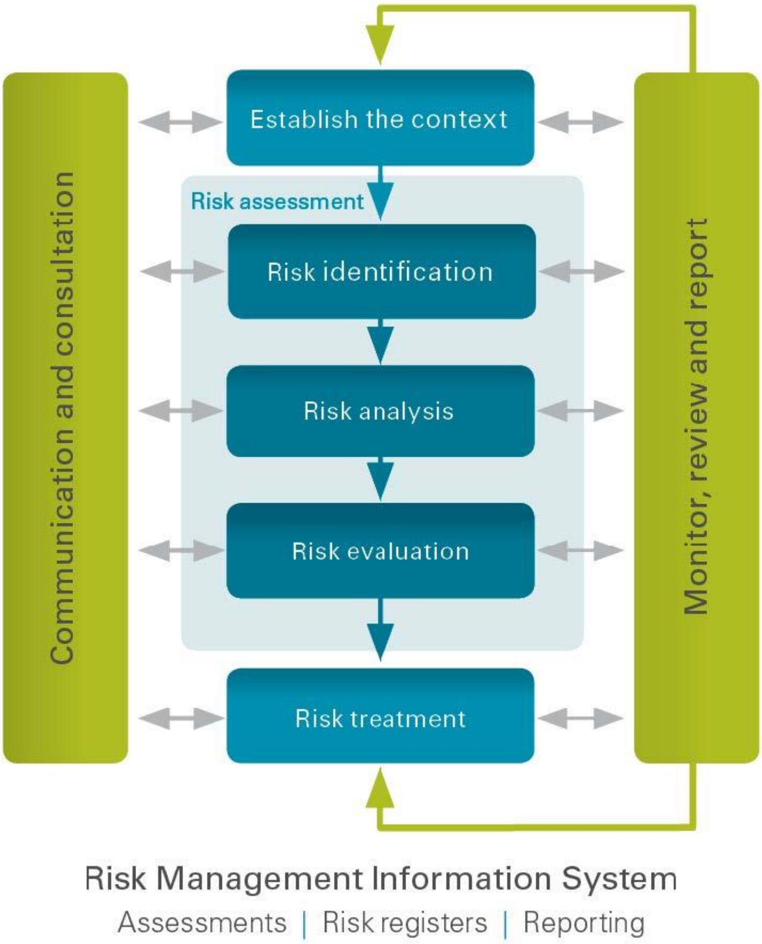


Figure 2-1: Woodside's Risk Management Process

2.2.2 Health, Safety and Environment Management Procedure

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

2.2.3 Impact Assessment Procedure

To support effective environmental risk assessment, Woodside's Impact Assessment Procedure (**Figure 2-2**) provides the steps to meet the required environment, health and social standards by ensuring impact assessments are undertaken 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.

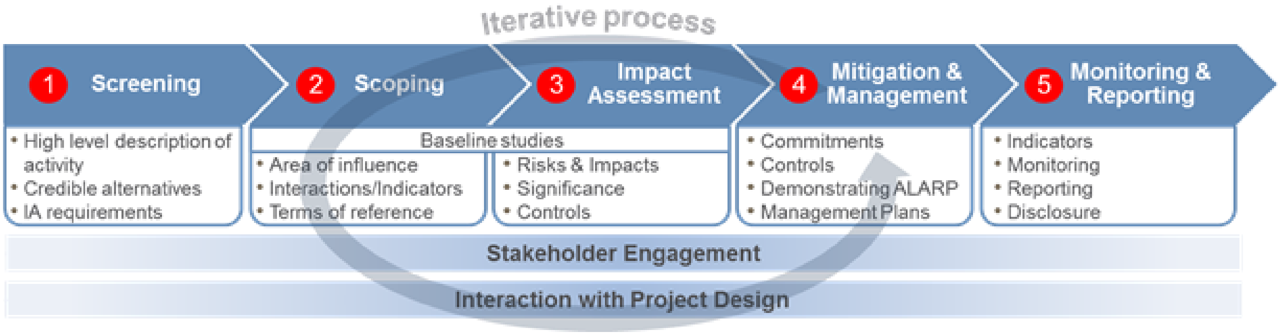


Figure 2-2: Woodside's Impact Assessment Process

2.2.4 Process Safety Management Procedure and Process Safety Risk Assessment Procedure

Due to the nature and scale of petroleum activities, Woodside's Process Safety Management Procedure establishes Woodside's framework for Process Safety Management (**Section 7.1.2**). This framework includes the Process Safety Risk Assessment Procedure (PSRA). The PSRA is a key part of Woodside's process safety management framework for managing the integrity of systems and processes that handle hazardous substances over the exploration and production lifecycle. The PSRA sets out methods to ensure that process safety risks are understood and controlled, including that all process safety hazards are systematically identified, assessed and treated so that the associated risks are reduced to a level that is tolerable and ALARP.

2.3 Environment Plan Development Process

The EP development process is illustrated in **Figure 2-3**. Each element of this process is discussed further in **Section 2.5** to **Section 2.11**.

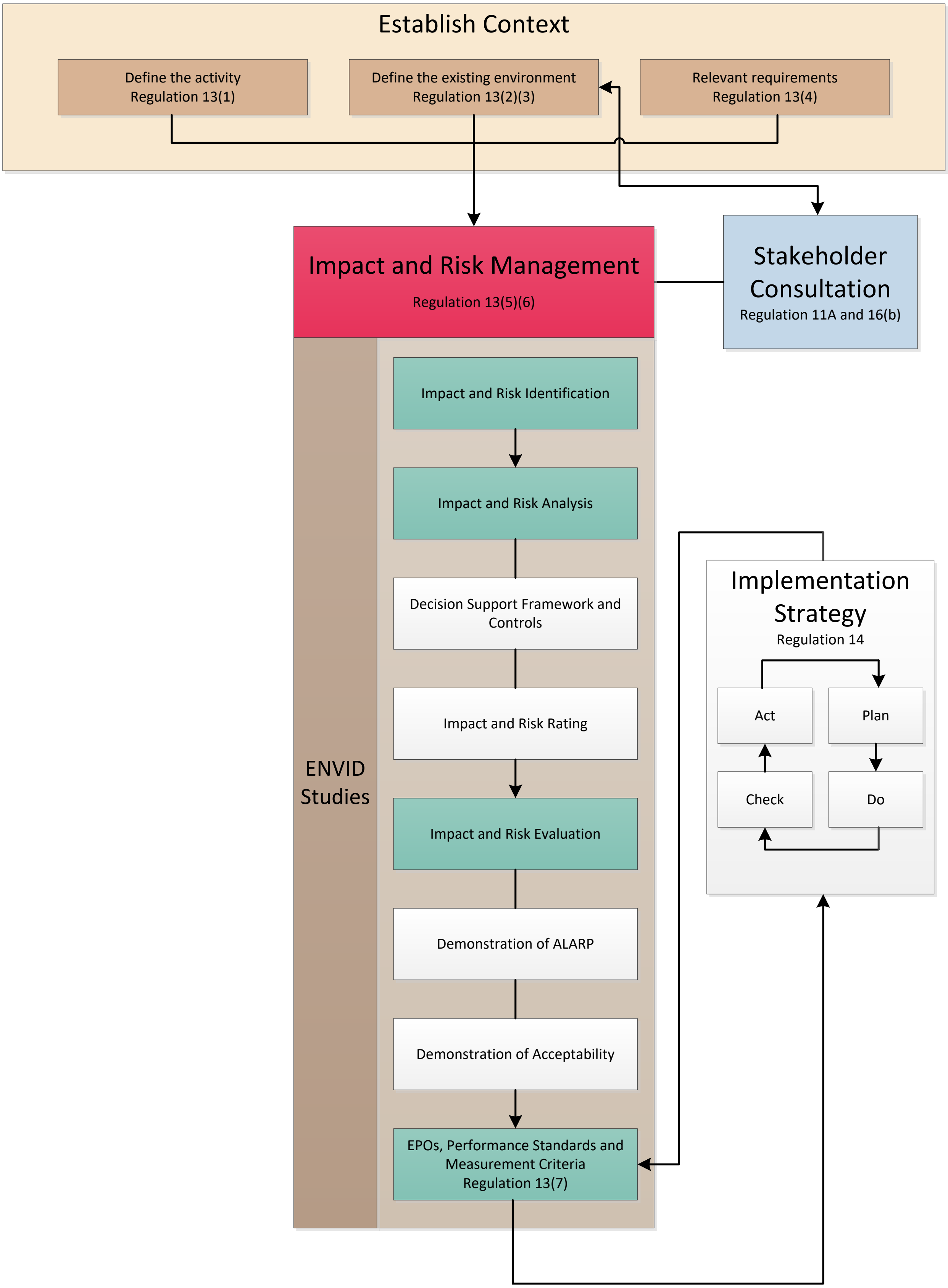


Figure 2-3: Environment Plan Development Process

2.4 Establish the Context

2.4.1 Define the Activity

This first stage involves evaluating whether the activity meets the definition of a 'petroleum activity' as defined in the Environment Regulations. The activity is described in relation to:

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

The 'what' and 'how' are described in the context of 'environmental aspects'[1] to inform the risk and impact assessment for planned (routine and non-routine) and unplanned (accidents/incidents/emergency conditions) activities.

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

2.4.2 Define 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[2] events.

The Existing Environment (**Section 4**) is structured into subsections defining 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 subsections 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 2.2**) and rated for all planned and unplanned activities. Additional detail is provided for unplanned hydrocarbon spill risk evaluation.
- 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 6.7.1**. MNES, as defined under the EPBC Act, are addressed through Woodside's impact and risk assessment (**Section 6**).
- Relevant values and sensitivities, which may include world or national heritage listed areas, listed Threatened species or ecological communities, listed Migratory species, or sensitive values.

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.

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

[2] 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 and in turn provides context to the 'nature and scale' of the existing environment.

Table 2-1: Example of the Environment Values Potentially Impacted which are Assessed within the Environment Plan

Environmental Value Potentially Impacted Regulations 13(2)(3)						
Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl. Odour)	Ecosystems/ Habitats	Species	Socio-economic

2.4.3 Relevant Requirements

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

The Corporate Health, Safety, Environment and Quality Policy is presented in **Appendix A**.

2.5 Impact and Risk Identification

Relevant environmental aspects and hazards were identified that 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 and environmental risk identification studies (e.g. HAZID/ENVID), consequence modelling studies for high consequence, low probability environmental risks, bowtie risk assessments for Major Environmental Events (MEEs) as required by Woodside's PSRA processes, desktop reviews and studies associated with the Petroleum Activities Program. Impacts, risks and potential consequences were 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 in this EP.

An environmental impacts and risks identification and assessment workshop was undertaken by multidisciplinary teams comprising relevant operational and environmental personnel with sufficient breadth of knowledge, training and experience to reasonably assure that risks and impacts were identified, and their potential environmental consequences assessed. Impacts and risks were identified, during the workshop, for both planned (routine and non-routine) activities and unplanned (accidents/incidents/emergency conditions) events. During this process, risks identified as not applicable (not credible) were removed from the assessment.

Impacts and risks were evaluated and tabulated for each planned activity and unplanned events respectively. Environmental impacts and risks were recorded in an environmental impacts and risk register. The output of the workshop is used to present the risk assessment and form the basis of performance outcomes, standards, and measurement criteria. This information is presented in **Section 6**, following 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**					
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability
Summary of source of impact/risk													

2.6 Impact and Risk Analysis

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

These key steps were undertaken for each identified risk during the risk assessment:

- identify the Decision Type in accordance with the decision support framework
- identify appropriate control measures (preventive and mitigation) aligned with the Decision Type
- assess the risk rating.

2.6.1 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 the use of 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 integrated into the environmental impacts and risks identification and assessment workshop to determine the level of supporting evidence that may be required to draw sound conclusions regarding risk level and whether the risk is acceptable and ALARP (**Figure 2-4**). Application of the decision support framework confirms:

- activities do not pose an unacceptable environmental risk
- appropriate focus is placed on activities where the impact or risk is anticipated to be acceptable and demonstrated to be ALARP
- appropriate effort is applied to manage risks and impacts 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/impact (referred to as the Decision Type A, B, or C). The Decision Type is selected based on an informed discussion around the uncertainty of the risk/impact and is documented in impact and risk register worksheets.

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

2.6.1.1 Decision Type A

Decision Type A risks and impacts are well understood and established practice. They are generally recognised as good industry practice and are often embodied in legislation, codes and standards, and utilise professional judgment.

2.6.1.2 Decision Type B

Decision Type B risks and impacts 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 that the risk is ALARP. Engineering risk assessment tools may include:

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

2.6.1.3 Decision Type C

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

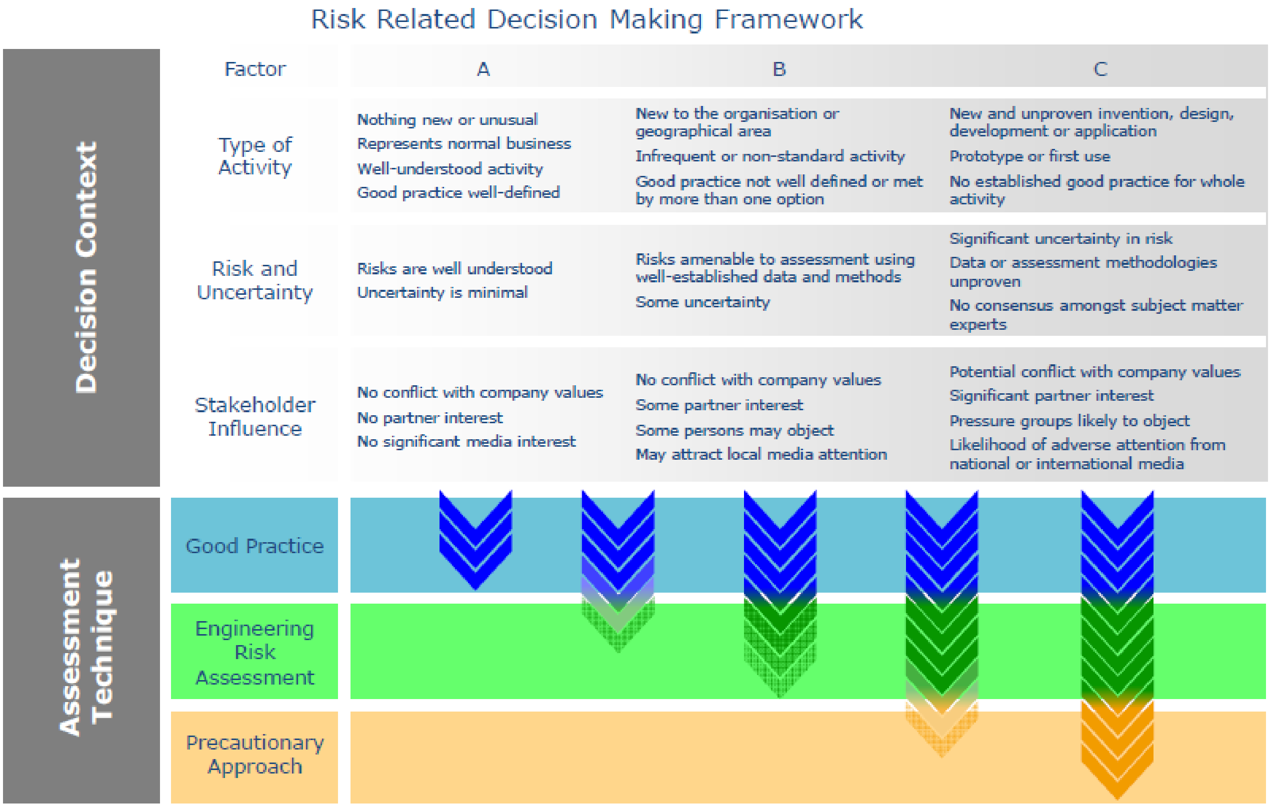


Figure 2-4: Risk-related Decision-making Framework (Oil and Gas UK, 2014)

2.6.1.4 Decision Support Framework Tools

These 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 that are to be complied with for the activity.
- **Good Industry Practice (GP)** – identifies further engineering control standards and guidelines that may be applied by Woodside above that 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.

Decision Calibration

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

- **LCS/Verification of Predictions –** Verification of compliance with applicable LCS and/or good industry practice.
- **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 deemed to represent acceptable risk.
- **Internal Stakeholder Consultation** – Consultation undertaken within Woodside to inform the decision and verify company values are met.
- **External Stakeholder Consultation** – Consultation undertaken to inform the decision and verify societal values are considered.

Where appropriate, additional calibration tools may be selected specific to the Decision Type and the activity.

2.6.2 Control Measures (Hierarchy of Controls)

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

- **Elimination** of the risk by removing the hazard.
- **Substitution** of a hazard with a less hazardous one.
- **Engineering Controls** include design measures to prevent or reduce the frequency of the risk event, or detect or control the risk event (limiting the magnitude, intensity and duration) such as:
  - Prevention: design measures that reduce the likelihood of a hazardous event occurring
  - Detection: design measures that facilitate early detection of a hazardous event
  - Control: design measures that limit the extent/escalation potential of a hazardous event
  - Mitigation: design measures that protect the environment if a hazardous event occurs
  - Response Equipment: design measures or safeguards that enable clean-up/response after a hazardous event occurs.
- **Procedures and Administration** includes management systems and work instructions used to prevent or mitigate environmental exposure to hazards.
- **Emergency Response and Contingency Planning** includes methods to enable recovery from the impact of an event (e.g. protection barriers deployed near the sensitive receptor).

2.6.3 Impact and Risk Classification

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

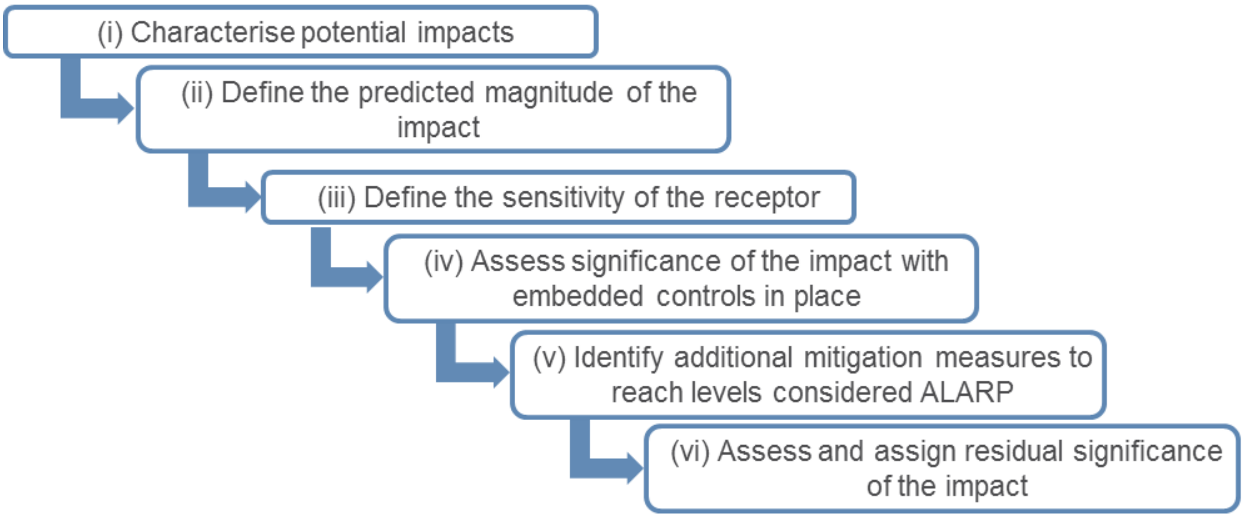


Figure 2-5: Environmental Risk and Impact Analysis

Impacts are classified in accordance with the consequence (**Table 2-3**) outlined in Woodside's Risk Management Procedure and Risk Matrix (**Figure 2-6**). Risks are assessed qualitatively and/or quantitatively in terms of both likelihood and consequence in accordance with this matrix.

The impact and risk information, including classification and evaluation information as shown in the example (**Table 2-2**), are tabulated 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 (>50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Catastrophic, long-term impact (>20 years) to a community, social infrastructure or highly valued area/item of international cultural significance.	**A**
Major, long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Major, long-term impact (5–20 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	**B**
Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	Moderate, medium term impact (2–5 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	**C**
Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	**D**
Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Slight, short-term impact (<1 year) to a community or area/item of cultural significance.	**E**
No lasting effect (<1 month). Localised impact not significant to environmental receptor.	No lasting effect (<1 month). Localised impact not significant to area/item of cultural significance.	**F**

2.6.3.1 Risk Rating Process

The risk rating process assigns a level of risk to each risk event, measured in terms of consequence and likelihood. The assigned risk rating is determined with controls in place, therefore; the risk rating is 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 (refer to **Figure 2-6**).

The risk rating process is done using the steps described in the subsections below.

Select the Consequence Level

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

Select the Likelihood Level

Determine the description that best fits the chance of the selected consequence occurring, assuming reasonable effectiveness of the prevention and mitigation 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 1,000–10,000 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**

Calculate the Risk Rating

The risk rating is derived from the consequence and likelihood levels above, in accordance with the Woodside Risk Matrix shown in **Figure 2-6**. A likelihood and risk rating are only applied to environmental risks, not environmental impacts from planned activities.

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

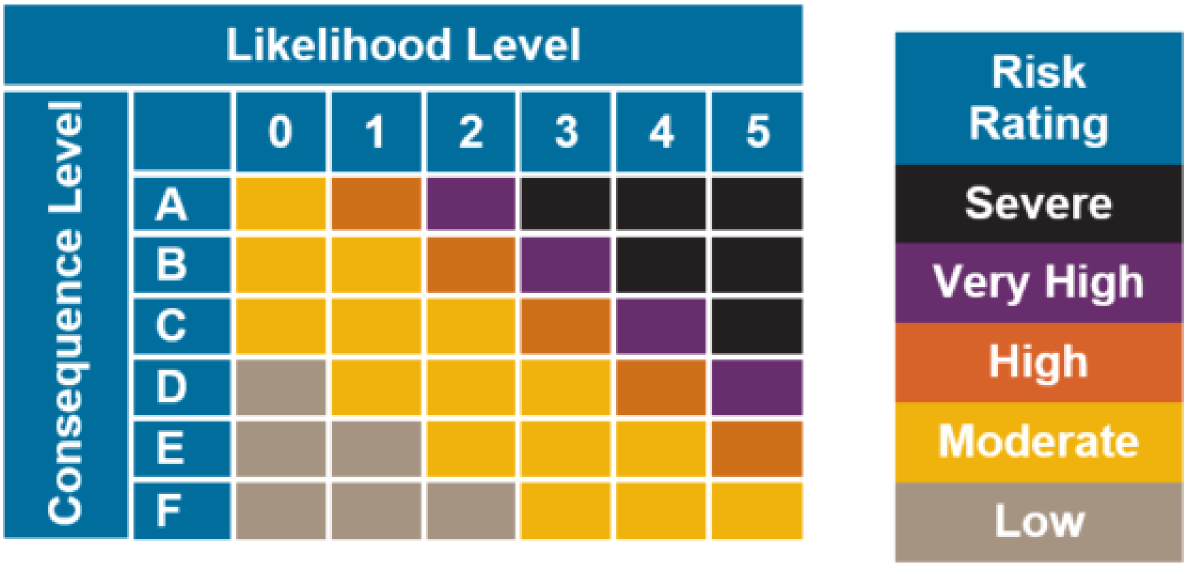


Figure 2-6: Woodside Risk Matrix – Risk Level

To support ongoing risk management (as a key component of Woodside's Process Safety Management Framework – refer to the implementation strategy in **Section 6.9**), Woodside uses the concept of 'current risk' and applies a Current Risk Rating to indicate the current or 'live' level of risk, considering controls that are currently in place and effective on a day-to-day basis. The 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 communicating and making visible the risk events and ensure the continual management of risk to ALARP by identifying risk reduction measures and assessing acceptability.

2.7 Classification and Analysis of Major Environment Events

For Woodside's production facilities, a further level of analysis is undertaken to identify, classify and analyse Major Environmental Events (MEEs). This extra level of rigour is applied to ensure sufficient controls are in place for risks with potential Level B and above consequences. In the health and safety area, Major Accident Events (MAEs) are identified using a similar process, which supports consistency in managing key risks within Woodside in accordance with Process Safety Risk Management Procedures.

Woodside defines a MEE as an event with potential environment, reputation (pertaining to environment events), social or cultural consequences of level B or higher as per Woodside's Risk Matrix (**Figure 2-6**). MEEs are evaluated against credible worst-case scenarios that may occur when all controls are absent or have failed.

2.7.1 Major Environment Event Identification

The ENVID process identifies numerous sources of risk with differing consequence levels. These risks are screened for those risk events that meet the MEE criteria, and MEE risks are analysed further through detailed consequence modelling and probability/ frequency studies and examined for 'appropriateness' of controls in a bowtie risk assessment.

Risks that do not meet the MEE definition, although screened out of the MEE process, are still evaluated for ALARP and risk acceptability using the methodology described in **Section 2.8**. Some high consequence/low probability events which do not meet the MEE consequence threshold may still undergo additional consequence and probability assessment where they could have a high adverse impact on the company's reputation or relationships with stakeholders, beyond requirement to demonstrate ALARP and acceptable risk levels following application of controls.

2.7.2 MEE Classification

A standard naming convention has been established for MEEs which is based around ensuring the MEE titles reflect the cause of the event (e.g. ‘subsea system loss of containment’) rather than the event itself (e.g. significant hydrocarbon spill to the marine environment). The MEEs are assigned a unique identification code (e.g. MEE-01, MEE-02, etc).

2.7.3 Bowtie Analysis

MEEs are subject to more detailed analysis using the bowtie risk assessment technique, which illustrates cause outcome pathways for each MEE and controls in place to prevent the ‘top event’ or mitigate the consequences (outcomes). The key drivers for adopting the bowtie technique for MEEs are that it:

- identifies the controls (prevention and mitigation barriers) necessary to ensure the risk is acceptable and ALARP
- supports the process of demonstrating ALARP (described in **Section 2.8.1**)
- enables verification of and linking to the relevant sections of the WMS that supports barriers
- improves the capacity for lessons learnt and incident prevention by being able to directly relate causes of an incident to those controls that failed
- ensures greater visibility and granularity in the assessment process and enables complex risk scenarios to be presented in an easy to understand format.

The bowtie technique (an example bowtie diagram is shown in **Figure 2-7**) shows the relationships between the ‘Causes’ that may lead to a particular unwanted event (‘Top Event’), together with the range of potential escalation paths that can lead to a variety of ‘Outcomes’ (or consequences). A bowtie also shows the preventive barriers that may prevent a Top Event from occurring specific to each Cause, and the mitigation barriers in place to limit the potential effects once the Top Event has been realised, specific to each credible MEE Outcome.

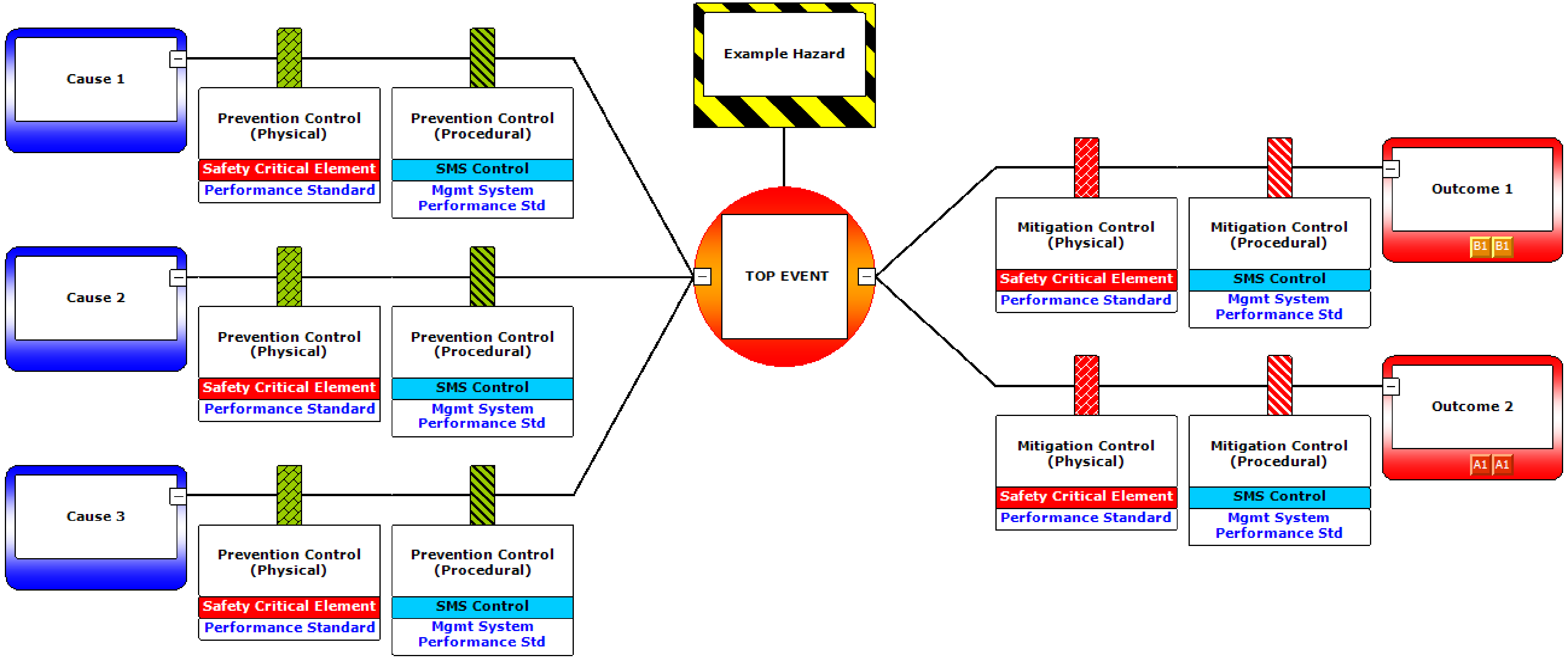


Figure 2-7: Example of Bowtie Diagram Structure

2.7.4 MEE Register

A MEE Register is prepared for each production facility after completing the bowtie diagrams. The purpose of the MEE Register is to record the MEE identification process, groupings, bowtie diagrams and datasheets in a consolidated format. Datasheets are prepared for each MEE, which summarise the hazard description, hazard management, emergency response, ALARP summary and a list of critical barriers identified on the bowties (known as Safety and Environment Critical Elements (SCEs)).

Potential common causes that contribute to MAEs/MEEs, or that can result in failure or degradation of the controls in place to protect against MAEs/MEEs, include some generic mechanisms of SCE failure and generic human error. These are represented in bowties applicable to multiple MEEs and identified in the MEEs applicable to this EP.

2.7.5 Safety and Environment Critical Elements and Technical Performance Standards

Woodside identifies and manages Safety and Environment Critical Element (SCE) technical and management system performance standards in accordance with Process Safety Management Procedures, Risk Management Procedures and Change Management Procedures (further described in the implementation strategy in **Section 7.1.5**). SCEs are identified for MAEs and MEEs. An SCE is a hardware control, the failure of which could cause or contribute substantially to, or the purpose of which is to prevent or limit the effect of a MAE, MEE or Process Safety Event. In addition, Woodside defines Safety and Environment Critical Component (SCC) as an item of equipment or structure forming part of a hardware SCE that supports the SCE in achieving the safety function[3].

Once an SCE is identified as an MEE barrier, technical performance requirements are developed for the facility SCE in accordance with the Global SCE Performance Standards and process described in the SCE Management Procedure and form the SCE Facility Performance Standard. Each SCE Performance Standard represents a statement of the performance required of an SCE (e.g. functionality, availability, reliability, survivability). SCE Performance Standard requirements are used to establish agreed assurance tasks for each SCE, support the management of operations within acceptable safety and/or environment risk levels, and ensure continuous management of risk to ALARP. An assurance task is an activity carried out by the operator to confirm that the SCE meets, or will meet, its SCE Performance Standard. Examples of assurance tasks include inspection routines, maintenance activities, test routines, instrumentation calibration, and reliability monitoring.

SCE Facility Performance Standards do not always align directly with EPSs. They are used in conjunction with the WMS to identify and treat potential step-outs from expected controls performance or integrity envelopes and ensure SCE performance can be optimised. Woodside's HSE Event Reporting Guideline describes the process for identifying 'Failure to meet Facility Performance Standard', which is when the SCE does not meet the goal as stated in the relevant Performance Standard. (see **Section 7.1.5**). Situations where SCEs fail to meet Facility Performance Standards represent a potential increase in risk that, if not addressed immediately, have the potential to result in a process safety event, or worsen the consequences of one. Recording SCE Failure to Meet Performance Standard Events into the Event Reporting Database is important to highlight risk, investigate causes, ensure risks are managed and meet potentially applicable external reporting requirements. For applicable SCEs, 'Failure to meet Facility Performance Standard' represent scenarios that may fail to achieve an EPS presented in this EP.

The results of the MEE classification and analysis for Julimar operations are presented in **Section 6.8.1** of this EP. More detail on the SCE and Performance Standards process, and the interrelationships to other parts of the SCE Management Procedures, is described in **Section 7.1.5**.

[3] *Note: Not all individual equipment items that comprise a SCE are safety-critical.*

2.7.6 Safety-critical Management System Barriers

For each MEE, Safety-critical Management System specific measures are also identified. These are management system components (generally WMS processes) that are key barriers to, or measures for, managing MEEs.

2.8 Impact and Risk Evaluation

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

- Decision Type
- principles of ESD – as defined under the EPBC Act
- internal context – ensuring the proposed controls and risk level are consistent with Woodside policies, procedures and standards (**Section 6.9** and **Appendix A**)
- external context – the environment consequence (**Section 6**) and stakeholder acceptability (**Section 5**)
- other requirements – ensuring the proposed controls and risk level are consistent with national and international standards, laws and policies.

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

2.8.1 Demonstration of ALARP

The descriptions in **Table 2-5** articulate how Woodside demonstrates that different risks, impacts and Decision Types identified within the EP are ALARP.

Table 2-5: Summary of Woodside's Criteria for ALARP Demonstration

Risk	Impact	Decision Type
Low and Moderate (C, D, E or F level consequence)	**Negligible, Slight, or Minor (D, E or F)**	**A**
Woodside demonstrates these risks, impacts and Decision Types are reduced to ALARP if: • identified controls meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines, or • further effort towards impact/risk reduction (beyond using opportunistic measures) is not reasonably practicable without sacrifices that are grossly disproportionate to the benefit gained.		
High, Very High or Severe (A or B level consequence)	**Moderate and above (C, B or A)**	**B and C**
Woodside demonstrates these higher-order risks, impacts and Decision Types are reduced to ALARP where it can be shown good industry practice and RBA have been employed, if legislative requirements are met, societal concerns are accounted for, and the alternative control measures are grossly disproportionate to the benefit gained.		

2.8.2 Demonstration of Acceptability

The descriptions in **Table 2-6** articulate how Woodside demonstrates how different risks, impacts and Decision Types identified within the EP are Acceptable.

Table 2-6: Summary of Woodside's Criteria for Acceptability

Risk	Impact	Decision Type
Low and Moderate	**Negligible, Slight, or Minor (D, E or F)**	**A**
Woodside demonstrates these risks, impacts and Decision Types are 'Broadly Acceptable' if they meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines. Further effort towards risk reduction (beyond using opportunistic measures) is not reasonably practicable without sacrifices that are grossly disproportionate to the benefit gained.		
High, Very High or Severe	**Moderate and above (C, B or A)**	**B and C**
Woodside demonstrates these higher order Risks, Impacts and Decision Types are 'Acceptable if ALARP' if it can be demonstrated using good industry practice and risk based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained. In undertaking this process for Moderate and High risks, Woodside evaluates: • the Principles of ESD as defined under the EPBC Act • the internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards • the external context – consideration of the environment consequence (**Section 6**) and stakeholder acceptability (**Section 5**) are considered • other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies ad consideration of applicable plans for management and conservation advices, conventions and significant impact guidelines (e.g. MNES). Additionally, Very High and Severe risks require 'Escalated Investigation' and mitigation. If after further investigation the risk remains in the Very High or Severe category, the risk requires appropriate business engagement with increasing involvement of senior management in accordance with Woodside's Risk Management Procedure to accept the risk. This includes due consideration of regulatory requirements.		

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 1.10.2.2**). The steps in this process are:

- Identify relevant listed threatened species and ecological communities (**Section 4.6**).
- Identify relevant recovery plans and threat abatement plans (**Section 4.6.2**).
- 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 6.9**).
- 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 6.9**).

2.10 Environmental Performance Outcomes, Environmental Performance Standards, and Measurement Criteria

EPOs, EPSs and MC are defined to address the potential environmental impacts and risks. These are explored in **Section 6**.

2.11 Implement, Monitor, 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 program. The strategy is based on the principles of AS/NZS ISO 14001 Environmental Management Systems, and demonstrates:

- control measures are effective in reducing the environmental impacts and risks of the Petroleum Activities Program to ALARP and Acceptable levels

- EPOs and EPSs set out in the EP are met through monitoring, recording, auditing, managing non-conformance, and reviewing
- 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 for oil pollution emergencies, to respond to and monitor impacts
- environmental reporting requirements are met, including 'reportable incidents'
- appropriate stakeholder consultation is undertaken throughout the activity.

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

2.12 Stakeholder Consultation

A stakeholder assessment is undertaken to identify relevant people (as defined under Regulation 11A of the Environment Regulations) to whom an activity update is issued electronically. Reasonable consultation periods are included. Further details and information are provided to a stakeholder if requested.

A summary and assessment of each stakeholder response is undertaken and a response, where appropriate, is provided by Woodside.

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

3 DESCRIPTION OF THE ACTIVITY

3.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations and describes the activities to be undertaken as part of the Petroleum Activities Program under this EP. It includes the location of the activity, general details of the Julimar Field Production System's layout, the operational details of the activity, and additional information relevant to consideration of environmental risks and impacts. An overview of the Petroleum Activities Program is provided in **Table 3-1**.

Table 3-1: Petroleum Activities Program Overview

Item	Description
Licence areas	Woodside operated licence areas within the Operational Area: • WA-49-L; WA-26-PL; WA-29-PL; WA-536-P. Non-Julimar licence areas within the Operational Area (for vessel operations only): • WA-34-L. Non-Woodside license area connected to the Julimar Field Production System: • WA-3-IL (Chevron operated, includes 20% Julimar Joint Venture), WA-48-L.
Field Life	25 years production (as referred under EPBC 2011/5936)
Key components of subsea infrastructure	Wells, Xmas trees, manifolds, flowlines/pipelines and umbilicals.
Exploration Wells Temporary Abandoned (ETA)*	ETA with wellheads
Vessels	Offshore activity vessels • IMMR vessels and others appropriate to nature of petroleum activities.
Key activities	Operation of the Julimar Field Production System (including routine testing of the wells and subsea infrastructure performed from the Wheatstone Platform), which includes: • Julimar and Brunello wells (up to 14 wells) • subsea inspections and surveys (including use of ROVs, AUVs and acoustic sensors) • subsea valve testing • seabed intervention for scour protection or stabilisation works (mattress rectification, rock placement, grout bagging activities, etc.) • start-up activities for JDP2 wells and subsea infrastructure.

*ETA wells are managed as per WOMP requirements. Woodside is conducting a detailed review of the subsurface and well barrier status to determine adequacy as permanent barriers.

3.2 Location

The Petroleum Activities Program is located in Commonwealth waters in the Carnarvon Sub-basin, within licence areas WA-49-L, WA-26-PL and WA-29-PL. Vessel based operations may also be undertaken within the Julimar Exploration Permit WA-356-P and non-Julimar production licence area WA-34-L. The Operational Area (**Figure 3-1**) is about 160 km north-west of Dampier and adjacent to the Wheatstone Platform. The closest landfall to the Petroleum Activities Program is the Montebello Islands, about 46 km south east. Approximate location details for the Petroleum Activities Program are provided in **Table 3-2**.

Table 3-2: Julimar and Associated Infrastructure Locations and Petroleum Permits

Activity	Water depth (Approx. in LAT)	Latitude (WGS84)	Longitude (WGS84)	Production licence
Well and centre locations (Figure 3-2)				
BruA-2	149 m	20°01’49.1571” S	115°12’05.6357” E	WA-49-L
BruA-3	149 m	20°01’47.8720” S	115°12’07.0511” E	WA-49-L
BruA-4	149 m	20°01’48.1207” S	115°12’07.5964” E	WA-49-L
BruA-5	149 m	20°01’49.6633” S	115°12’05.7596” E	WA-49-L
BruA-6	149 m	20°01’48.4958” S	115°12’07.8942” E	WA-49-L
JULA-01	174 m	20° 08’ 52.996” S	115° 02’ 28.377” E	WA-49-L
JULA02	174 m	20° 08’ 52.222” S	115° 02’ 26.436” E	WA-49-L
JULA04	174 m	20° 08’ 53.554” S	115° 02’ 28.078” E	WA-49-L
Pipeline/flowline route corridor location (Figure 3-2)				
Brunello, Julimar, MEG pipeline/ production flowline corridor	148 m (start) 71 m (end)	20°01’51.7586” S (start) 19°55'45.776" S (end)	115°12’11.3265” E (start) 115°23'02.215" E (end)	WA-26-PL
JDP2 Flowline / Umbilical Route	145 m (start) 174 m (end)	20° 01 '53.43” S (start) 20° 08 '52.917” S (end)	115° 12 '09.28” E (start) 115° 02 '27.23” E (end)	WA-29-PL
Manifolds				
BruA manifold	149 m	20°01’49.0788” S	115°12’06.8670” E	WA-49-L
BruA Crossover manifold (BruA XOM)	149 m	20°01’51.1115” S	115°12’09.0653” E	WA-49-L
JULA manifold	174 m	20° 08 '52.917” S	115°02 '27.23” E	WA-49-L
Inline T Assembly	167 m	20° 07 '36.11” S	115°04 '12.23” E	WA-49-L
Exploration Wells Temporary Abandoned				
Julimar East – 1	174 m	20°6'23.209992" S	115°5'7.969992" E	WA-49-L
Julimar Southeast – 1	156 m	20°9'7.049988" S	115°3'58.889988" E	WA-49-L
Grange – 1 – WA	177 m	20°5'8.369988" S	115°5'40.740000" E	WA-49-L
Brulimar – 1	171 m	20°0'18.264996" S	115°11'4.989012" E	WA-49-L
Brunello – 1ST1	151 m	20°3'1.964016" S	115°10'25.358988" E	WA-49-L
Balnaves Deep – 1	135 m	20°4'58.212984" S	115°10'34.191984" E	WA-49-L

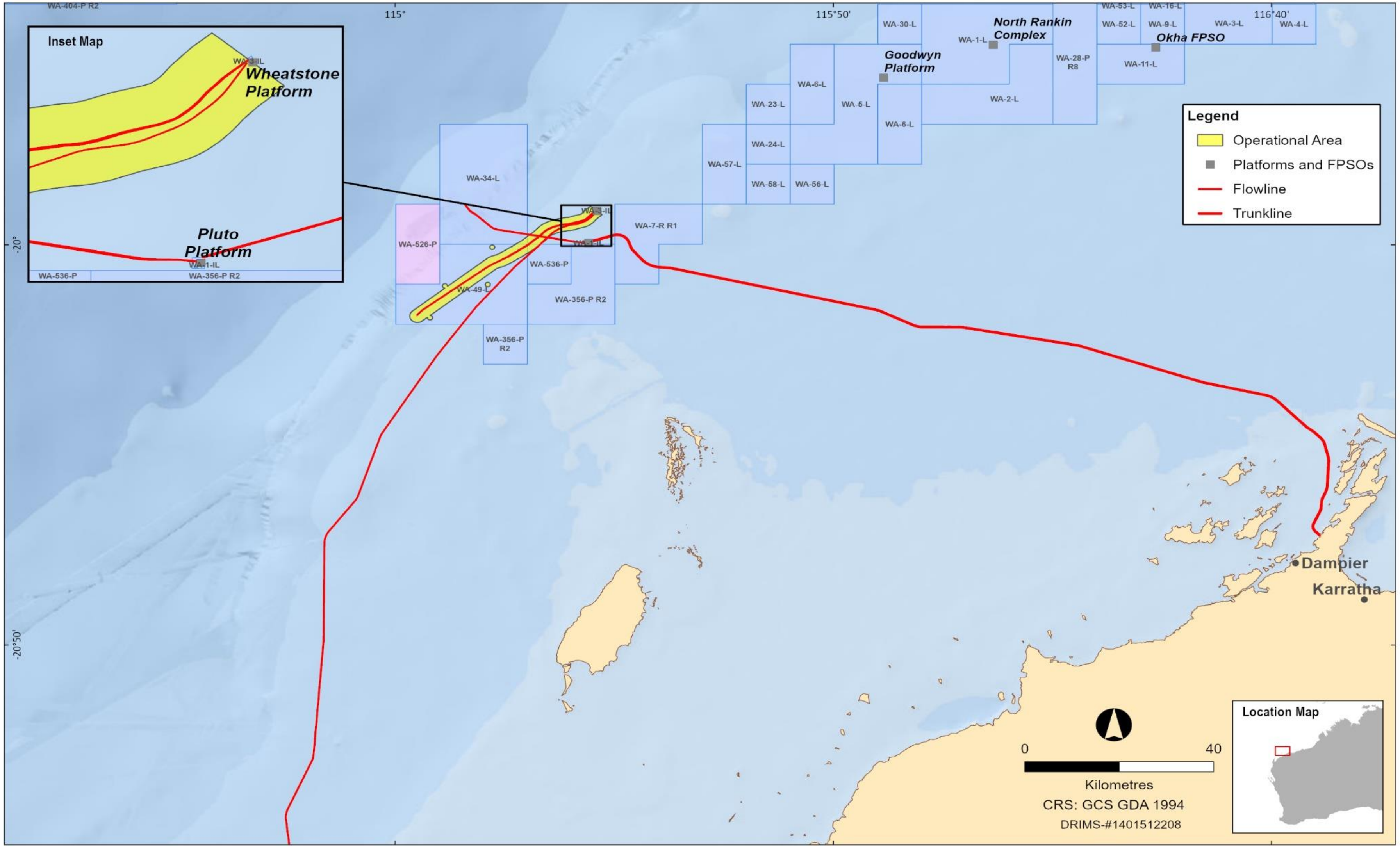


Figure 3-1: Julimar Operational Area

3.3 Operational Area

The Operational Area defines the spatial boundary of the Petroleum Activities Program (**Figure 3-1**), as described, risk assessed and managed by this EP, including vessel related petroleum activities within the Operational Area[4].

For the purposes of this EP the following Operational Area applies:

- The subsea infrastructure, including wells and flowlines/pipeline, and an area within 1500 m of this infrastructure.
- The Operational Area is about 44 km long, extending along the length of WA-26-PL and WA-29-
- An area of 500 m around each of the ETA wells (noting that two are fully within the Operational Area for the subsea infrastructure).

Existing facilities with infrastructure within the Julimar Operational Area include:

- Sections of the Woodside Pluto subsea infrastructure which intersects the lines (including the production flowlines and MEG pipeline), as described in the Pluto Offshore Facility Operations Environment Plan.
- The Wheatstone Platform and associated subsea infrastructure, as described in the Start-Up and Operations Environment Plan: Wheatstone Project.

3.4 Timing

The Julimar Field Production System commenced production in 2016 and operates 24 hours a day, 365 days a year.

The Brunello and Julimar Fields are predicted to remain active for the life of this EP.

3.5 Activity Components

3.5.1 Field Inventory

The layout of the Julimar Field Production System infrastructure, including location of Brunello and Julimar drill centres, is shown in **Figure 3-2.** The inventory of subsea infrastructure, within scope of this EP, in WA-49-L, WA-26-PL and WA-29-PL are detailed in **Table 3-3**.

The subsea infrastructure in title is recorded and tracked using a database. This database is updated as equipment is brought into title, which may include new or replacement equipment (**Section 3.5.1; Section 6.6.2**). ROV as found and as left surveys are undertaken to identify the location of items placed on the seabed. At the completion of the IMMR campaign this data is used to update the inventory for the title. Material items dropped to the marine environment and not recovered (See **Section 6.7.5**) are added to the inventory for the title.

[4] Vessels supporting the Petroleum Activities Program operating outside of the Operational Area (e.g. transiting to and from port) are subject to applicable maritime regulations and other requirements which are not managed under this EP

Table 3-3: Inventory of wells and subsea infrastructure, including status

Infrastructure	Status[1]
2 x 22 km 18" Julimar/Brunello flowlines/pipeline	Maintained for production
1 x 22 km 18" JDP2 flowline	Maintained for production
Horizontal spools and vertical jumpers	Maintained for production
Eight production wells with Xmas trees, with provision for further six	Maintained for production
Three production manifolds (BruA PM, JULA, BruA XOM)	Maintained for production
Electrical, hydraulic and optical flying leads	Maintained for production
Electro-hydraulic umbilicals and associated structures	Maintained for production
Tie-in structures and skids /pipeline end terminations	Maintained for production
Adjustable pipe support structures	Maintained for production
Flowline deflection initiators	Maintained for production
Six exploration wells	Temporary abandoned

[1]Status at time of submission of this EP (Revision 5)

The Julimar subsea system has been designed, fabricated and installed in accordance with best practice and international standards. The Julimar subsea and pipeline components are lined internally with a corrosion resistant alloy (CRA) which aims to prevent corrosion and pinhole leak failure mechanisms. The pipelines, flowlines and wells are marked on nautical charts.

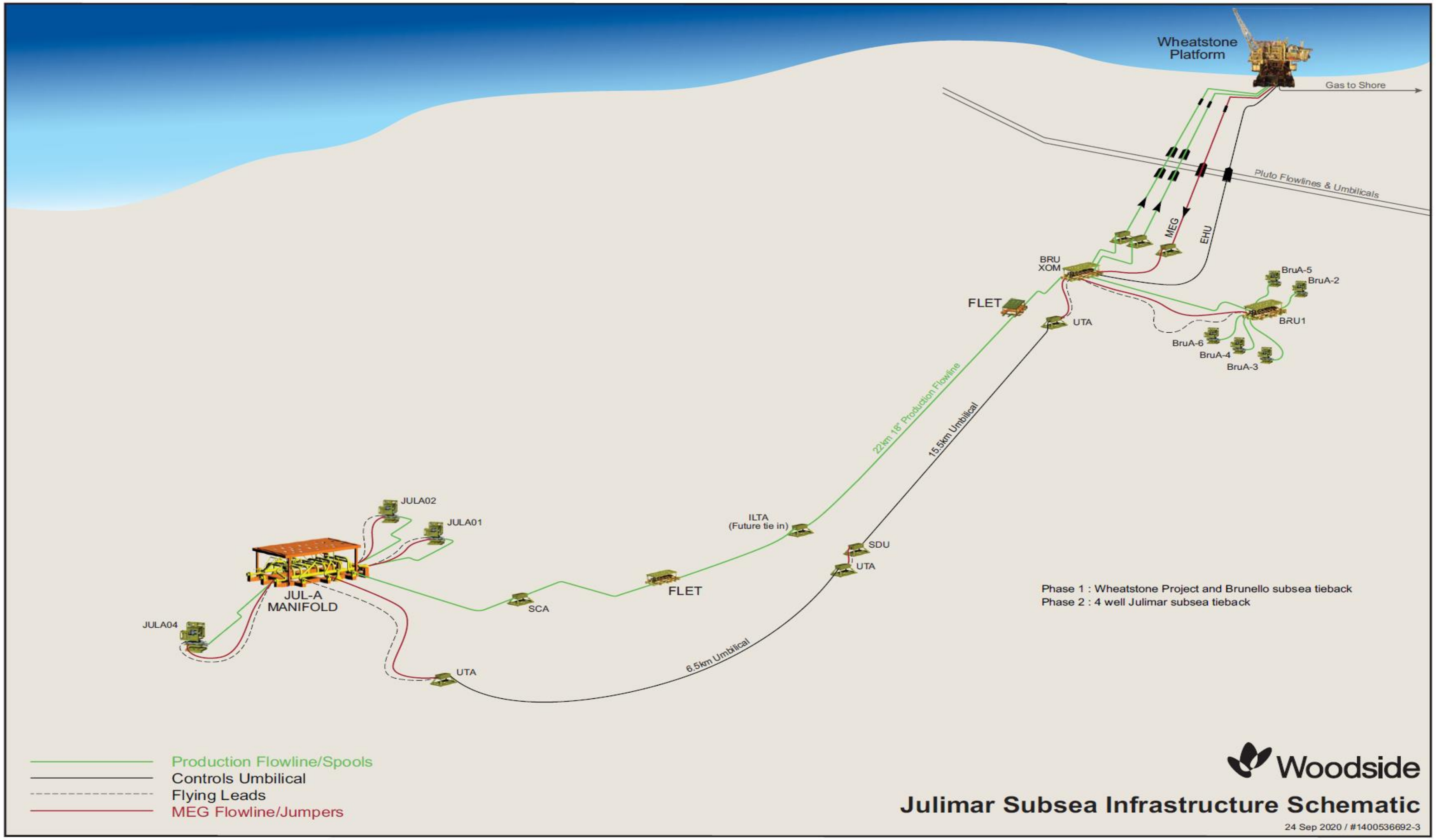


Figure 3-2: Julimar Field Overview

3.5.2 Julimar Phase 2 Start-up

The start-up activities associated with the Julimar Phase 2 wells and associated subsea infrastructure are planned to commence mid-2021. All activities may be subject to rescheduling, including delay, based on operational requirements of the Wheatstone Platform or other operational requirements, and external influences such as weather.

Activities for cold commissioning of the Julimar Phase 2 subsea infrastructure are covered under the *Julimar Phase 2 Drilling and Subsea Installation EP* (Rev. 2), up to the point of nitrogen packing the system ready for the introduction of hydrocarbons including clean-up of wells to maximum rates. Once hydrocarbons have been introduced into the system (hot commissioning), nitrogen is displaced to the Wheatstone platform. A support vessel will be in the field during this time assisting with start-up activities, including opening process isolation valves with a remotely operated vehicle (ROV).

3.5.3 Steady State Production Operations

In steady state production, hydrocarbon gas, condensate and water are produced from the Brunello and Julimar fields into Xmas Trees prior to comingling at the BruA XOM (**Figure 3-2**). Eight wells are currently planned to produce from the field. This EP also includes provision for production from a further three wells that may be tied in to the eight slot BruA production manifold and three wells in to the six slot JULA production manifold.

Production fluids flow into a separator on the Wheatstone Platform. Separated gas, condensate and produced water (PW) streams are metered prior to combining with the Wheatstone production streams. Emissions and discharges from the Wheatstone Platform are managed under the *Start-Up and Operations Environment Plan: Wheatstone Project*.

Combined dehydrated gas and dewatered condensate enter the trunkline for onshore plant supply, which is outside the scope of this EP.

3.5.4 Temporary Abandoned Wells

There are six ETA wells in WA-49-L that are not tied back to the Julimar Field Production System and have no associated infrastructure (i.e. Xmas tree). The wells are managed under NOPSEMA accepted Well Operations Management Plans (WOMP) and maintained as per a set IMMR activity schedule. The integrity of all abandoned wells is assessed prior to abandonment and the abandoned wells are monitored and inspected based on the assessed risk (**Section 3.9.1**).

In line with the WOMP commitment relating to ETA wells, Woodside has completed a detailed subsurface/technical assessment of each well. This has concluded that the ETA wells have been abandoned according to the relevant regulatory requirements, including permanent downhole barriers. WOMPs to enable final NOPSEMA assessment and subsequent abandonment applications are being progressed. The process has commenced with Balnaves Deep – 1, with the Balnaves Deep-1 WOMP submitted to NOPSEMA in 2020. The intention is for remaining ETA wells to be included in a WOMP to be submitted the first half of 2021.

Decommissioning of the ETA wellheads cannot progress until the related WOMPs have been accepted. However, planning for ETA wellhead decommissioning shall be premised upon removal as the base case, with consideration of the principles of ALARP and acceptability. Once WOMPs are accepted and the activity is defined, an EP will be submitted for the decommissioning activity. The anticipated submission date for the ETA wellhead decommissioning EP is 2022.

3.6 Support Vessels Operations

Vessels are utilised in a support capacity for field work such as subsea IMMR and start-up activities. The length of time that vessels are in field varies depending on the nature of the activity. Vessels supporting the activities vary depending on operational requirements, vessel schedules, capability and availability. The specifications of the *Fugro Etive* (**Figure 3-3**) are presented in **Table 3-4** as an example and represent the typical specifications of a support vessel.

Figure 3-3: Typical Operational Support Vessel (*Fugro Etive*)

All vessels are typically required to undergo a Woodside Marine Assurance inspection to review compliance with marine laws and Woodside safety and environment requirements. Refer to **Section 7.1.3.5** for a summary of the marine assurance process.

Support vessels have appropriate lighting to ensure a safe working environment. They also have appropriate navigational lighting as per maritime requirements. Light and noise emissions may be generated by temporary subsea ROV and transponder (positioning) activities.

Typical support vessels use a dynamic positioning (DP) system in combination with satellite navigation to allow manoeuvrability, maintain position and avoid anchoring when undertaking works due to the proximity of subsea infrastructure. Vessels are equipped with anchors which may be deployed in the event of an emergency.

Table 3-4: Indicative Operational Support Vessel Specifications (*Fugro Etive*)

Attribute	Details
Type	Operational support vessel
Length overall (LOA)	92.95 m
Breadth	19.70 m
Depth	7.7 m
Gross tonnage	4926 Te
Accommodation	100
Dynamic positioning system	DP2
Fuel Capacity	2225 m^3 (241 m^3 largest isolated diesel tank)

3.7 Helicopter Operations

Helicopters may be used to transport specialist personnel and/or urgent freight to/from the activity vessels. They may also be used as a means of evacuating personnel in the event of an emergency. Helicopter support is principally supplied from Karratha Airport. Helicopter use for the activity is limited to occasional periods of short duration when vessels are present within the Operational Area.

3.8 Chemical Usage

Production chemicals are utilised for purposes such as scale inhibition and prevention of bacterial growth. These may originate from the Wheatstone platform or from a chemical package on a support vessel.

Continuous use chemicals are those that are typically supplied to the Brunello and Julimar fields via Mono Ethylene Glycol (MEG) flowline and umbilicals from the Wheatstone platform and continuously added into the process. These may include:

- MEG - MEG is used as a hydrate inhibitor
- Scale Inhibitor – manages and prevents scale build-up within subsea equipment
- The subsea control fluid, Castrol Transaqua HT2, is used in the subsea control system. The subsea control system is an open-loop system that releases hydraulic fluid by design during valve functioning under steady state operations (about 6 L released per valve actuation)
- Subsea Control Modules (SCM), Control Distribution Units (CDU) and Electrical Flying Leads (EFL) have dielectric fluid to compensate for hydrostatic pressure and protect the electrical components in the subsea control system.

Chemicals that may be used intermittently during subsea IMMR activities are outlined in **Section 3.9.5**.

3.8.1 Environmental Considerations during Chemical Selection, Assessment and Approval

Operational chemicals required by the Petroleum Activities Program are selected and approved in accordance with Woodside's process for selecting and assessing chemicals. This process is used to reduce potential impacts and risks associated with chemical use to ALARP by selecting chemicals with the lowest practicable environmental impacts and risks, subject to technical constraints.

A summary of the environmental requirements of the Chemical Selection and Assessment Environment Guideline is outlined below.

Environmental Selection Criteria

Woodside's process for selecting and assessing chemicals follows the principles outlined in the Offshore Chemical Notification Scheme (OCNS) which manages chemical use and discharge in the United Kingdom (UK) and the Netherlands (background on the OCNS scheme is provided below).

Operational chemicals are selected/assessed in compliance with the Woodside process for selecting and assessing chemicals, specifically:

- Where operational chemicals with an OCNS rating of Gold/Silver/E/D and no OCNS substitution or product warning are selected, or a substance is considered to pose little or no risk to the environment, no further control is required. Such chemicals do not represent a significant impact on the environment under standard use scenarios and therefore are considered ALARP and acceptable.
- If other OCNS-rated or non–OCNS-rated operational chemicals are selected, the chemical is assessed as follows:
  - If there is **no planned discharge** of the operational chemical to the marine environment, written technical verification of the 'no discharge' fate is provided, and no further assessment is required.
  - If there is **planned discharge** of the operational chemical to the marine environment, a further assessment and ALARP justification is conducted.

The ALARP assessment considers chemical toxicity and biodegradation, and bioaccumulation potential, using industry standard classification criteria (Centre for Environment, Fisheries and Aquaculture Science scheme criteria).

If a product has no specific ecotoxicity, biodegradation, or bioaccumulation data available, these options are considered:

- environmental data for analogous products can be referred to where chemical ingredients and composition are largely identical, or
- environmental data may be referenced for each separate chemical ingredient (if known) within the product.

If no environmental data is available for a chemical or if the environmental data does not meet the acceptability criteria outlined above, potential alternatives for the chemical are investigated, with preference for options with a hazard quotient (HQ) band of Gold or Silver, or in OCNS Group E or D with no substitution or product warnings.

If no more environmentally suitable alternatives are available, further risk-reduction measures (e.g. controls related to use and discharge) are considered for the specific context and implemented where relevant to ensure the risk is ALARP and acceptable.

Once the further assessment/ALARP justification has been completed, confirmation that the environmental risk as a result of chemical use is ALARP and acceptable is obtained from the relevant manager.

Background Overview of OCNS

The OCNS applies the requirements of the Oslo–Paris 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 chemical management.

All chemical substances listed on the OCNS list of registered products have an assigned ranking based on toxicity and other relevant parameters (e.g. biodegradation, bioaccumulation), in accordance one of two schemes (as shown in **Figure 3-4**):

- **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). Applied to inorganic substances, hydraulic fluids, and pipeline chemicals only.

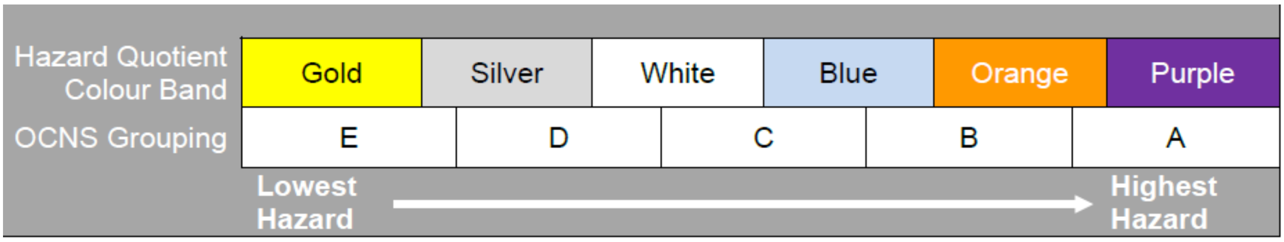


Figure 3-4: Offshore Chemical Notification Scheme Ranking

3.9 Subsea Inspection, Monitoring, Maintenance, and Repair Activities

Subsea infrastructure is designed not to require significant intervention. Inspection and maintenance are undertaken to ensure the integrity of the infrastructure and identify problems before they present a risk of loss of containment. Intervention may be required to repair identified problems. The IMMR activities for subsea infrastructure, including any redundant equipment (**Section 3.9.4**), maintains equipment in good condition and repair, for production and to enable future removal.

Subsea activities are typically undertaken from an IMMR support vessel (ISV) and may use ROV with transponders or autonomous underwater vehicles (AUV). Subsea activities can be broadly categorised into Inspection, Monitoring, Maintenance and Repair activities.

Maintenance and repair activities may require the deployment of frames/baskets which are temporarily placed on the seabed. These typically have a perforated base with a seabed footprint of about 15 m^2. This temporary equipment is removed from field via recovery to project vessels at the completion of IMMR activities.

Typical IMMR activities are described below.

3.9.1 Inspections

Inspection of subsea infrastructure, including ETA wellheads, is the process of physical verification and assessment of components in order to detect changes to the as-installed location and condition by comparison to initial state following installation and previous inspections. Details of typical subsea infrastructure inspections/surveys and frequencies are provided in **Table 3-5**. However, scope and frequency of subsea, ETA wellheads and pipeline inspections are determined using a Risk Based Inspection (RBI) methodology and associated plans.

Table 3-5: Typical Subsea Infrastructure Inspections/Surveys and frequencies

Type of Inspection/Survey	Subsea infrastructure	Purpose	Approximate Frequency
General Visual Inspection (GVI)	All subsea infrastructure, including ETA wellheads	Check general infrastructure integrity.	Varied – every 2-8 years
Close Visual Inspections (CVI)	Production trees and manifold valves	Investigate certain subsea infrastructure components.	Varied – every 2-6 years
Cathodic Protection (CP)	ETA wellheads	Check for corrosion and renew sacrificial anodes, if required.	Varied – every 2-6 years
Wall Thickness Surveys	Production and crossover manifolds, flowlines and pipelines	Monitor the condition of subsea infrastructure. (i.e. ultrasonic testing).	Typical: Once every 25 years. Worst Case: Once every 5 years
Acoustic survey including Side Scan Sonar (SSS) and Multibeam Sonar (MBES)	Pipelines and spools	Identify buckling, movement, scour and seabed features. Low frequency/ intensity signals undertaken on the flowlines.	Varied – every 1-6 years
Non-Destructive Testing (NDT)	Pipeline and manifolds (if required)	Evaluates the properties of material/items using electromagnetic, radio graphic, acoustic resonance technology, ultrasonic, or magnetic equipment.	Typical: Once every 25 years. Worst Case: Once every 25 years per well
Seabed sampling surveys including minor grabs/cores	NA	Identify benthic fauna, sediment characteristics, determine level of penetration / compaction, etc. Grabs/cores typically disturb 0.1m^2 of seabed per sample.	Typical: Once every 25 years. Worst Case: Once every 5 years
Water sampling surveys	NA	Determine water quality around the pipeline.	Typical: Once every 25 years. Worst Case: Once every 5 years
Anode sampling	Production and crossover manifolds, trees, flowlines and pipelines	Samples taken of anode materials for testing.	Typical: Once every 25 years. Worst Case: Once every 25 years.
Marine growth sampling	All subsea infrastructure	Samples taken of marine growth for testing.	Typical: Once every 25 years. Worst Case: Once every 5 years
Sub bottom profiling	Around subsea components	Low frequency echo sounder undertaken to identify returns of metals under the seabed	Varied – every 1-6 years
Laser surveys	Dimensional check on infrastructure	Used to conduct dimensional checks on spools etc. and measure proximity.	Varied – every 1-6 years

3.9.2 Monitoring

Monitoring of subsea infrastructure refers to the process of surveillance of the physical and chemical environment that a subsea system or component is exposed to, to determine if and when damage may occur, and (where relevant) predict the rate or extent of that damage.

Monitoring activities may include process composition testing, acoustic sand detectors, erosion probes, metocean and geological seismic monitoring, and cathodic protection testing.

3.9.3 Maintenance

Maintenance activities on subsea infrastructure are those required at regular or planned intervals to prevent deterioration or integrity failure of infrastructure. Typical maintenance activities are described in **Table 3-6**.

Table 3-6: Typical maintenance activities and frequencies

Type of maintenance	Subsea infrastructure	Purpose	Approximate Frequency
Cycling of valves	Wells	Test functionality of technical integrity valves.	Every 6 months
Marine growth removal	Production and cross over manifolds and retrieval components (e.g. chokes)	Reduce weight or gain visual access	Based on outcomes from visual inspections (**Table 3-5**) and marine growth trends on regional infrastructure.
Flushing of chemical hydraulic fluid lines	Hydraulic fluid lines	For repair scenarios	When required for repair.
Leak and pressure testing	All subsea infrastructure	Test integrity of subsea infrastructure.	Following installation of subsea infrastructure components after a repair or intervention, prior to return to service.

3.9.4 Repair

Repair activities are those required when a subsea system or component is degraded, damaged or has deteriorated to a level outside of acceptance limits. Damage sustained may not necessarily pose an immediate threat to continued system integrity but may present an elevated level of risk to environment or production reliability. Due to the design of subsea infrastructure and materials used, repairs will be undertaken on an as needs basis. The requirements and frequency of these repairs will be dictated by the outcome of the inspection and maintenance regimes described in Table 3-5 and Table 3-6. Typical subsea repair activities included but not limited to, are described below.

- subsea choke replacement
- chemical injection metering valve insert replacement
- subsea control module (SCM) or Control Distribution Unit (CDU) replacement
- hydraulic flying lead (HFL) replacement
- electrical flying lead (EFL) replacement
- pipeline or spool support with grout bag or mattress
- spool disconnection and/or replacement
- umbilical jumper replacement and/or relocation
- flowline/pipeline replacement
- scour prevention installation
- cathodic Protection System replenishment/repair.

When equipment is replaced, the redundant equipment, may remain in-situ or be removed from the field. The location of redundant subsea infrastructure items is recorded as part of the ROV as left survey and input into the database for the inventory for WA-49-L (Refer Section 6.6.2; EPS 2.2). The inventory is used to track equipment on the seabed to enable planning for future removal. Currently, there is no redundant equipment in the Operational Area.

3.9.5 Chemical Usage During IMMR Activities

IMMR chemicals for intermittent use typically originate from a chemical package located onboard a support vessel during specific activities, and may typically include:

- dye - chemical dyes incorporated in the subsea control fluid used to identify the source of a leak
- acid – acetic or sulfamic acid (or equivalent) which removes calcium deposits
- grout - the material used in grout, mattresses, and rock is typically concrete-based
- preservation fluids – chemicals used to preserve subsea infrastructure if scope requires subsea infrastructure replacement. Chemicals typically used may include MEG, corrosion inhibitor, oxygen scavenger and biocide.

Typical Discharges During IMMR Activities

Minor environmental discharges are expected during subsea IMMR activities (e.g. during pressure/leak testing or flushing). Where practicable, flushing is performed before a subsea component is disconnected to reduce residual hydrocarbon or chemical releases to the environment upon disconnection; instead returning fluids to the Wheatstone platform. Flushing may be supplied from either the Wheatstone platform or via a support vessel. **Table 3-7** lists typical discharge volumes during different IMMR activities.

Table 3-7: Typical Discharge Volumes During Different IMMR and Subsea Activities

Activity	Typical Discharge
Pressure/leak testing and investigation	Chemical dye <10 L
Flushing	Residual hydrocarbon or chemical release (corrosion inhibitor and oxygen scavenger) volume depends on injection port size, component geometry, and pumping rates
Hot stab change-out	Hydrocarbons or subsea control fluid <10 L.
SCM changeout	Typical releases: acid about 400 L; subsea control fluid about 10 L.
Umbilical replacement	Typical releases of hydraulic fluid, MEG and scale inhibitor are estimated to be <10 L each
Choke change out	Release of hydrocarbons <10 L and a typical release of MEG is estimated to be 280 L
Flowline or spools repair, replacement, and recovery	Typical release of hydrocarbon or other chemicals depends on equipment configuration and flushing ability. This will be subject to an ALARP determination for the activity, as per normal practice

3.9.6 Marine Growth Removal

Due to the relatively high rate of marine growth in the Julimar and Brunello fields, excess growth may need to be removed before undertaking many subsea IMMR activities. **Table 3-8** lists the different techniques used.

Table 3-8: Marine Growth Removal Methods

Activity/Equipment	Description
Water jetting	Uses high pressure water stream to remove marine growth
Brush systems	Uses brushes attached to an ROV or AUV to physically remove marine growth

Activity/Equipment	Description
Acid (typically sulfamic or acetic acid)	Chemically dissolves calcium deposits. Volume used is dependent on the amount of marine growth to remove.

3.9.7 Sediment Relocation and Disturbance

If sediment builds up around subsea infrastructure, an ROV-mounted suction pump/dredging unit may be used to relocate the sediment to allow inspection/works to be undertaken. This activity is limited to relocating small amounts of sediment material in the immediate vicinity of the subsea infrastructure (i.e. within the existing footprint). Sediment relocation typically results in minor seabed disturbance and some localised turbidity.

If it is determined that anode skids are required for corrosion protection, they are placed on the seabed using a support vessel crane. A typical anode skid has a seabed footprint of about 8 m^2.

3.9.8 Pressure and Leak Testing

Pressure testing is undertaken to test the integrity of subsea infrastructure, test isolations and identify any leaks. Pressure testing is typically done after construction and prior to normal operation. In the operation phase, there are no planned pressure tests for the Julimar subsea system. If required, pressure is usually applied to the component from the production system but can also be applied via a downline from a support vessel.

Pressure in the isolated section of pipeline or subsea component is monitored to check for any drop-in pressure and review of locations of leaks detected by visual inspection. This is undertaken by flushing the line with a small volume of a chemical dye and an ROV or AUV will be used to locate and observe the leak. A typical release of chemical dye during leak testing is estimated to be between 2 L and 10 L.

4 DESCRIPTION OF THE ENVIRONMENT

4.1 Overview

In accordance with Regulation 13(2) and 13(3) of the Environment Regulations, a description of the EMBA by the activity (both planned and unplanned activities) as defined in **Section 2.4.2** and described in **Section 3**, including details of the particular relevant values and sensitivities of the environment, is provided in this section and has been used to inform the impact and risk assessments (**Section 6**).

The EMBA is the largest spatial extent where unplanned events could have an environmental consequence. For this EP the EMBA is the potential spatial extent of surface and in-water (dissolved and entrained) hydrocarbons at concentrations above ecological impact thresholds and in the event of the worst-case credible spill scenario; a loss or well containment. The ecological impact thresholds used to delineate the EMBA are defined in **Table 4-1** and **Section 6.7.1**. The EMBA also includes any areas predicted to experience shoreline accumulation of hydrocarbons at or above the threshold concentration defined in **Table 4-1**, however; there is no shoreline accumulation at or above this concentration for this worst-case credible spill scenario.

Woodside recognises that surface hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds. Hydrocarbons visible at these thresholds 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 socio-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, National and Commonwealth heritage listed places, areas of tourism and recreation and commercial and traditional fisheries. The EMBA and socio-cultural EMBA are shown on **Figure 4-1** and detailed in **Table 4-1**. It is noted that the socio-cultural EMBA is fully within the boundaries of the EMBA for ecological impacts (see **Figure 4-1**). As such, no additional values and sensitivities have been described in this EP specific to the socio-cultural EMBA.

It should be noted that the hydrocarbon fates presented in **Figure 4-1** do not represent the predicted coverage of any one hydrocarbon spill or a depiction of a surface slick or in-water plume at any particular instant in time. Rather, the contours are a composite of a large number of theoretical trajectories for the three hydrocarbon fates, integrated over the full duration of simulations run under various metocean conditions.

Table 4-1: Hydrocarbon Spill Thresholds used to Define the Ecological EMBA, Socio-cultural EMBA and Planning Area for Scientific Monitoring

<table>
<tr><th>Hydrocarbon Type</th><th>EMBA</th><th>Socio-cultural EMBA</th><th>Planning Area for Scientific Monitoring</th></tr>
<tr><td>Surface</td><td>10 g/m²
This represents the minimum oil thickness (0.01 mm) at which ecological impacts (e.g. impacts to flora and fauna) are expected to occur.</td><td colspan="2">1 g/m²
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 area is fully within the EMBA.
This low exposure value also establishes planning area for scientific monitoring (NOPSEMA guidance note: A652993, April 2019).</td></tr>
<tr><td>Dissolved</td><td colspan="2">50 ppb
This represents potential toxic effects, particularly sublethal effects to highly sensitive species.
As entrained and dissolved hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors are associated with ecological impacts. Therefore, dissolved and entrained at this threshold also represents the level at which sociocultural impacts may occur.</td><td rowspan="2">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 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.</td></tr>
<tr><td>Entrained</td><td colspan="2">100 ppb
This represents potential toxic effects, particularly sublethal effects to sensitive species.
As entrained and dissolved hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors are associated with ecological impacts. Therefore, dissolved and entrained at this threshold also represents the level at which sociocultural impacts may occur.</td></tr>
<tr><td>Shoreline accumulation</td><td>100 g/m²
This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.</td><td>10 g/m²
This represents the volume where hydrocarbons may be visible on the shoreline but is below concentrations at which ecological impacts are expected to occur. This area is shown and considered in the EMBA.</td><td>N/A</td></tr>
</table>

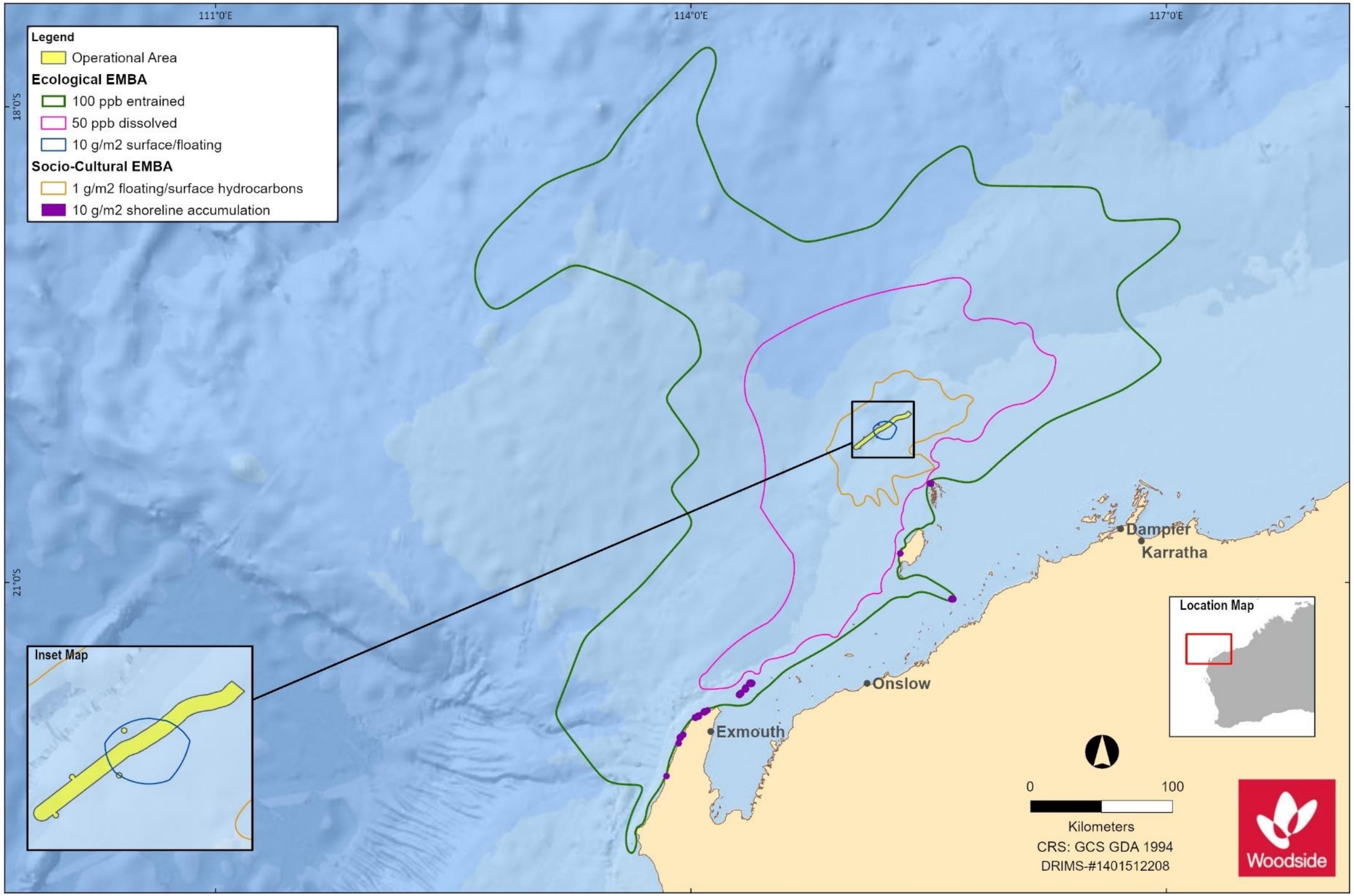


Figure 4-1: The Ecological and Socio-Cultural EMBAs for Each of the Relevant Hydrocarbon Fates According to the Adopted Thresholds for the Worst-case Scenario; a Loss of Well Containment

4.2 Summary of Key Existing Environment Characteristics

A summary of the key existing environment characteristics, consistent with the process of identifying and describing the existing environment in relation to the 'nature and scale' of the activity (refer **Section 2.4.2**), is provided in **Table 4-2**. The key existing environment characteristics in **Table 4-2** are described with regard to both the Operational Area (defined in **Section 3.3**) and the EMBA (as defined above in **Section 4.1**).

Table 4-2: Summary of the Key Environment Characteristics of the Operational Area and EMBA

Sensitive Receptor		EP Section	Description
Physical Environment	***Meteorology***	***4.5.1***	*Operational Area and EMBA* • Tropical monsoon climate with distinct dry (winter) and wet (summer) season, with rainfall occurring during the late summer months. • Tropical cyclones are common during the wet (summer) season. • Winds in the North-west Marine Region (NWMR) vary seasonally with summer south-westerly winds and winter south-easterly winds.
	Oceanography	***4.5.2***	*Operational Area and EMBA* • The NWMR experiences large-scale ocean circulation influenced by the Indonesian Through Flow (ITF) current, Leeuwin Current, Holloway Current, Ningaloo Current, internal tides and cyclones. • Semi-diurnal tides with large tidal variations occur within the NWMR.
	Seawater characteristics	***4.5.3***	*Operational Area* • Seawater temperatures are relatively warm and range seasonally from an average of 24.3°C to 28.5°C near the Pluto Platform (4 km from the Operational Area). *EMBA* • Currents within the NWMR contribute to the seawater temperature and salinity variability. • There is a greater stratification of water column characteristics during summer.
	Bathymetry	***4.5.4***	*Operational Area* • The Operational Area is located in depths between about 71 and 174 m. • The seabed is primarily smooth and regular substrate with an incline of 0.5° *EMBA* • Bathymetry of the wider NWMR is characterised by four distinct zones; the inner continental shelf, the middle continental shelf, the outer shelf/continental slope and the abyssal plain.

Sensitive Receptor		EP Section	Description
	Marine sediment	***4.5.5***	*Operational Area* • Sediments are primarily silty, fine to medium grain calcareous sands that increase in size as depth increases. *EMBA* • Sediments within the NWMR are comprised of bioclastic (i.e. derived from skeletal fossil fragments), calcareous (i.e. derived from calcium carbonate) and organogenic (i.e. derived from living organisms) sediments.
	Air quality	***4.5.6***	*Operational Area and EMBA* • The ambient air quality of the Operational Area and wider offshore region is expected to be of high quality.
Habitats and Communities	***Plankton***	***4.6.1.1***	*Operational Area* • Plankton abundance and diversity within the Operational Area is generally expected to reflect that of the NWMR. *EMBA* • Notable location of seasonal plankton abundance within the EMBA is at Ningaloo Reef, peak primary productivity occurring in late summer/early autumn along the shelf edge.
	Benthic infauna and epifauna	***4.6.1.2***	*Operational Area and EMBA* • Benthic epifauna associated with soft sediment within the Operational Area include sparsely distributed filter and deposit feeding invertebrates. These numbers increase where the seabed includes hard substrate as recorded for the east and north east of the Operational Area. • The Operational Area overlaps with the Ancient Coastline at the 125 m depth contour Key Ecological Feature (KEF). This KEF is a unique seafloor feature with ecological properties of regional significance. • The benthic infauna and epifauna found within the Operational Area are representative of the wider NWMR (and EMBA).

Sensitive Receptor		EP Section	Description
	Benthic primary producers	***4.6.1.3***	*Operational Area* • Given the water depth of the Operational Area and seabed habitat depth is beyond the phototrophic zone, ecologically sensitive primary producers (seagrasses, macroalgae, reef-building corals) do not occur. *EMBA* • Coral reef habitats within the EMBA include the submerged shoal feature Rankin Bank, shallow fringing reefs surrounding the Montebello Islands and Barrow Island protected areas, Muiron Islands and the Ningaloo Coast. • Seagrass beds and macroalgae habitats occur in the shallow waters surrounding the Montebello Islands and Barrow Island, Pilbara Island Groups, Muiron Islands and along the Ningaloo Coast. • The closest mangrove habitats to the Operational Area (within the EMBA) are located along the coastline of the Montebello Islands and Barrow Island and the two locations of the Ningaloo Coast.
	Pelagic and demersal fish communities	***4.6.1.4***	*Operational Area* • Benthic habitats of the Operational Area are not expected to support a high diversity of demersal fish species. Surveys have found some demersal fish are present at the hard substrate outcrops and associated with existing petroleum infrastructure. *EMBA* • Rankin Bank is the nearest location to the Operational Area identified as supporting high demersal fish richness and abundance. Additionally, the EMBA overlaps with the Continental slope demersal fish communities KEF which features high levels of demersal fish endemism.
Matters of National Environmental Significance	***Biologically Important Areas***	***4.6.2.2***	*Operational Area* • Biologically Important Areas (BIAs) that overlap the Operational Area include those for the pygmy blue whale, whale shark, wedge-tailed shearwater and flatback turtle. *EMBA* • There are BIAs for a number of species within the EMBA, including marine turtles, dugong, whales (the pygmy blue whale and humpback whale), the whale shark and seabirds and migratory shorebirds.
	Habitat Critical to the Survival of a Species	***4.6.2.3***	*Operational Area* • There are no habitats critical to the survival of marine turtle species within the Operational Area. *EMBA* • Within the EMBA there are a number of habitats critical to the survival of marine turtles.

Sensitive Receptor		EP Section	Description
	Critical Habitat – EPBC Act Listed	***4.6.2.5***	*Operational Area and EMBA* There are no Critical Habitats listed under the EPBC Act within the Operational Area or EMBA.
	Key Ecological Features	***4.6.2.6***	*Operational Area* • There is one KEF mapped as overlapping the Operational Area; the Ancient coastline at the 125 m depth contour. *EMBA* • The EMBA overlaps with five additional KEFs; the Continental slope demersal fish communities, Exmouth plateau, Canyons linking the Cuvier abyssal plain with the Cape Range Peninsula, Glomar Shoal and Commonwealth waters adjacent to Ningaloo Reef.
	Threatened Ecological Communities	***4.6.2.7***	*Operational Area and EMBA* There are no Threatened Ecological Communities (TECs) within the Operational Area or EMBA.
	Ramsar Wetlands	***4.6.2.8***	*Operational Area and EMBA* There are no Ramsar Wetlands within the Operational Area or EMBA.
	Marine mammals	***4.6.2.9***	*Operational Area and EMBA* There are a number of EPBC Act Listed Threatened, Migratory and/or Marine mammal species that may occur within the Operational Area and/or EMBA, including the humpback whale and pygmy blue whale.
	Marine turtles	***4.6.2.9***	*Operational Area and EMBA* Five EPBC Act listed Threatened and migratory marine turtle species may occur within the Operational Area and/or EMBA; the hawksbill turtle, loggerhead turtle, green turtle, leatherback turtle and flatback turtle.
	Sea snakes	***4.6.2.9***	*Operational Area and EMBA* Several EPBC Act listed Marine sea snakes may occur within the EMBA, including one listed Threatened species; the short-nosed sea snake.
	Sharks, fish and rays	***4.6.2.9***	*Operational Area and EMBA* Five EPBC Act listed Threatened shark, ray and fish species may occur within the Operational Area and/or EMBA, including the whale shark (Vulnerable and Migratory) and the grey nurse shark (Vulnerable). An additional seven listed Migratory shark, ray or fish species may occur within the EMBA.

Sensitive Receptor		EP Section	Description
	Seabirds and/or migratory shorebirds	***4.6.2.9***	*Operational Area and EMBA* Numerous EPBC Act listed Threatened and/or Migratory seabird and migratory shorebird species may occur within the Operational Area and/or EMBA, including ten Threatened species. A number of the shorebird species utilise the East-Asian Australasian (EAA) Flyway to migrate between resting and breeding grounds (in the northern hemisphere) and utilise WA mainland and island beaches, intertidal and wetland habitats as seasonal staging and resting grounds. There are no emergent lands within the Operational Area that may provide important habitat to seabirds or migratory shorebirds.
Socio-economic	***Cultural heritage***	***4.7.1***	*Operational Area* • There are no known sites of Commonwealth, National, World or cultural heritage within the Operational Area. *EMBA* • One registered aboriginal site was identified as occurring within the EMBA according to the Aboriginal Heritage Inquiry System (AHIS). • The Ningaloo Coast, within the EMBA, is a World Heritage Area (WHA; the Ningaloo Coast WHA), a Commonwealth Heritage Place (Ningaloo Marine Area – Commonwealth Waters) and a National Heritage Place (the Ningaloo Coast). The other National heritage Places within the EMBA are the Barrow Island and Montebello-Barrow Islands Marine Conservation Reserves. • There are a number of shipwrecks within the EMBA, including six within 35 km of the Operational Area.
	Commercial fisheries	***4.7.2***	*Operational Area* • Thirteen State managed commercial fisheries overlap the Operational Area. • Three Commonwealth managed commercial fisheries overlap the Operational Area. • There are no aquaculture activities known to occur within the Operational Area. *EMBA* • There are a number of State and Commonwealth managed commercial fisheries located within the EMBA (refer to **Table 4-12**). • There are no known pearling leases within the EMBA and aquaculture within the Gascoyne and Pilbara regions is typically confined to coastal areas.

Sensitive Receptor		EP Section	Description
	Traditional fisheries	***4.7.4***	*Operational Area and EMBA* There are no known traditional or customary fisheries within the Operational Area, however fishing has historically occurred at the Montebello Islands, the Ningaloo region and adjacent foreshores within the EMBA.
	Tourism and recreation	***4.7.5***	*Operational Area* • No tourism activities are known to take place within the Operational Area. *EMBA* • Recreation and tourism within the EMBA includes fishing, boating and ecotourism primarily in shallow, coastal waters.
	Commercial shipping	***4.7.6***	*Operational Area and EMBA* • No vessel marine fairways intersect with the Operational Area. Some marine fairways occur within the EMBA. • Major shipping routes in the vicinity of the Operational Area are associated with entering the ports of Dampier and Barrow Island.
	Existing petroleum facilities	***4.7.7***	*Operational Area and EMBA* The Operational Area is located within the North West Shelf (NWS), an area with established oil and gas operations. There is existing petroleum infrastructure within the Operational Area (associated with the Pluto and Wheatstone Platforms) and a number of facilities within the EMBA.
	Defence activities	***4.7.8***	*Operational Area and EMBA* • The Operational Area overlaps a Military Flying area and the EMBA overlaps an additional Military Flying area and a Firing zone.

<table>
<tr><th colspan="2">Sensitive Receptor</th><th>EP Section</th><th>Description</th></tr>
<tr><td rowspan="3">Other Values and Sensitivities</td><td>Australian Marine Parks</td><td>4.8.1</td><td>Operational Area
There is one AMP that overlaps with Operational Area; the Montebello Marine Park Multiple Use Zone (IUCN VI).
EMBA
There are three AMPs within the EMBA:
• Montebello Marine Park
• Gascoyne Marine Park
• Ningaloo Marine Park</td></tr>
<tr><td>State managed marine parks and terrestrial reserves</td><td>4.8.2</td><td>Operational Area
There are no State managed marine parks or terrestrial reserves within the Operational Area.
EMBA
The following marine and terrestrial parks and reserves are within the EMBA:
• Barrow Island Marine Park and Marine Management Area
• Barrow Island Nature Reserve
• Montebello Islands Marine Park
• Montebello Islands Conservation Park
• Muiron Islands Nature Reserve
• Pilbara Islands Nature Reserves
• Ningaloo Marine Park</td></tr>
<tr><td>Shoals, banks and reefs</td><td>4.8.4</td><td>Operational Area
There are no shoals, banks or reefs within the Operational Area.
EMBA
• Rankin Bank and Glomar Shoal are located within the EMBA. These shoals feature benthic habitats such as consolidated reef and algae habitat, hard corals and unconsolidated sand/silt which support benthic communities such as macroalgae, soft corals, sponges. These shoals feature high fish abundance and diversity.</td></tr>
</table>

4.3 Summary of Matters of National Environmental Significance

There are nine categories of MNES listed under the EPBC Act. These nine categories, and whether they are relevant to the Operational Area or EMBA, are listed in **Table 4-3** and **Table 4-4** respectively.

The MNES relevant to the Operational and EMBA are described within this section.

Table 4-3: Matters of National Environmental Significance within the Operational Area

MNES Category	Presence within Operational Area
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance	None
Commonwealth Marine Area	1 Exclusive Economic Zone and Territorial Sea
Listed Threatened Ecological Communities	None
Listed Threatened Species	19
Listed Migratory Species	4
Great Barrier Reef Marine Park	N/A
Nuclear Actions	N/A
A water resource, in relation to coal seam gas development and large coal mining development.	N/A

Table 4-4: Matters of National Environmental Significance within the EMBA

MNES Category	Presence within EMBA
World Heritage Properties	1
National Heritage Places	1
Wetlands of International Importance	None
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	None
Listed Threatened Species	26
Listed Migratory Species	51
Great Barrier Reef Marine Park	N/A
Nuclear Actions	N/A
A water resource, in relation to coal seam gas development and large coal mining development.	N/A

4.4 Regional Context

The Operational Area and EMBA are located in Commonwealth waters within the NWMR. Within the NWMR, the Operational Area is located primarily in the Northwest Shelf Province, as well as marginally within the Northwest Province (south-western edge of the Operational Area; **Figure 4-2**) as defined under the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0).

The Northwest Shelf Province comprises an 238,759 km^2 expanse of continental shelf waters between North West Cape and Cape Bougainville, including a small portion of continental slope north of Cape Leveque. The provincial bioregion varies in width from about 50 km at the Exmouth Gulf to more than 250 km off Cape Leveque, and primarily (> 45%) features water depths of between 50 and 100 m, although depths reach 200 m (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008a).

The Northwest Shelf Province is characterised by the following biophysical features (DEWHA, 2008a):

- Transitional climatic conditions occur between the dry tropics in the regions south and humid tropics in the regions north. The tropical climate is associated with strong seasonal winds and moderate offshore tropical cyclone activity (average of four per year). The region also features large tides which contribute to vertical mixing of water and sediments, primarily in shallower shelf waters. These physical processes are thought to drive biological productivity in the bioregion.
- Ocean circulation is strongly influenced by the warm, low salinity waters transported by the Indonesian Throughflow (ITF) via the Eastern Gyre and South Equatorial currents. During the summer when the ITF is weaker, south-west winds cause intermittent reversals in currents. These events may be associated with occasional weak upwellings of deeper colder waters onto the shelf. From the south, the Ningaloo Current may also bring waters north as far as Barrow Island during the summer months.
- Surface waters are highly stratified during the summer months (thermocline at between 30 and 60 m), whilst surface waters in the winter are well mixed (thermocline at 120 m).
- The provincial bioregion boasts a number of seafloor features such as shoals, banks and valleys, which feature sedimentology variable to the wider NWMR. Glomar Shoal is noted to be particularly important for fish species within this bioregion due to localised upwelling.
- 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 60–90% of the sediments in the region are carbonate derived (Brewer *et al*., 2007). The distribution and resuspension 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 resuspension and net downslope deposition of sediments.
- The region has high species richness but a relatively low level of endemism, i.e. species particular to the region in comparison to other areas of Australian waters. Furthermore, the majority of the region’s species are tropical and are recorded in other areas of the Indian Ocean and Western Pacific Ocean.
- Benthic communities within the region range from nearshore benthic primary producer (BPP) habitats such as seagrass beds, coral communities and mangrove forests, to offshore soft sediment seabed habitats featuring low density sessile and mobile benthos, such as sponges, molluscs and echinoids.
- Demersal and pelagic fish communities are strongly correlated with depth; inner shelf species include smaller primarily demersal species such as lizardfish, trevally and angelfish, whilst

deeper waters (between 100 and 200 m) feature primarily pelagic species such as trevally, billfish and tuna.

- There are a number of migratory routes and important breeding and/or feeding habitats for EPBC Act listed Threatened and Migratory marine species; including the pygmy blue whale, humpback whale, dugong, marine turtle species, whale sharks, seabirds and migratory shorebirds.

The Northwest Province comprises an area of continental slope 178,651 km^2 and primarily features water depths of 1 to 2 km (DEWHA, 2008a). This provincial bioregion features the Exmouth Plateau (a unique seafloor feature and a 4.6.1.5), the Montebello Trough and Swan Canyon seafloor features. The canyons of the Northwest Province (including the Canyons linking the Cuvier Abyssal Plan and the Cape Range Peninsula KEF) are thought to assist in directing currents through the Exmouth Plateau and onto the Ningaloo Reef shelf. This in turn promotes biological productivity in these areas (DEWHA, 2008a). This provincial bioregion supports both tropical and temperate species as it is located in a transitional zone and encompasses the Continental Slope Demersal Fish Communities KEF (DEWHA, 2008a; see **Section 4.6.1.5** for a description of KEFs).

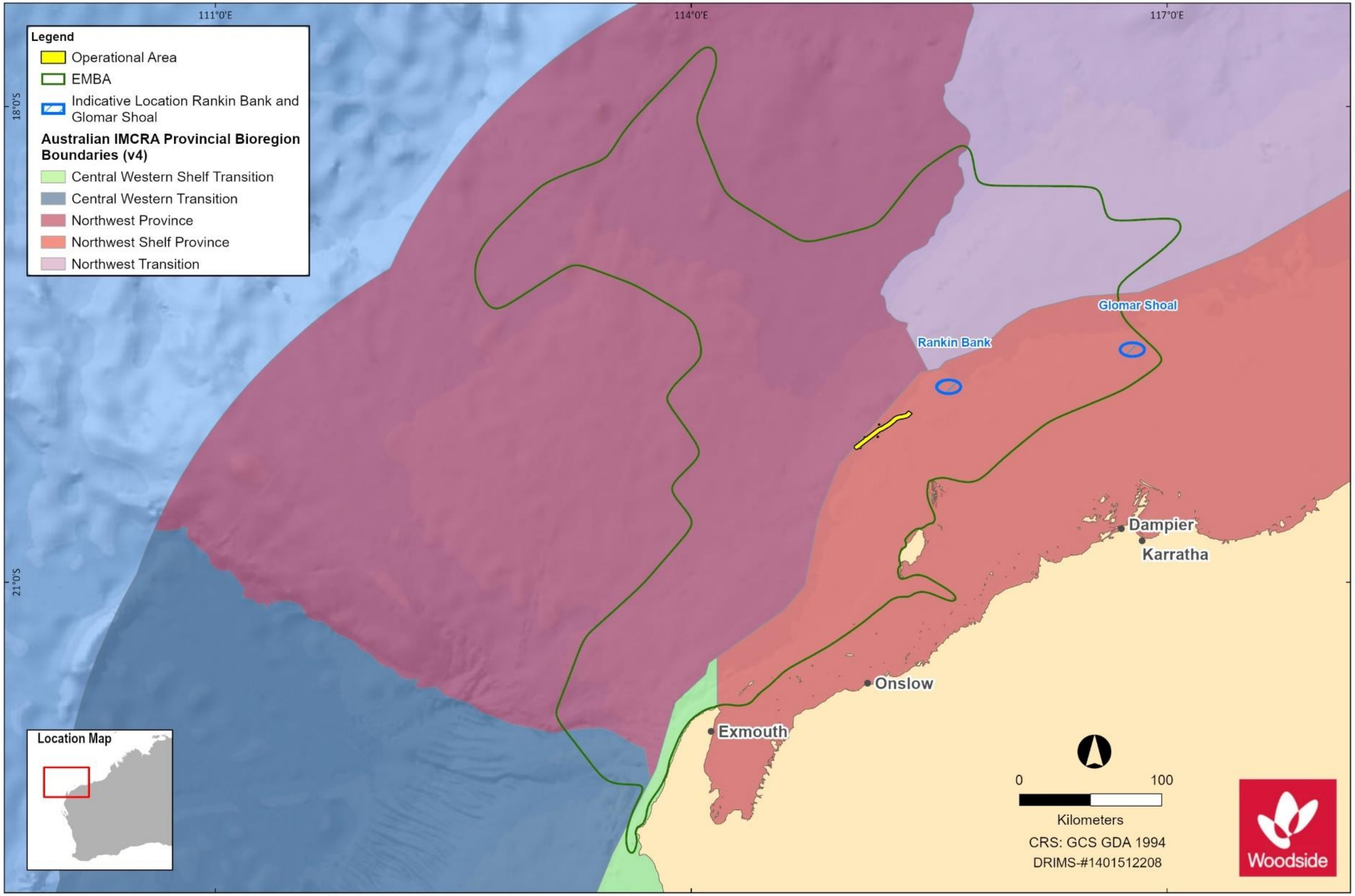


Figure 4-2: Location of the Operational Area within the Northwest Shelf Province and Northwest Province of the North-west Marine Region

4.5 Physical Environment

4.5.1 Climate

The broader NWMR experiences a tropical or monsoon climate (in northern Australia areas), exhibiting a hot summer season from October to April and a milder winter season between May and September. The North West Shelf (NWS) is situated in the Pilbara region which has a tropical arid climate with high cyclone activity (Commonwealth of Australia, 2007).

The Pilbara region has a hot summer season from October to April and a milder winter season between May and September with transition periods between the summer and winter regimes. Rainfall in the region typically occurs during the summer, with highest falls observed late in the season (BoM, 2020a), refer to monthly air temperature and rainfall averaged-date recorded at Karratha **Figure 4-3**. This is often associated with the passage of tropical low pressure systems and cyclones. The Pilbara coast experiences more cyclonic activity than any other region of the Australian mainland coast (BoM, 2020b). Tropical cyclone activity typically occurs between November and April and is most frequent in the region during January to March.

The Julimar Operation Area offshore conditions (as reported for the Pluto Offshore Basic Design Data (Woodside, 2014)) show air temperatures range from highest mean record of 28.71°C in March to lowest mean record of 22.89°C in July (as derived from North Rankin records (excluding tropical cyclones)).

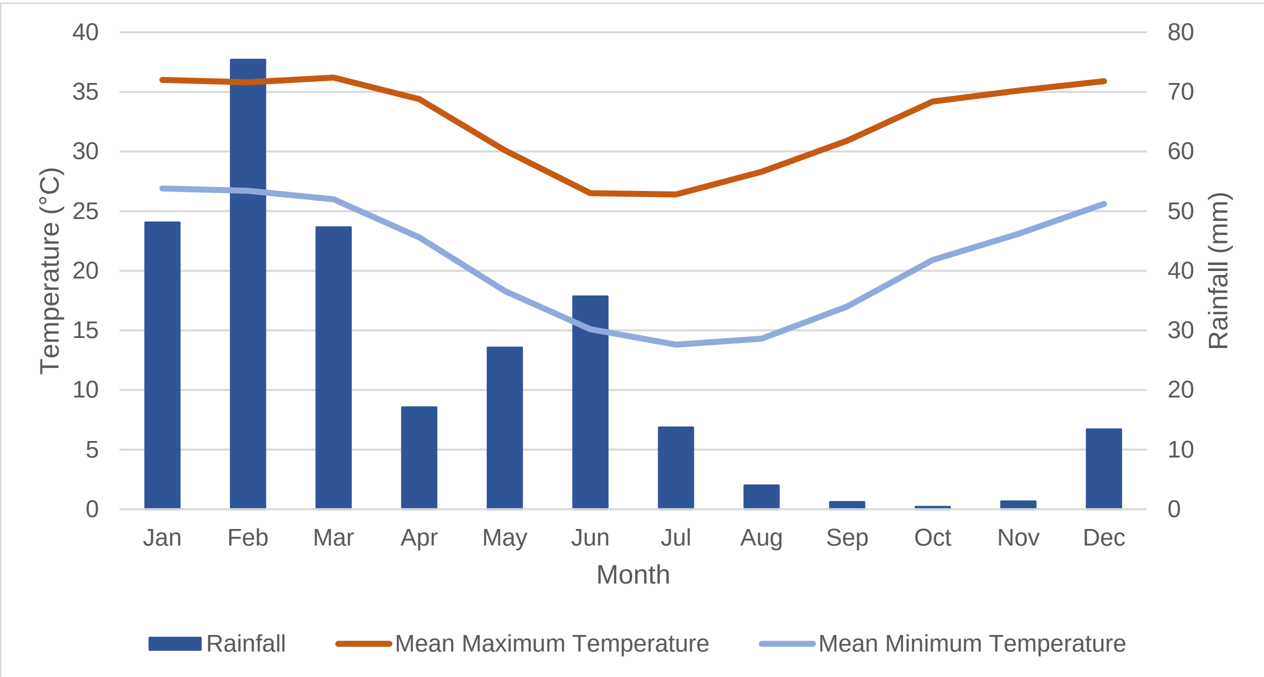


Figure 4-3: Mean Monthly Maximum Temperature and Minimum Temperature between 1993 and 2019; and Mean Monthly Rainfall between 1972 and 2019 as Recorded at the Karratha Aerodrome Meteorological Station (BoM, 2020a)

4.5.1.1 Wind

Winds within the Operational Area are expected to follow this pattern, as indicated by hindcast modelling of wind speed and monitoring of wind direction, undertaken at the nearby Pluto facility, about 4 km from the Operational Area (**Figure 4-4**). Seasonal variability derived from Pluto Offshore Basic Design Data (BDD) (Woodside, 2014), the highest mean wind speed (7.63 m/s) was predicted for June and July (Winter period April- September) and the highest mean wind speed (7.15m/s) for the Summer period (October- March) was predicted for the months of November and December based on hindcast modelling of wind speed. Winds typically weaken and are more variable during the transitional period between the summer and winter regimes, generally between April and August (Woodside, 2014).

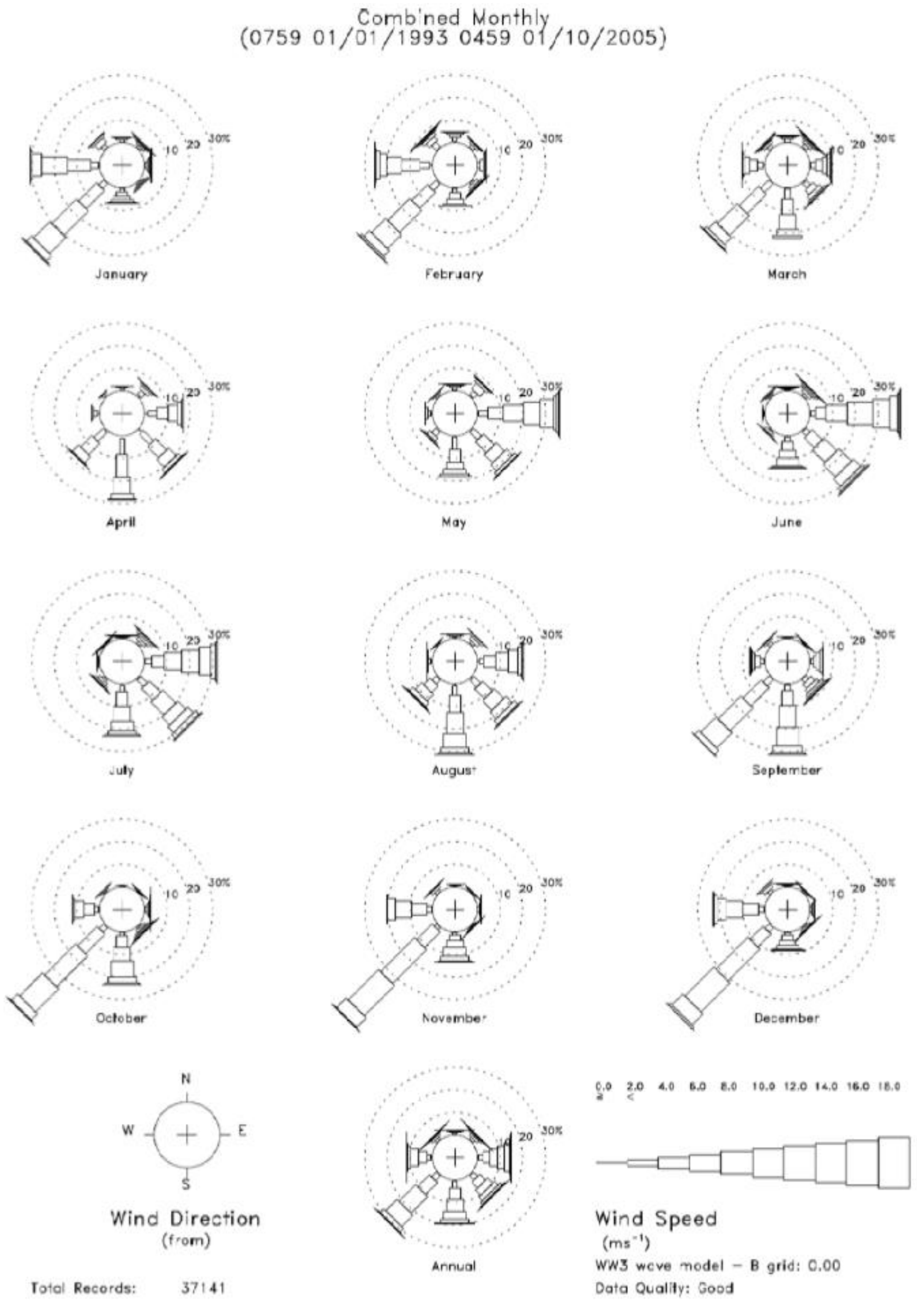


Figure 4-4: Monthly modelled hindcast wind speed and direction for offshore Pluto 1993 to 2005, representative data based on Pluto Basic Design Data (Woodside, 2014).

4.5.2 Oceanography

4.5.2.1 Currents and Tides

Large-scale ocean circulation within the NWMR is primarily influenced by the Indonesian Through Flow (ITF) current and the Leeuwin Current, internal tides and cyclones (see **Figure 4-5**). The ITF and Leeuwin Currents are driven by pressure differences between the equator and the higher density cooler and more saline waters of the Antarctic Ocean and are strongly influenced by seasonal change and the El Niño–Southern Oscillation (ENSO) cycle (DSEWPaC, 2012a). The ITF brings warm waters from the Indonesian Archipelago into the NWMR and the Leeuwin Current flows southward along the edge of the continental shelf and is primarily a surface flow (up to 300 m deep). The ITF and Leeuwin Current are strongest during late summer and winter (Holloway & Nye, 1985; Feng et al., 2009).

The Ningaloo Current is a smaller scale current near the Operational Area. The Ningaloo current is a seasonal current that 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. 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).

Measured current direction and speed as recorded for the Pluto offshore facility are shown in **Figure 4-6**. These records show that the dominant annual current directions are west or north-west and maximum current speeds between 2 and 3 m/s (Woodside, 2014). Geophysical surveys undertaken within the Operational Area indicate that prevailing seafloor currents in this area are orientated east-north east/west-south west (Fugro, 2011; Neptune Geomatics, 2010a).

Tides in the NWMR 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 region exhibits a considerable range in tidal height, from microtidal ranges (<2 m) south-west of Barrow Island to macrotidal (>6 m) north of Broome (Holloway, 1983; Brewer *et al*., 2007). Storm surges and cyclonic events can also significantly raise sea levels above predicted tidal heights (Pearce *et al*., 2003). Tidally-driven currents are a significant component of water movement within the NWMR.

In summer, the stratified water column (**Section 4.5.3**) and large tides can generate internal waves over the upper slope of the NWS (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 & Nye, 1985; Holloway, 1983). Internal waves of the NWS region 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).

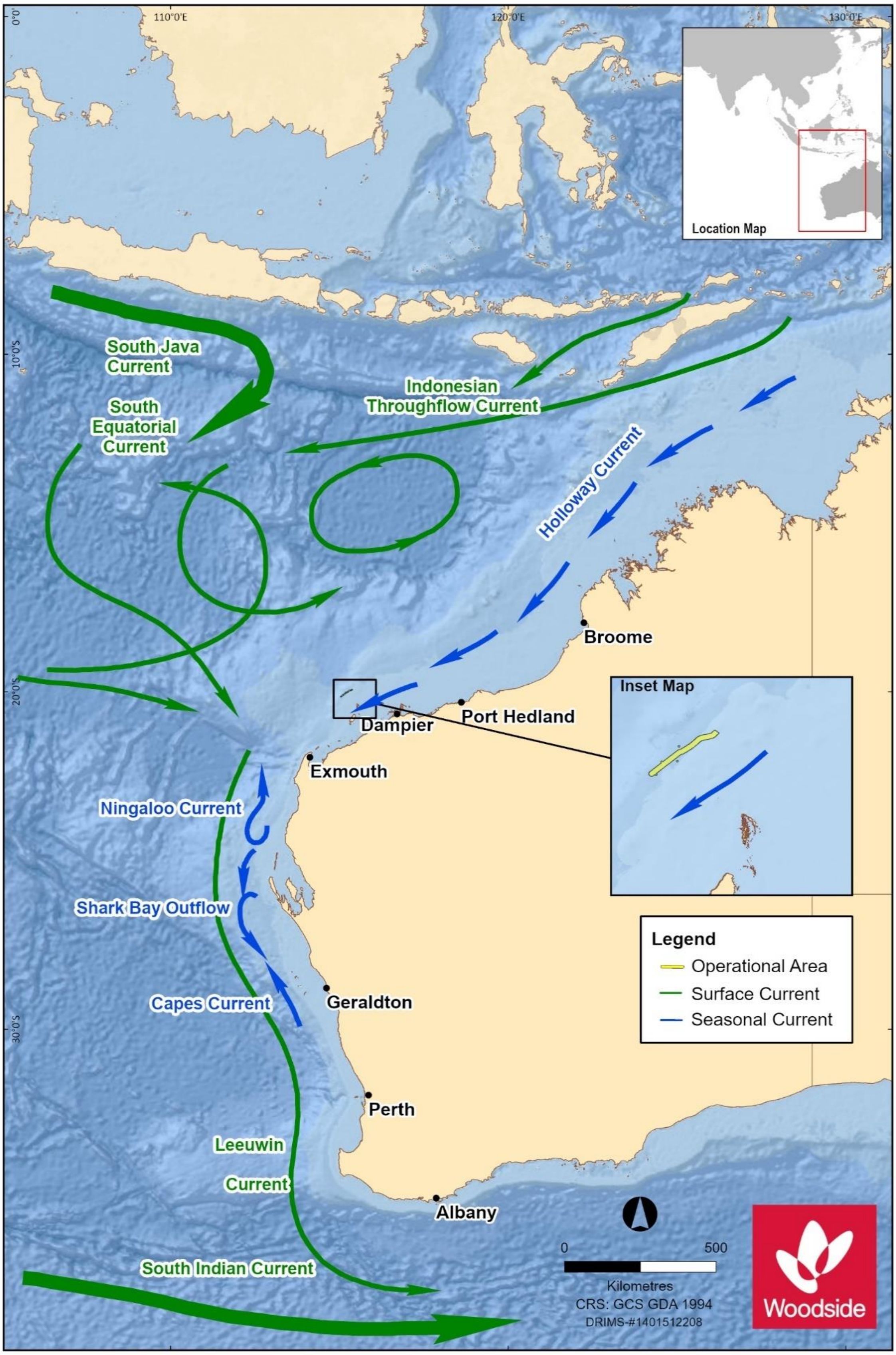


Figure 4-5: Large-scale Ocean Circulation Influencing the North-west Marine Region (Source Commonwealth of Australia, 2007)

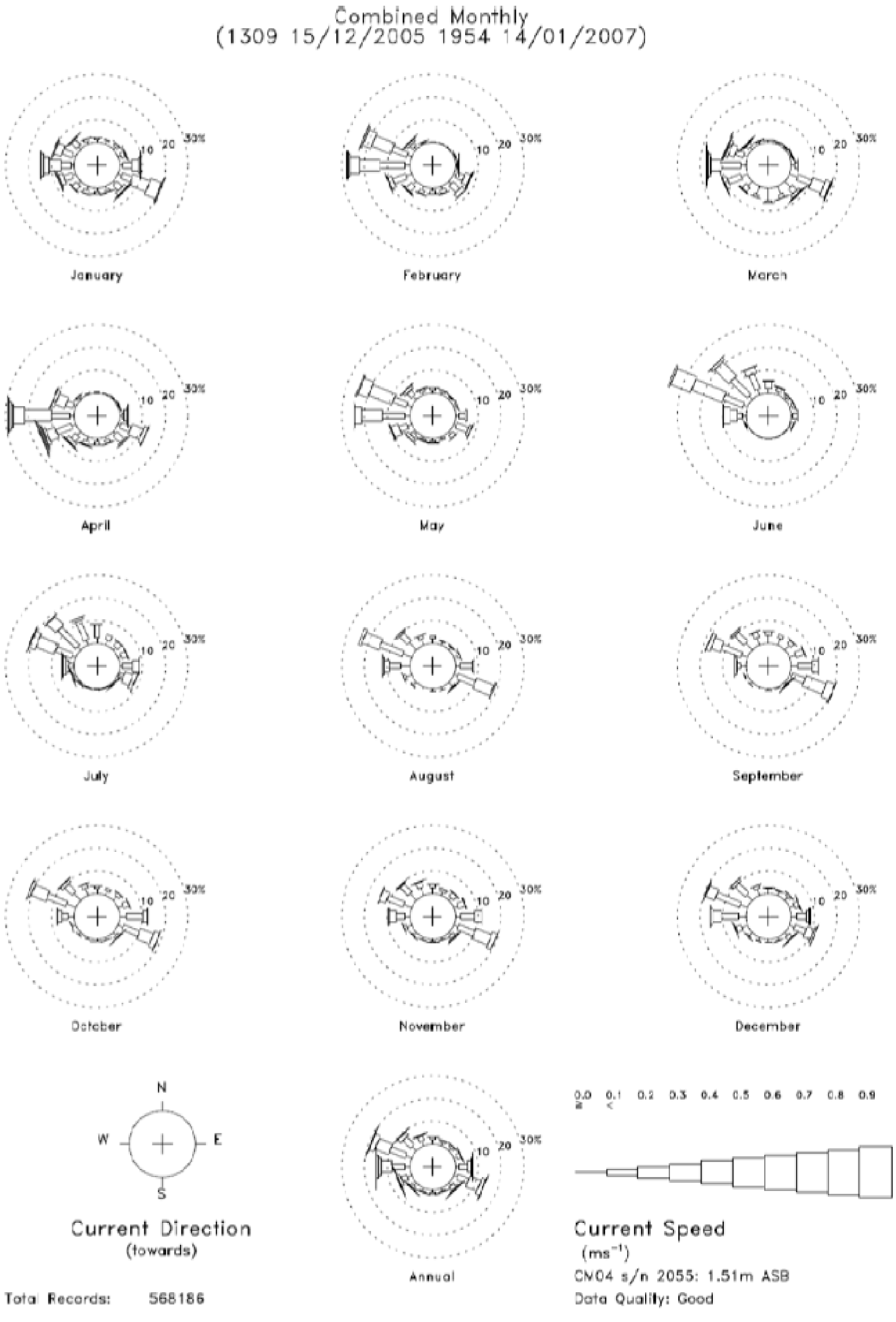


Figure 4-6: Measured Monthly Mean Current Speed and Direction from the Pluto Offshore Facility at 1.51 m ASB in 81 m MSL water depth from the period 2005-2007, representative data based on Pluto Basic Design Data (Woodside, 2014).

4.5.2.2 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' (the average height of the highest one third of waves) 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).

The mean total significant wave height measured at Pluto location over the deployment period (18 December 2005 to 8 December 2006) is 1.84 m. The mean wave height measured in summer is 1.82 m, slightly less than the mean winter wave heights, 1.85 m. The mean significant wave height of sea waves and for swell waves for the deployment is 1.26 m. The maximum significant wave height was 7.05 m from the south-southeast which occurred in March 2006 due to tropical cyclone Glenda. This corresponded to the maximum swell wave height measured during the deployment; 5.4 m. The predominant wave directions are from the west-south west and south-west (Woodside, 2014).

4.5.3 Seawater Characteristics

Within the NWMR the currents described in **Section 4.5.2.1** contribute to variability in seawater temperature and salinity throughout the water column. The tropical water brought south by the ITF and circulated by the Leeuwin Current in winter keeps surface waters relatively warm year-round, with temperatures ranging between 30°C in summer and 22°C in winter (Pearce *et al*., 2003). Water temperatures near the seabed have low interannual variability (±1.5°C at depths of 150 m) and become more stable with increasing water depth (Pearce *et al*., 2003).

The water column is more stratified during summer months due to surface heating with a thermocline occurring typically between 30 and 60 m water depth (James *et al*., 2004). Due to a weaker thermal gradient and persistent south-easterly winds in winter, the water column is less stratified, and the thermocline occurs around 120 m water depth (James *et al*., 2004).

As mentioned in **Section 4.5.2.1**, the ITF brings low salinity waters to the NWMR during winter months. Increased coastal evaporation during summer, however, reduces the salinity of these waters. Variation in surface salinity within the NWMR is minimal, typically remaining between 35.2 and 35.7 PSU (Pearce *et al*., 2003; James *et al*., 2004).

Data on measured seawater temperature (September 2005 and December 2007) presented in the Pluto offshore facility Basic Design Data shows the mean seawater temperatures at surface and through the water column in the upper 100 m depth range from 26.5°C at surface to 24°C at 100 m depth (Woodside, 2014). The mean seawater temperature declines rapidly with mean temperatures of 17°C and 15°C at 200 m and 220 m, respectively. During the summer months the temperature gradient is lower in the water column and there is less mixing in the upper layer. Measurements indicated an upper layer thermocline between 20 and 70 m and a lower thermocline between 160 and 230 m. During the winter months the water column exhibits a very well mixed upper layer with very little temperature change. A strong thermocline exists between 120 and 165 m. The mixing in the water column in the winter months can be attributed to less surface heating and more wind mixing. The Leeuwin Current influences also influences water layer mixing at depths of greater than 150 m (RPS MetOcean, 2007).

4.5.4 Bathymetry, Seabed Features and Physical Habitat

The bathymetry of the wider NWMR is broadly characterised by four distinct zones: the inner continental shelf, the middle continental shelf, the outer shelf/continental slope and the abyssal plain. These divisions are made on the basis of water depth and geomorphic features in the region (Heap & Harris, 2008). Several deep-sea geomorphic features in the form of abyssal plains, marginal plateaus and sub marine canyons provide broad-scale, biologically important seabed habitat in the EMBA.

The Northwest Shelf Province (in which the Operational Area is primarily located) features a number of seafloor features, including submerged banks and shoals (**Section 4.3**). Rankin Bank, located 25 km from the Operational Area, is one of two major geomorphic features in this province; this feature comprises three main sedimentary banks rising from about 40 to 50 m below sea level to about 18 m from the sea surface. The biological values of this feature are described in **Section 4.8.4.1**. Other notable seafloor features within the EMBA include KEFs (**Section 4.6.1.5**). The Ancient coastline at 125 m depth contour is one of these KEFs and is mapped as overlapping the Operational Area (including the Balnaves Deep-1 wellhead). This KEF, as well as others within the EMBA, are described in **Section 4.6.1.5**.

The Operational Area is located in offshore water depths ranging from about 71 to 177 m. A number of geophysical surveys have been undertaken in areas which overlap the Operational Area (Fugro, 2011; Neptune Geomatics, 2008, 2009, 2010a, 2010b; Tri-Surv Pty Ltd, 2007). A survey by Fugro (Fugro, 2011) for the development of the Julimar Fields provides bathymetric and seabed geomorphological information for the majority of the Operational Area (Figure 4-7).

The geophysical survey conducted in 2011 (Fugro, 2011) encompassed a seabed area larger than the Operational Area and survey sampling was conducted in water depths ranging from 69.9 m LAT in the north-east to a maximum of 502.2 m LAT in the southwest. The survey confirmed the seabed composition is predominantly sediment grading from high energy sediment deposits such as coarse sand and gravel in the east and north-east to low energy sediment deposits such as silt and clay in the west and south-west.

Fugro (2011) reported on three main depth categories as follows:

- In water depths less than about 120 m LAT the seabed undulates due to north-west/south-east trending sand waves comprise coarse sand and gravel sediments (**Figure 4-8**). These sand waves, as well as shallow (< 0.5 m) pockmarks (both individual and groups of pockmarks) and mega-ripples, were consistently noted in other surveys overlapping the northern portion of the Operational Area (RPS, 2010; Neptune Geomatics, 2010a). The sand waves are considered most likely to have formed by sediments that have been swept off the continental slope and redeposited by current action (Fugro, 2011). Outcropping cemented sediments (reported as high relief and a low ridge by Fugro (2011)) were also recorded in the far north-east of the Operational Area near the Wheatstone platform and are generally covered in a thin layer of unconsolidated and partially cemented sediments.
- In water depths between 120 and 220 m LAT the seabed area is smooth and featureless with seabed sediment composition predominately silty fine to medium sand, grading to clay and silt with increasing water depth. Representative seabed habitat for this water depth range is shown in **Figure 4-9**.
- In water depths greater than 220 m LAT, to the southwest of the survey area and outside the Operational Area (beyond the continental shelf), there is a distinct break in the continental slope with north-west trending submarine canyons. Sediments predominately comprise clay and silt.

Past oil and gas activity within the Operational Area was evidenced by anchor scars and drilling discharge deposition associated with the Brunello-1 well (Neptune Geomatics, 2008).

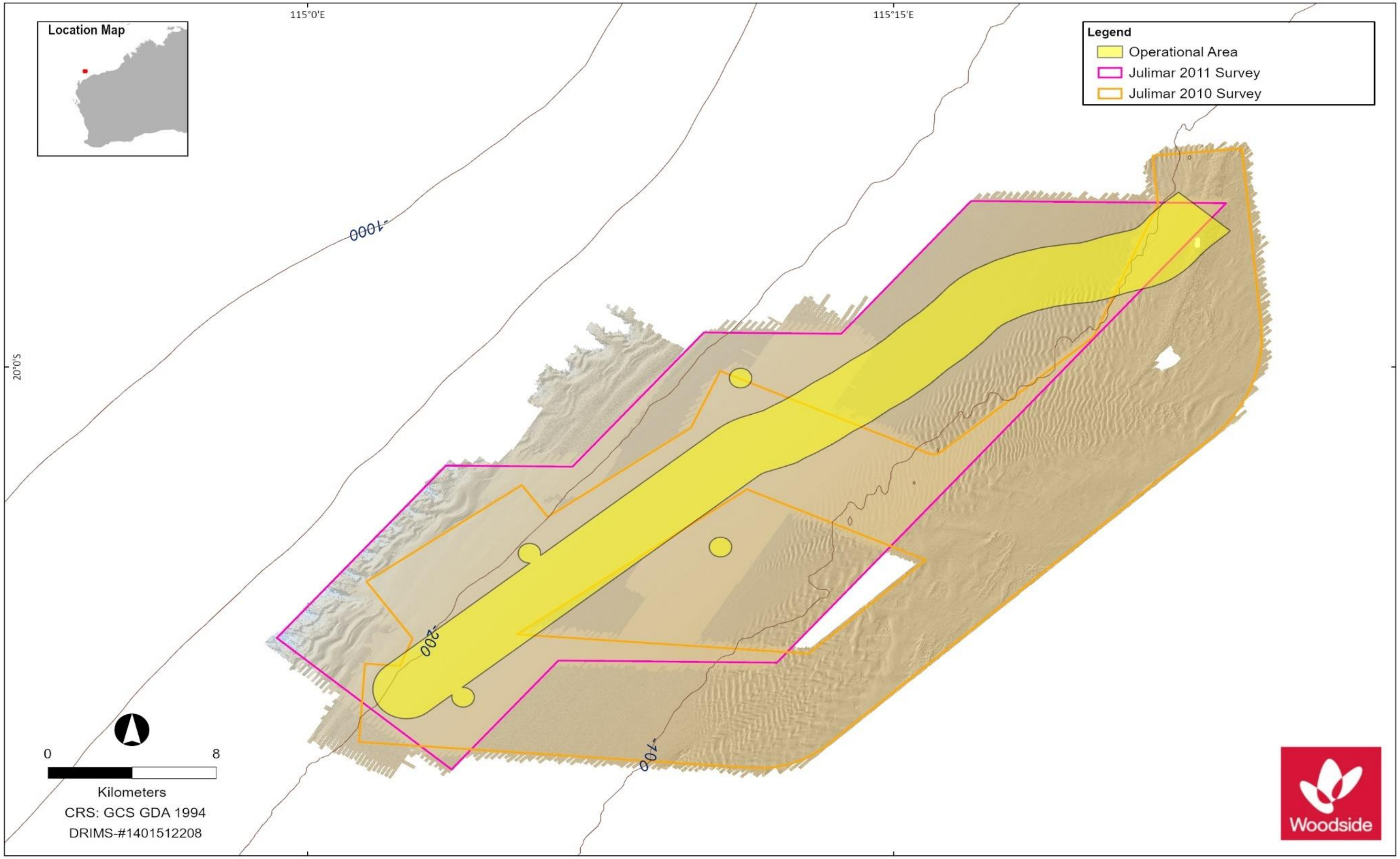


Figure 4-7: Bathymetry of the Operational Area (Source: Fugro 2011)

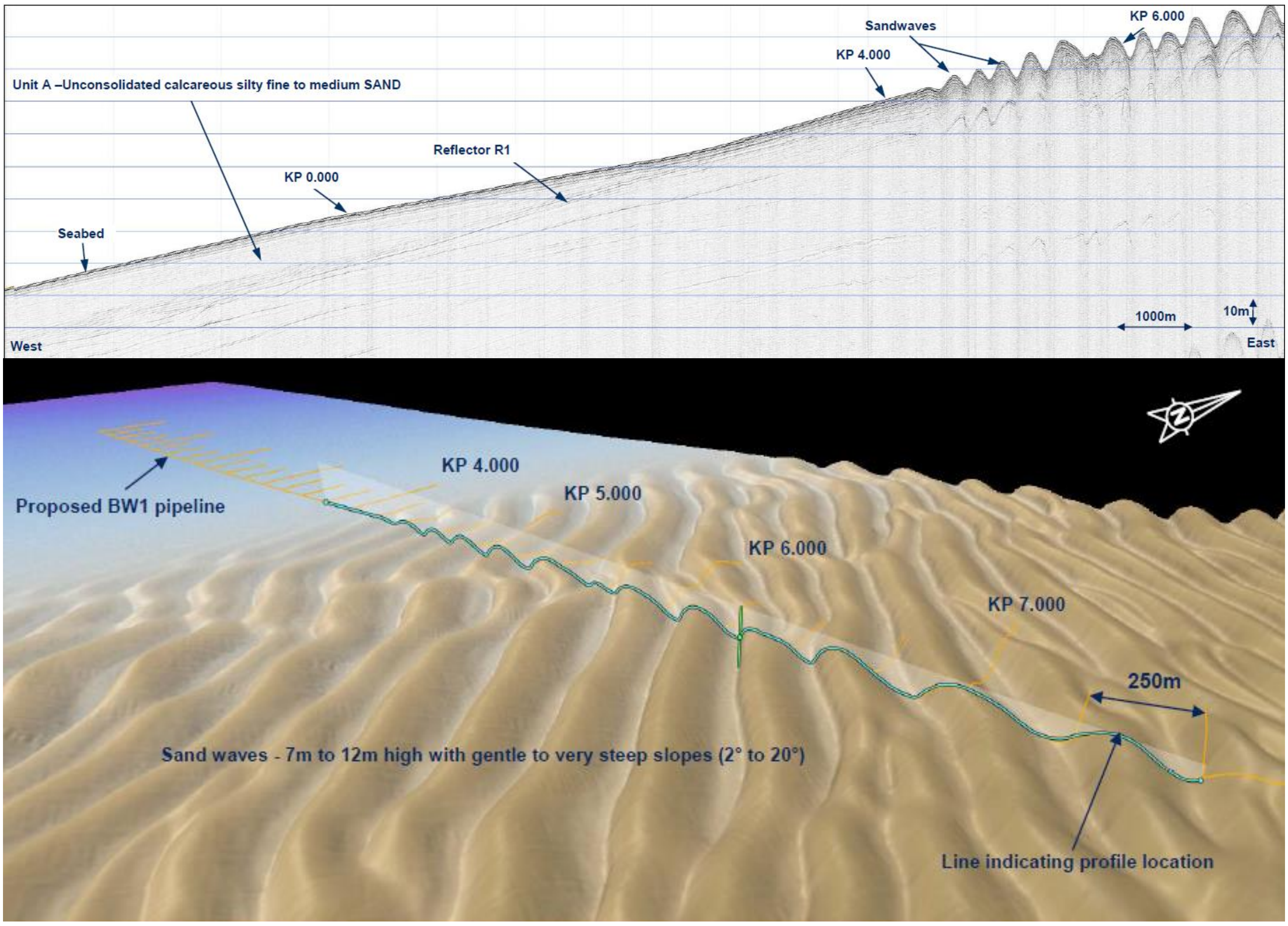


Figure 4-8: Example of the Sand Waves Present Within the Operational Area Along a Survey Corridor Projecting East-South East (RPS Group, 2010)

4.5.5 Marine Sediment

Sediments within the NWMR are comprised of bioclastic (i.e. derived from skeletal fossil fragments), calcareous (i.e. derived from calcium carbonate) and organogenic (i.e. derived from living organisms) sediments (Baker *et al*., 2008). These sediments were deposited by relatively slow and uniform sedimentation rates, as the NWMR is an area of winnowing (i.e. transport of sediment via flow of water) as opposed to active deposition. A variety of processes control the sediment transport mechanisms of the inner shelf, middle shelf, outer shelf/slope and abyssal plain/deep ocean floor of the NWMR; the inner shelf is influenced by the outflow of terrigenous sediments from rivers, whereas sediments of the middle shelf region are predominantly influenced by tidal processes. Sediments of the outer shelf/slope are influenced through a combination of slope processes and large ocean currents (Baker *et al*., 2008).

The inner shelf is typified by sand, with localised accumulations of mud and gravel. Silt sized sediments in the inner shelf have been found to contain 30% carbonate and 70% non-carbonate sediments with skeletal fragments of benthic fauna. Terrigenous sediments are typically less common within the inner shelf and are restricted to areas adjacent to rivers. The middle shelf, in which the Operational Area is located, is typified by sand with deposits of coral and gravel. The outer shelf and shelf slope are dominated by fine grained sediments and feature characteristic accumulations of carbonate deposits at the shelf edge (Baker *et al*., 2008).

Geophysical and benthic habitat surveys within the Operational Area reported sediments to be primarily silty, fine to medium grain calcareous sands (Fugro, 2011; Neptune Geomatics, 2008, 2009, 2010a; Tri-Surv Pty Ltd., 2007; RPS Group, 2010; 2011; see **Figure 4-9**). Shell fragments were also reported amongst these finer sediments (Neptune Geomatics, 2010a). Sediment size increased with decreasing depth (toward the east and north-east of the Fugro (2011) survey area).

As noted in **Section 4.5.4**, sand waves present in the Operational Area were largely comprised of coarse sand and gravel with shall fragments. The troughs of these sand waves also featured some cemented sediments. Also mentioned is the area of outcropping cemented sediments associated with a ridge formation in the north-eastern portion of the Operational Area.

Figure 4-9: Soft Sediments and Primarily Flat Seabed with Medium Bioturbation Representative of the Operational Area. Image Taken Near to the Brunello I Manifold (RPS Group, 2010)

4.5.6 Air Quality

There is no air quality data available for the offshore NWS air shed. Studies have been undertaken 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 undertaken offshore.

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

4.6 Biological Environment

4.6.1 Habitats and Communities

4.6.1.1 Plankton

Plankton plays an important role as a source of food to many large aquatic organisms. Phytoplankton are single-celled microscopic algae that capture light energy and dissolved nutrients and convert them into biomass that acts as the foundation for all higher consumer levels in the food chain (i.e. primary producers). Zooplankton, which are the dominant consumers of phytoplankton, provide a source of food for other zooplankton, larger invertebrates, fish and some megafauna, including whale sharks and cetacean species.

A high degree of temporal and spatial variability is a common feature of plankton populations and is strongly linked to localised and seasonal productivity (Evans et al., 2016). Fluctuations in abundance and distribution occur both vertically and horizontally in response to tidal cycles, seasonal variation (light, water temperature and chemistry, currents and nutrients) and cyclonic events. Subsequently, phytoplankton populations have very marked seasonal cycles of abundance. As do the zooplankton which rely on them for food. In tropical regions, higher plankton concentrations generally occur during the dry season (Hayes et al., 2005).

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 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 that spend their early life stage as plankton (termed meroplankton). A key locality within the EMBA for nutrient productivity is Ningaloo Reef; 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 (MPRA, 2005) with periodic upwelling throughout the year.

4.6.1.2 Benthic Infauna and Epifauna

A number of geophysical and benthic habitat surveys have been undertaken within the Operational Area. These surveys have found the benthic epifauna associated with the soft sediment seabed habitat within the Operational Area to comprise sparsely (< 5%) distributed filter and deposit feeding invertebrates; such as sea whips, soft corals, gorgonians and occasional echinoderms (RPS Group, 2010; 2011). Bioturbation of surveyed habitats ranged from sparse (> 5% coverage) to dense (> 25% coverage indicating infauna and decapod (shrimp) and demersal fish presence; shown in **Figure 4-9**).

Outcropping hard substrates (e.g. emergent limestone) located to the east and north-east of the Operational Area (survey areas ENV001, ENV002, ENV003 shown on (**Figure 4-10**) were found to feature a greater abundance of invertebrate fauna, including sea whips, gorgonians and sponges (RPS Group, 2010; 2011). These habitats were also associated with fish such as banner fish, trevally and red emperor (RPS Group, 2011). An ROV inspection of existing petroleum infrastructure associated with the Pluto pipeline (north-east of the Operational Area) found these structures also provided shelter for fish species and substrate for filter feeding species to attach to (RPS Group, 2011). Other petroleum infrastructure within the survey areas, such as well heads, were similarly found to be associated with benthic invertebrates and fish species (RPS Group, 2010; 2011).

ROV transects of the Ancient coastline at the 125 m contour KEF and of the north-west corner of the Montebello Marine Park (both within the Operational Area) undertaken for a survey of the Scarborough trunkline route indicated that there was no evidence of this KEF (i.e. no consolidated hard substrates) or of significant benthic habitats or fauna at these locations (Advisian, 2019). Benthic habitats were typically bare sand over various bedforms, with no notable features (Advisian, 2019).

The results of these surveys support the findings of other surveys at similar depths within the Northwest Shelf Province and NWMR, which indicate a widespread and well represented assemblage of benthic fauna is present (Rainer, 1991; Woodside, 2004; Brewer *et al*., 2007).

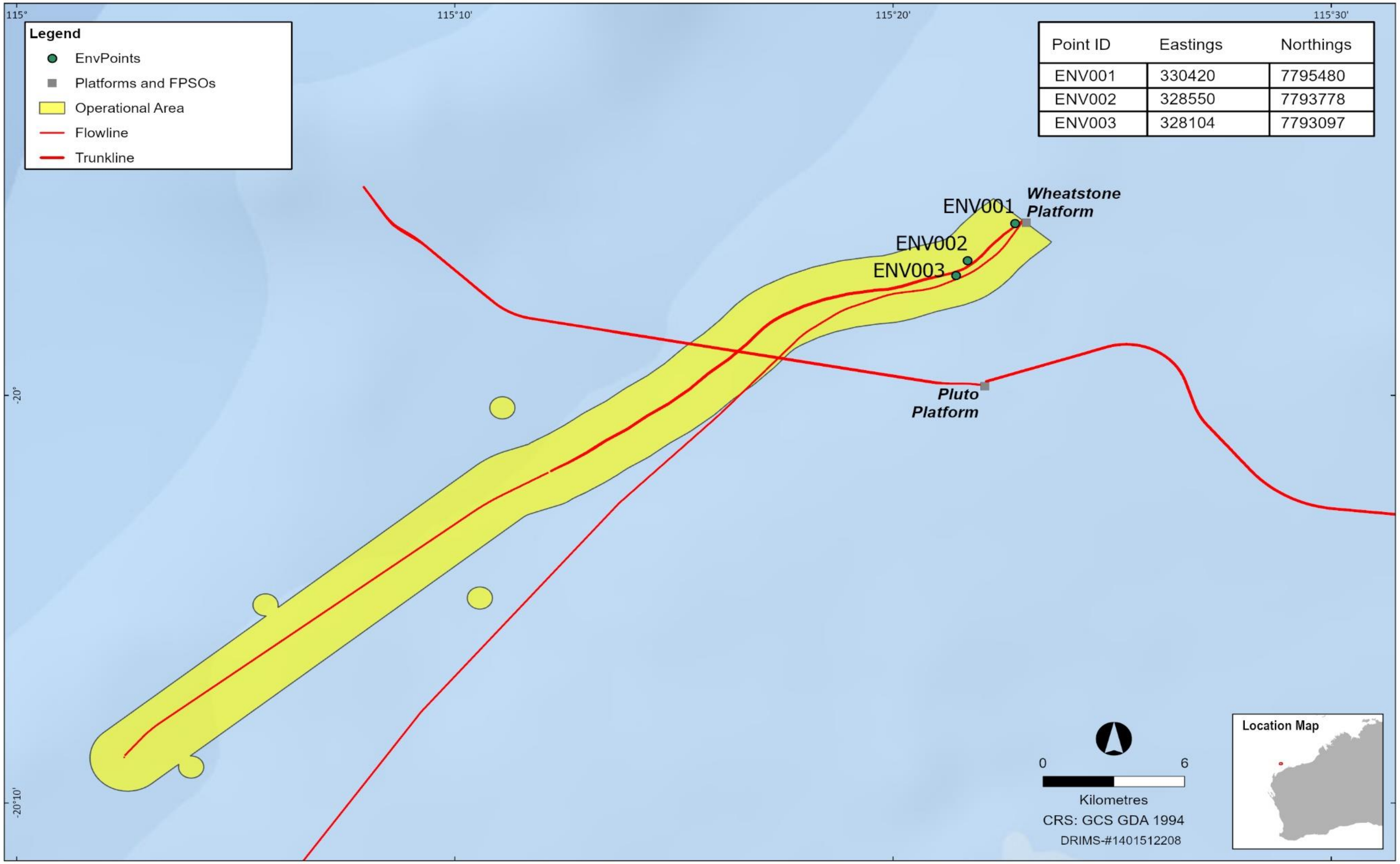


Figure 4-10: RPS (2010, 2011) Survey Locations of Cemented Sediment Outcrops Located in the Operational Area

4.6.1.3 Benthic Primary Producers

Seafloor communities in deeper shelf waters receive insufficient light to sustain ecologically sensitive primary producers such as seagrasses, macroalgae or reef-building corals. The Operational Area (71 to 177 m water depth) is at the edge of and beyond the phototrophic zone (defined as 1% light attenuation and recorded at about 75 m water depth), as indicated by the lack of light dependent light hard corals. This BPP group is typically not recorded at depths beyond the phototrophic zone and hard corals are not expected to occur in the Operational Area. A number of surveys (RPS Group, 2010; 2011; Fugro 2011) near the Operational Area and in similar water depths have confirmed that BPP habitat (e.g. hard coral habitat) is not present.

A number of BPP habitats are, however, present within the EMBA and are typically associated with the shallow water coastal areas.

Coral Reef

Coral reef habitats typically have a high diversity of corals with associated fish communities and support numerous flora and fauna species; many of which are of both commercial and conservation importance. Coral reef habitats are an integral part of the marine environment within the NWMR. The nearest coral reef habitat to the Operational Area is located at Rankin Bank, about 25 km north-east (see **Section 4.8.4.1**). Other coral reef habitats in the EMBA include those within the Montebello and Barrow Island protected areas, the Muiron Islands and Ningaloo Coast; these areas are described in **Section 4.7**.

Seagrass Beds/Macroalgae

Seagrass beds and macroalgae habitats represent a food source for many marine species, including the dugong, and may also provide key habitats and nursery grounds to species (DoF, 2011). Seagrass beds and macroalgae habitats are present in several locations within the Northwest Shelf Province; the nearest to the Operational Area (and within the EMBA) are at the Montebello and Barrow Islands (about 46 km and 68 km south-east of Operational Area, respectively) where macroalgae is the dominant macrophyte and occupies about 40% of the benthic habitat cover (MPRA, 2007). Seagrass beds and macroalgae habitat can also be found within the EMBA at some islands in the Pilbara Island Groups, the Muiron Islands and along the Ningaloo Coast. These areas and their values are described in **Section 4.8**.

Mangroves

Mangrove systems provide complex structural habitats that act as nurseries for many marine species as well as nesting and feeding sites for many birds, reptiles and insects. Mangroves also maintain sediment, nutrient and water quality within habitats and minimise coastal erosion (Nagelkerken *et al*., 2008).

The closest mangrove habitats to the Operational Area are located at the Montebello and Barrow Islands. Mangrove communities of the Montebello Islands are considered scientifically important as they represent an unusual occurrence of mangrove communities within lagoons on offshore islands (Chevron, 2013). Other mangrove habitats associated with the EMBA include those located along the Ningaloo Coast.

4.6.1.4 Pelagic and Demersal Fish Communities

Demersal fish are associated with a wide range of habitats, including coastal and estuarine ecosystems, macroalgal and seagrass communities, and coral reefs (Hutchins, 2001; Blaber *et al*., 1985). Abundance and species richness of demersal fish species and communities (those that live and feed on or near the seabed) typically increase with increasing marine habitat complexity (Gratwicke & Speight, 2005). As such, the benthic habitats within the Operational Area (described in **Section 4.6.1**) are not expected to support high diversity of demersal fish species. This has been verified by ROV footage which did not identify any vertebrate species as being present within a large portion of the surveyed area (RPS Group, 2010, 2011). Areas within the Operational Area featuring outcropping hard substrates and more complex seabed morphology were found to have some demersal fish species present (RPS Group, 2010, 2011). Specifically, vertebrate fauna observed near the seabed during the RPS Group (2010, 2011) surveys consisted of small numbers of fish (including barracuda, lizardfish, lionfish and cuttlefish), occasional unidentified sharks and snake eels, a sandbar shark (*Carcharhinus plumbeus*) and individual hammerhead sharks and shovelnose rays (RPS Group, 2010, 2011).

As mentioned in **Section 4.6.1.2**, petroleum infrastructure within and in proximity to the Operational Area was found to provide hard substrate and shelter for fauna, including fish, amongst otherwise bare and soft substrates. Recent studies in the NWMR have provided insight into fish communities associated with subsea oil and gas infrastructure, particularly pipelines and wellheads (Bond *et al*. 2018a, 2018b; McLean *et al*. 2018). These studies have similarly found increased species richness and abundance on petroleum infrastructure relative to the surrounding seabed, including the presence of commercially important fish species. Structurally complex epibenthic habitat forming invertebrates have also been reported on petroleum infrastructure (Bond *et al*. 2018a, 2018b; McLean *et al*. 2018).

Within the EMBA, Rankin Bank is the nearest location identified as supporting high demersal fish richness and abundance. The fish communities at Rankin Bank, described in detail in **Section 4.8.4.1**, are comparable to other shoal and reef features within the NWMR (AIMS, 2014; Abdul Waheb *et al.*, 2018). Other locations which feature high abundance of demersal fish communities are those with the BPP habitats discussed in **Section 4.6.1.3**. Also, within the EMBA is the Continental slope demersal fish communities KEF. As detailed in **Section 4.6.1.5**, this KEF is identified as one of the most diverse demersal fish slope assemblages in Australian waters.

Pelagic fish species within the NWMR include both small and large 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 larger pelagic fish, sharks, seabirds and marine mammals (Mackie *et al*., 2007). Large pelagic fish in the NWMR include commercially 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. Pelagic fish species may be present within the Operational Area, although there are no habitats considered important to these species within the Operational Area.

4.6.1.5 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 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 community that is nationally or regionally important for biodiversity.
- An area or habitat that is nationally or regionally important for:
  - enhanced or high biological productivity
  - aggregations of marine life
  - biodiversity or endemism
  - a unique seafloor feature with ecological properties of regional significance.

Six KEFs were identified by the PMST Search as occurring within the EMBA, including one which has been mapped as overlapping the Operational Area (see **Figure 4-11**). These KEFs are described below in **Table 4-5**.

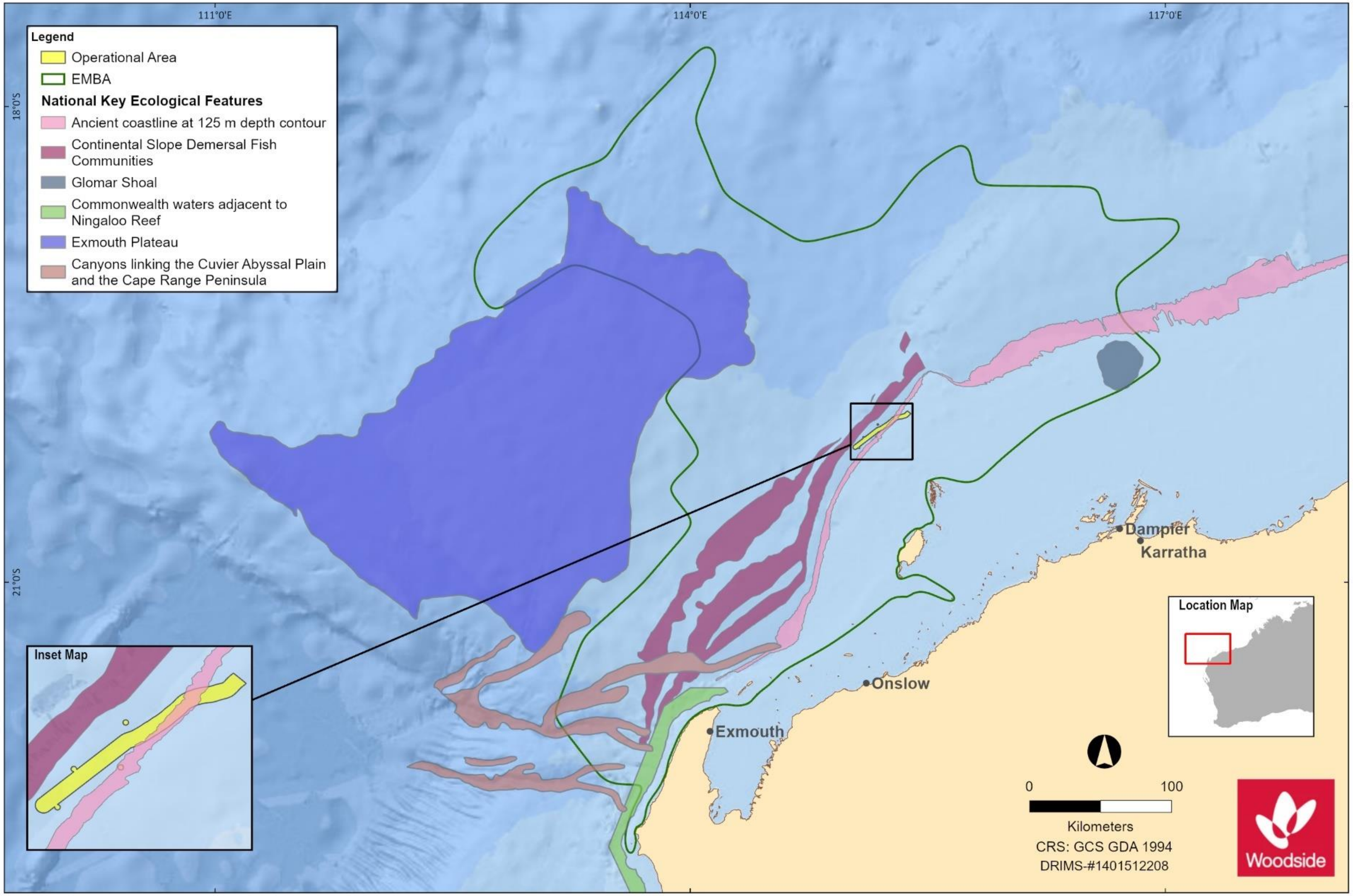


Figure 4-11: Key Ecological Features that Overlap the Operational Area and/or EMBA

Table 4-5: Key Ecological Features Within the Operational Area and/or EMBA (DSEWPaC, 2012a)

Key Ecological Feature	Description of Values	Operational Area	EMBA
Ancient coastline at 125 m depth contour	***Unique seafloor feature with ecological properties of regional significance.*** Several steps and terraces associated with Pleistocene sea level changes exist along the NWS, with the most prominent of these features occurring as an escarpment along the NWS and Sahul Shelf at a water depth of 125 m; the Ancient coastline at 125 m depth contour. This KEF is not continuous and is fragmented along the 125 m depth contour. This KEF is an important divide between carbonate, cemented sands at the edge of the shelf and the fine, less cemented slope materials offshore. The Ancient coastline at 125 m depth contour is valued as a unique seafloor feature with ecological properties of regional significance; where the KEF provides areas of hard substrate, it may contribute to higher diversity and enhanced species richness relative to the surrounding widespread soft sediment habitats. The escarpment type features may also potentially facilitate mixing within the water column due to upwelling, providing a nutrient rich environment. 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, these habitat types are not unique as they are widespread on the upper shelf (Falkner *et al*. 2009b).	✓	✓
Continental slope demersal fish communities	***High levels of endemism.*** The continental slope demersal fish communities within the Northwest Province (neighbouring the Northwest Shelf Province) provincial bioregion have been identified as a KEF, due to the high levels of fish endemism and diversity associated with this area. For example, the continental slope between North West Cape and the Montebello Trough specifically boasts more than 500 fish species, with 76 of these species endemic. Within the KEF, demersal fish assemblages fall into two major categories associated with the upper-slope (between 225 and 500 m water depths) and mid-slope (between 750 and 1,000 m water depths). The fish fauna of the North West Cape area 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 & Speight, 2005).		✓

Key Ecological Feature	Description of Values	Operational Area	EMBA
Exmouth plateau	***Unique seafloor feature.*** The Exmouth Plateau is a large (about 50,000 km^2), mid-slope, continental margin plateau that lies off the north-west coast of Australia. It ranges in depth from about 500 to 5,000 m and is a major structural element of the Carnarvon Basin (Geoscience Australia, 2020). The plateau is an area of enhanced biological productivity that supports a range of species (TGS, 2011). 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 feature localised areas of high biological productivity (TGS, 2011). 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 (TGS, 2011). 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 (TGS, 2011). Pelagic species are likely to include nekton, small pelagic fish and large predators such as billfish, sharks and dolphins (TGS, 2011). Protected and migratory species are also known to pass through the region including whale sharks, cetaceans and marine turtles.		✓
Canyons Linking the Cuvier Abyssal Plain with the Cape Range Peninsula	***Enhanced productivity, aggregations of marine life, unique seafloor feature.*** The canyons that link the Cuvier Abyssal Plain with the Cape Range Peninsula lie off the north west coast of Australia, south of the Operational Area. The canyons are believed to support the productivity and species richness of Ningaloo Reef (Commonwealth of Australia, 2012). Interactions with the Leeuwin current and strong internal tides are thought to result in upwelling at the canyon heads onto the shelf and Ningaloo Reef, thus creating conditions for enhanced productivity in the region (Brewer *et al*., 2007). As a result, aggregations of whale sharks, manta rays, humpback whales, sea snakes, sharks, predatory fish and seabirds are known to occur within the KEF and surrounding areas of enhanced productivity (Sleeman *et al*., 2007).		✓
Glomar Shoal	***High productivity and aggregations of marine life.*** Glomar Shoal has been identified as a KEF based on its regionally important habitats which support high biological diversity and 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. The ecological values of Glomar Shoal are described in **Section 4.8.4.2**.		✓
Commonwealth Waters Adjacent to Ningaloo Reef	***High productivity and aggregations of marine life associated with the benthic and pelagic habitats within the feature.*** The Commonwealth Waters adjacent to Ningaloo Reef KEF lie about 147 km from the Operational Area and are adjacent to the three nautical mile State waters limit along Ningaloo Reef. The KEF includes the Ningaloo AMP; see **Sections 4.8.1** and **4.8.5.1** for further information about the values and sensitivities associated with this KEF.		✓

4.6.2 Matters of National Environmental Significance

4.6.2.1 EPBC Act Listed Species

The DAWE Protected Matters Search Tool (PMST) was used to identify listed species under the EPBC Act that may occur within the Operational Area and/or EMBA. A total of 64 and 101 EPBC Act listed Threatened, Migratory and/or Marine species were identified as potentially occurring within the Operational Area and EMBA, respectively (**Appendix C**). These species are listed in **Table 4-6**.

These results were used to inform the assessment of planned and unplanned events in **Section 6**. It should be noted that the PMST is a general database that conservatively identifies areas in which protected species have the potential to occur.

Those species considered most likely to occur within the Operational Area are described in **Section 4.6.2.9**. Some species captured by the search were not considered relevant and have not been considered in this EP. **Appendix D** provides a list of these species and justification for their exclusion.

Table 4-6: EPBC Act Listed Threatened, Migratory and/or Marine Species Identified as Potentially Occurring with the Operational Area and/or EMBA

Species	Common Name	Threatened Status	Listed Migratory	Listed Marine	Potential Occurrence	
					Operational Area	EMBA
Marine Mammals						
Balaenoptera musculus	Blue whale	Endangered	✓	✓	✓	✓
Megaptera novaeangliae	Humpback whale	Vulnerable	✓	✓	✓	✓
Balaenoptera borealis	Sei whale	Vulnerable	✓	✓	✓	✓
Balaenoptera physalus	Fin whale	Vulnerable	✓	✓	✓	✓
Eubalaena australis	Southern right whale	Endangered	✓	✓	×	✓
Balaenoptera edeni	Bryde's whale	Not Threatened	✓	✓	✓	✓
Orcinus orca	Killer whale, orca	Not Threatened	✓	✓	✓	✓
Physeter macrocephalus	Sperm whale	Not Threatened	✓	✓	✓	✓
Balaenoptera bonaerensis	Antarctic minke whale	Not Threatened	✓	✓	×	✓
Sousa chinensis	Indo-Pacific humpback dolphin	Not Threatened	✓	✓	×	✓
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	Not Threatened	✓	✓	✓	✓
Dugong dugon	Dugong	Not Threatened	✓	✓	×	✓
Balaenoptera acutorostrata	Minke Whale	Not Threatened	×	✓	✓	✓
Delphinus delphis	Common dolphin	Not Threatened	×	✓	✓	✓
Feresa attenuate	Pygmy killer whale	Not Threatened	×	✓	✓	✓
Globicephala macrorhynchus	Short-finned pilot whale	Not Threatened	×	✓	✓	✓
Grampus griseus	Risso's dolphin	Not Threatened	×	✓	✓	✓
Kogia breviceps	Pygmy sperm whale	Not Threatened	×	✓	✓	✓
Kogia simus	Dwarf sperm whale	Not Threatened	×	✓	✓	✓

Species	Common Name	Threatened Status	Listed Migratory	Listed Marine	Potential Occurrence	
					Operational Area	EMBA
Lagenodelphis hosei	Fraser's dolphin	Not Threatened	×	✓	✓	✓
Mesoplodon densirostris	Blainville's beaked whale	Not Threatened	×	✓	✓	✓
Peponocephala electra	Melon-headed whale	Not Threatened	×	✓	✓	✓
Pseudorca crassidens	False killer whale	Not Threatened	×	✓	✓	✓
Stenella attenuate	Spotted dolphin	Not Threatened	×	✓	✓	✓
Stenella coeruleoalba	Striped dolphin	Not Threatened	×	✓	✓	✓
Stenella longirostris	Long-snouted spinner dolphin	Not Threatened	×	✓	✓	✓
Steno bredanensis	Rough-toothed dolphin	Not Threatened	×	✓	✓	✓
Tursiops aduncus	Indian Ocean bottlenose dolphin	Not Threatened	×	✓	✓	✓
Tursiops truncatus s. str.	Bottlenose dolphin	Not Threatened	×	✓	✓	✓
Ziphius cavirostris	Cuvier's beaked whale	Not Threatened	×	✓	✓	✓
Marine Reptiles						
Caretta caretta	Loggerhead turtle	Endangered	✓	✓	✓	✓
Chelonia mydas	Green turtle	Vulnerable	✓	✓	✓	✓
Dermochelys coriacea	Leatherback turtle	Endangered	✓	✓	✓	✓
Eretmochelys imbricate	Hawksbill turtle	Vulnerable	✓	✓	✓	✓
Natator depressus	Flatback turtle	Vulnerable	✓	✓	✓	✓
Aipysurus apraefrontalis	Short-nosed sea snake	Critically Endangered	×	✓	×	✓
Acalyptophis peronii	Horned sea snake	Not Threatened	×	✓	✓	✓
Aipysurus duboisii	Duboi's sea snake	Not Threatened	×	✓	✓	✓
Aipysurus eydouxii	Spine-tailed sea snake	Not Threatened	×	✓	✓	✓
Aipysurus laevis	Olive sea snake	Not Threatened	×	✓	✓	✓

Species	Common Name	Threatened Status	Listed Migratory	Listed Marine	Potential Occurrence	
					Operational Area	EMBA
Aipysurus tenuis	Brown-line sea snake	Not Threatened	×	✓	×	✓
Astrotia stokesii	Stoke's sea snake	Not Threatened	×	✓	✓	✓
Disteira kingie	Spectacled sea snake	Not Threatened	×	✓	✓	✓
Disteira major	Olive-headed sea snake	Not Threatened	×	✓	✓	✓
Emydocephalus annulatus	Turtle-headed sea snake	Not Threatened	×	✓	×	✓
Ephalophis greyi	North-western mangrove sea snake	Not Threatened	×	✓	✓	✓
Hydrophis czeblukovi	Fine-spined sea snake	Not Threatened	×	✓	✓	✓
Hydrophis elegans	Elegant sea snake	Not Threatened	×	✓	✓	✓
Hydrophis mcdowelli	Small-headed sea snake	Not Threatened	×	✓	×	✓
Hydrophis ornatus	Spotted sea snake	Not Threatened	×	✓	✓	✓
Pelamis platurus	Yellow-bellied sea snake	Not Threatened	×	✓	✓	✓
Hydrelaps darwiniensis	Black-ringed sea snake	Not Threatened	×	✓	×	✓
Sharks, Rays and Fish						
Rhincodon typus	Whale shark	Vulnerable	✓	×	✓	✓
Carcharius Taurus	Grey nurse shark (west coast population)	Vulnerable	×	×	✓	✓
Carcharodon Carcharias	Great white shark	Vulnerable	✓	×	✓	✓
Pristis clavate	Dwarf sawfish	Vulnerable	✓	×	✓	✓
Pristis zijsron	Green sawfish	Vulnerable	✓	×	✓	✓
Anoxypristis cuspidate	Narrow sawfish	Not Threatened	✓	×	✓	✓
Isurus oxyrinchus	Shortfin mako	Not Threatened	✓	×	✓	✓
Isurus paucus	Longfin mako	Not Threatened	✓	×	✓	✓
Carcharhinus longimanus	Oceanic whitetip shark	Not Threatened	✓	×	✓	✓
Manta birostris	Giant manta ray	Not Threatened	✓	×	✓	✓

Species	Common Name	Threatened Status	Listed Migratory	Listed Marine	Potential Occurrence	
					Operational Area	EMBA
Manta alfredi	Reef manta ray	Not Threatened	✓	×	✓	✓
Lamna nasus	Mackerel shark	Not Threatened	✓	×	×	✓
Seabirds and Migratory Shorebird						
Macronectes giganteus	Southern giant-petrel	Endangered	✓	✓	✓	✓
Calidris canutus	Red knot	Endangered	×	✓	✓	✓
Calidris ferruginea	Curlew sandpiper	Critically Endangered	✓	✓	✓	✓
Numenius madagascariensis	Eastern curlew	Critically Endangered	✓	✓	✓	✓
Rostratula australis	Australian painted snipe, painted snipe	Endangered	×	✓	×	✓
Sternula nereis	Australian fairy tern	Vulnerable	×	×	✓	✓
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	×	✓	×	✓
Thalassarche impavida	Campbell albatross	Vulnerable	✓	✓	×	✓
Anous stolidus	Common noddy	Not Threatened	✓	✓	✓	✓
Calonectris leucomelas	Streaked shearwater	Not Threatened	✓	✓	✓	✓
Fregata ariel	Lesser frigatebird	Not Threatened	✓	✓	✓	✓
Calidris melanotos	Pectoral sandpiper	Not Threatened	✓	✓	✓	✓
Pandion haliaetus	Osprey	Not Threatened	✓	✓	✓	✓
Actitis hypoleucos	Common sandpiper	Not Threatened	✓	✓	✓	✓
Calidris acuminate	Sharp-tailed sandpiper	Not Threatened	✓	✓	✓	✓
Apus pacificus	Fork-tailed swift	Not Threatened	✓	✓	×	✓
Ardenna carneipes	Flesh-footed shearwater	Not Threatened	✓	✓	×	✓
Fregata minor	Greater frigatebird	Not Threatened	✓	✓	×	✓
Sterna dougallii	Roseate tern	Not Threatened	✓	✓	×	✓

Species	Common Name	Threatened Status	Listed Migratory	Listed Marine	Potential Occurrence	
					Operational Area	EMBA
Sterna bengalensis	Lesser crested tern	Not Threatened	×	✓	×	✓
Limosa lapponica	Bar-tailed godwit	Not Threatened	✓	✓	×	✓
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	×	×	×	✓
Ardenna pacifica	Wedge-tailed shearwater	Not Threatened	✓	✓	×	✓
Hydroprogne caspia	Caspian tern	Not Threatened	✓	✓	×	✓
Onychoprion anaethetus	Bridled tern	Not Threatened	✓	✓	×	✓
Charadrius veredus	Oriental plover	Not Threatened	✓	✓	×	✓
Glareola maldivarum	Oriental pratincole	Not Threatened	✓	✓	×	✓
Thalasseus bergii	Crested tern	Not Threatened	✓	✓	×	✓
Tringa nebularia	Common greenshank	Not Threatened	✓	✓	×	✓
Ardea alba	Great Egret, White Egret	Not Threatened	×	✓	×	✓
Ardea ibis	Cattle Egret	Not Threatened	×	✓	×	✓
Chroicocephalus novaehollandiae	Silver Gull	Not Threatened	×	✓	×	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	Not Threatened	×	✓	×	✓
Sterna fuscata	Sooty Tern	Not Threatened	×	✓	×	✓
Merops ornatus	Rainbow Bee-eater	Not Threatened	×	✓	×	✓
Sterna nereis	Fairy Tern	Not Threatened	×	✓	×	✓

4.6.2.2 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 are developed and implemented under Part 13 of the EPBC Act (**Section 1.10.2**).

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 4-7 outlines the Part 13 statutory instruments recovery plans and conservation advices relevant to those species identified by the EPBC Protected Matters search (Appendix C).

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 Operational Areas 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 Areas.
- 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 6.9**).

Table 4-7: 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**
Cetaceans (Whales and Dolphins)			
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 6-16**
Humpback whale	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (Threatened Species Scientific Committee 2015a)	Y	**Section 6**
Sei whale	Conservation Advice for *Balaenoptera borealis* (Sei whale) (Threatened Species Scientific Committee 2015a)	N	N/A
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (Fin whale) (Threatened Species Scientific Committee 2015b)	N	N/A
Southern right whale	Conservation management plan for the southern right whale: a recovery plan under the EPBC Act 1999 2011–2021 (Commonwealth of Australia 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 6-15**
Short-nosed sea snake	Approved conservation advice for *Aipysurus apraefrontalis* (short-nosed sea snake) (Department of the Environment 2013a)	Y	**Section 6**
Sharks and Rays			
Whale shark	Approved Conservation advice *Rhincodon typus* (whale shark) (Threatened Species Scientific Committee 2015b)	Y	**Section 6**
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 6-17**
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (Commonwealth of Australia 2014)	Y	**Section 6** and **Table 6-18**

Birds			
Seabirds			
All petrels and albatrosses (southern giant-petrel, soft-plumaged petrel, Campbell albatross)	National recovery plan for threatened albatrosses and giant petrels 2011–2016 (Commonwealth of Australia 2011)	Y	**Section 6**
Australian fairy tern	Conservation advice for *Sterna nereis* (Australian Fairy tern) (Threatened Species Scientific Committee 2011a)	Y	
All migratory seabirds	Draft Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2019)	Y	
Migratory Shorebirds			
Red knot, knot	Approved Conservation Advice for *Calidris canutus* (red knot) (Threatened Species Scientific Committee, 2016c)	Y	**Section 6**
Curlew sandpiper	Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper) (Threatened Species Scientific Committee 2015c)	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	
Northern Siberian bar-tailed godwit	Conservation advice *Limosa lapponica menzbieri* bar-tailed godwit (northern Siberian) (Threatened Species Scientific Committee 2016b)	Y	
Migratory shorebird species	Wildlife conservation plan for migratory shorebirds (Commonwealth of Australia 2015c)	Y	

4.6.2.3 Habitat Critical to the Survival of a Species

Habitat critical to the survival of a species is defined under the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* as areas necessary (DAWE, 2020b):

- for activities such as foraging, breeding or dispersal
- for the long-term maintenance of the species (including the maintenance of species essential to the survival of the species)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species.

Marine turtles are presently the only animals for which habitat critical to the survival of a species has been defined.

As detailed in the *Recovery Plan for Marine Turtles in Australia* (DoEE, 2017), key nesting and internesting habitats have been identified, described and mapped for the green turtle, loggerhead turtle, flatback turtle, hawksbill turtle, olive ridley turtle and the leatherback turtle. These include habitat critical to the survival of these species. The Operational Area does not overlap any habitats critical to survival for marine turtle species, however; the EMBA overlaps a number of the habitats critical to survival for four species of marine turtles. These locations and the relevant marine turtle species and genetic stocks are listed in **Table 4-10** and shown on **Figure 4-15**.

4.6.2.4 Biologically Important Areas

Biologically Important Areas (BIAs) are spatially delineated areas where aggregations of individuals of a species are known to display biologically important behaviours (DoEE, 2012a). These behaviours may include breeding, foraging, resting and/or migration. BIAs were developed simultaneously with the Marine Bioregional Plans to inform regulatory and management decisions and are not enforced by legislation (DAWE, 2020a).

A review of the DAWE National Conservation Values Atlas (DAWE, 2020b), as well as species conservation advices, management and recovery plans (see **Section 4.6.2.2**), identified that the BIAs listed in **Table 4-8** overlap spatially with the Operational Area and/or EMBA. This table excludes BIAs within the Operational and/or EMBA for marine turtles; these are listed in **Table 4-10**.

Relevant BIAs are also shown on figures within the relevant species sections (**Section 4.6.2.9**).

Table 4-8: Biologically Important Areas that Overlap with the Operational Area and/or EMBA

Species	Biologically Important Area	Distance from the Operational Area
Marine Mammals		
Humpback whale	Migration (North and South)	23 km
Pygmy blue whale	Possible foraging Area (Ningaloo Coast)	214 km
	Migration (North and South; Augusta to Derby)	0 km
Dugong	Breeding, Calving, Foraging (high density seagrass habitat) and Nursing (Exmouth Gulf)	184 km
Sharks, Rays and Fish		
Whale shark	Foraging (Northward from Ningaloo along 200 m Isobath)	0 km
	Foraging (High Density Prey; Ningaloo Marine Park and adjacent Commonwealth waters)	210 km
Seabirds and Migratory Shorebirds		
Fairy tern	Breeding / Breeding with Foraging ('Pilbara and Gascoyne coasts and islands'; specifically, the Montebello and Barrow Islands, Ningaloo Coast, Pilbara Islands)	38 km
Lesser crested tern	Breeding / Breeding with Foraging ('Kimberley and Pilbara coasts and islands also Ashmore Reef'; specifically, Montebello and Barrow Islands, select Pilbara islands)	41 km
Roseate tern	Breeding / Breeding with Foraging ('Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef'; specifically, Ningaloo Coast, Dampier Archipelago, Lowendal Islands)	44 km
Wedge-tailed shearwater	Breeding (Pilbara Coast and Island Groups; numerous BIAs including those overlapping Operational Area)	0 km
	Foraging (High numbers; south-west coast of WA, from offshore Exmouth south to Eagle Bay)	657 km

4.6.2.5 Critical Habitat

No Critical Habitats listed on the Register of Critical Habitat (DAWE, 2020c) as defined under the EPBC Act are known to occur within the Operational Area or EMBA.

4.6.2.6 Seasonal Sensitivities of EPBC Act Listed Species

Those EPBC Act listed species identified by the PMST with known periods of seasonal sensitivity within the EMBA are listed in **Table 4-9**. These periods of sensitivity relate to key fauna behaviours, such as breeding, foraging or migration. Timings presented here are a guide only; many species exhibit inter-seasonal variation in the timing of their seasonal behaviours, which may relate to factors such as prey availability and metocean conditions.

Table 4-9: Indicative Key Seasonal Sensitivities of EPBC Act Listed Fauna as Relevant to the EMBA

Species	January	February	March	April	May	June	July	August	September	October	November	December
Marine Mammals												
East Indian Ocean (EIO) pygmy blue whale – northern migration (Double *et al.*, 2012; 2014)												
EIO pygmy blue whale – southern migration (Double *et al.*, 2012; 2014)												
Humpback whale – northern migration (Double *et al.*, 2010; TSSC, 2015a)												
Humpback whale – southern migration (Double *et al.*, 2010; TSSC, 2015a)												
Killer whale – feeding (Pitman *et al.*, 2015)												
Fin whale (Aulich *et al.*, 2019)												
Marine Reptiles[5] **(DoEE, 2017)**												
Green turtle, Northwest Shelf genetic stock – nesting												
Green turtle, Northwest Shelf genetic stock - hatching												
Loggerhead turtle, Western Australia genetic stock – nesting												
Loggerhead turtle, Western Australia genetic stock – hatching												
Flatback turtle, Pilbara Coast genetic stock – nesting												
Flatback turtle, Pilbara Coast genetic stock – hatching												
Hawksbill turtle Western Australia genetic stock – nesting												
Hawksbill turtle Western Australia genetic stock – hatching												
Leatherback turtle – nesting												

[5] Seasonal information is specific to the marine turtle genetic stocks relevant to this Petroleum Activities Program (see **Table 4-10**). Note that the leatherback turtle does not have differentiated genetic stocks within WA.

Species	January	February	March	April	May	June	July	August	September	October	November	December
Leatherback turtle – hatching												
Fish, Sharks and Rays												
Whale shark – foraging/ aggregation (Ningaloo Coast) (TSSC, 2015d)												
Whale shark – northern and southern migration (NWMR) (TSSC, 2015d)												
Great white shark – northern migration (to North West Cape) (DSEWPaC, 2013a)												
Giant manta ray – presence/ aggregation/breeding (Ningaloo Coast) (Ningaloo Centre, 2020)												
Reef manta ray – presence/ aggregation/breeding (Ningaloo Coast) (Ningaloo Centre, 2020)												
***Seabirds and Migratory Shorebirds* (Commonwealth of Australia, 2015)**												
Red knot – non-breeding season (NWMR) (TSSC, 2016a)												
Curlew sandpiper – non-breeding (NWMR) (DoE, 2015c)												
Eastern curlew – non-breeding (NWMR) (DoE, 2015d)												
Northern Siberian bar-tailed godwit – non-breeding (NWMR) (TSSC, 2016b)												

	Species likely to be present in the region.
	Peak period - presence of animals reliable and predictable each year.

4.6.2.7 Threatened Ecological Communities

An ecological community is defined by DAWE as ‘a group of plants, animals and other organisms that naturally occur together and interact in a unique habitat’ (DAWE, 2020e). Ecological communities under threat of extinction may be listed as Threatened Ecological Communities (TECs) under the EPBC Act in order to conserve these ecological communities.

The PMST did not identify any TECs as occurring within the Operational Area or EMBA.

4.6.2.8 Ramsar Wetlands of National Importance

Ramsar Wetlands of National Importance (Ramsar wetlands) are defined under Article 2 of the Ramsar Convention or under the EPBC Act and are recognised as MNES. The ‘Criteria for Identifying Wetlands of International Importance’ (DAWE, 2020f) is used to determine if a site is eligible for listing and at least one of the nine criteria must be met for a site to be eligible.

The PMST did not identify any Ramsar wetlands within the Operational Area or EMBA. The closest Ramsar wetland occurs at Eighty Mile Beach, 505 km east of the Operational Area. Ramsar wetlands are, therefore, not considered further in this EP.

4.6.2.9 Description of Relevant EPBC Act Listed Species

Marine Mammals

Twelve EPBC Act listed Threatened and/or Migratory marine mammal species were identified as potentially occurring within the Operational Area and/or EMBA. These species are listed in **Table 4-6**. Marine mammals, particularly whales, typically have wide distributions associated with migratory behaviours. Those species considered likely to occur within the Operational Area are discussed below.

<u>Blue Whale</u>

The blue whale (*Balaenoptera musculus*) is listed as Endangered, Migratory and Cetacean under the EPBC Act. The blue whale is a baleen filter feeder and primarily feeds on krill but also opportunistically feeds on fish and squid. The blue whale and its sub-species have been significantly impacted by historical whaling activities and whaling remains a threat today outside of Australia’s jurisdictional waters. The distribution of blue whales in Australia is shown on **Figure 4-12**. There are two subspecies of blue whale that occur within WA waters; the Antarctic blue whale, *B. m. intermedia*, and the pygmy blue whale, *B. m. brevicauda*. These two subspecies are differentiated by morphology, distribution, vocalisation and genetics (Commonwealth of Australia, 2015). Typically, Antarctic blue whales occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (Department of Environment and Heritage (DEH), 2005). On this basis, nearly all blue whales sighted in the NWMR (and hence the EMBA) are most likely to be pygmy blue whales and only this subspecies is discussed further in this EP. Furthermore, the population of pygmy blue whale considered most likely to occur within the EMBA has been named the East Indian Ocean (EIO) pygmy blue whale due to its geographical distribution; this population is seasonally distributed from Indonesia (a potential feeding and calving ground) to south west of Australia and east across the Great Australian Bight and Bonney Upwelling to beyond the Bass Strait (McCauley *et al*., 2018; Blue Planet Marine, 2019).

Like other whale species, the pygmy blue whale migrates between feeding and breeding grounds each year. The northward migration from the Perth Canyon (south west WA; a known feeding ground) to breeding grounds potentially as far as Indonesia is thought to occur between March / April and June, with the southern migration occurring between September and December (Commonwealth of Australia, 2015). A satellite tagging study undertaken by Double *et al*. (2014) showed northward migrating tagged whales travelled relatively near to the WA coastline

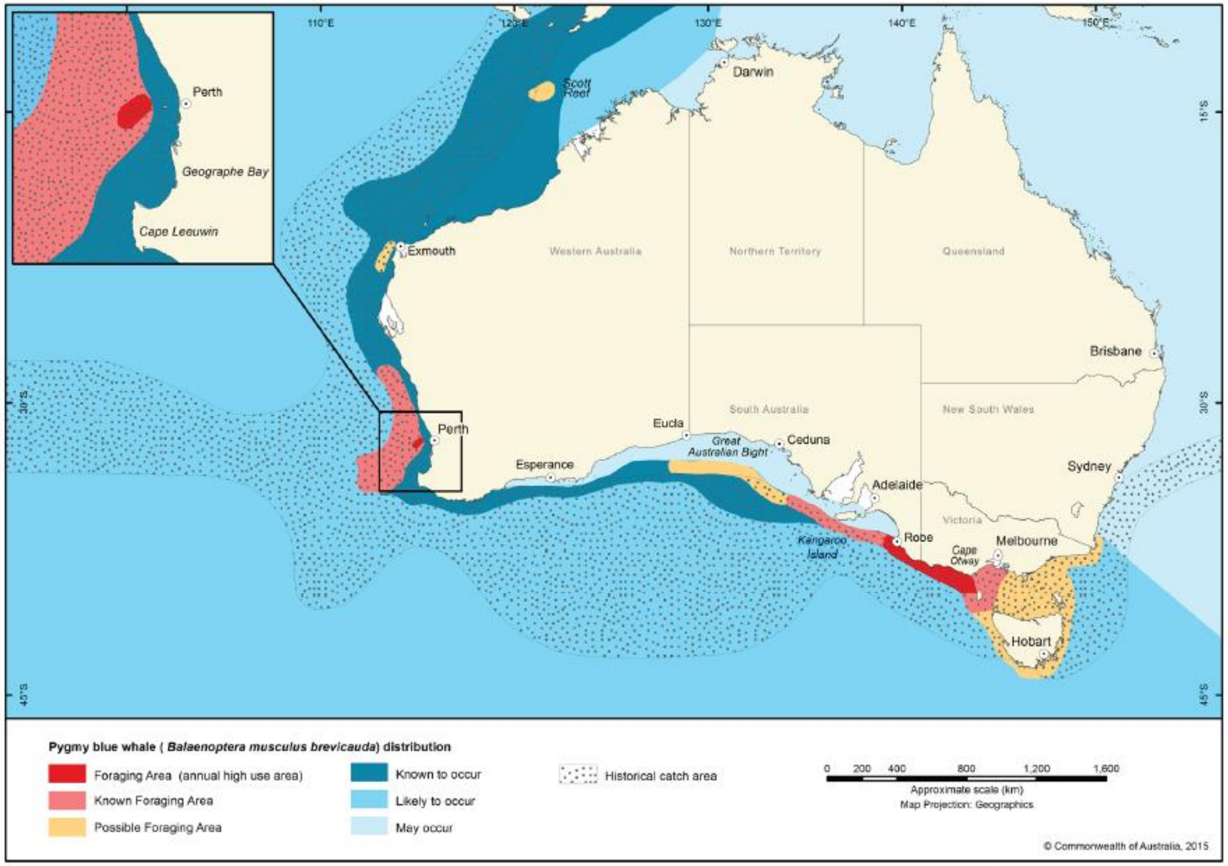
(100±1.7 km) throughout March and April until they reached the North West Cape (waters off this cape are partially within the EMBA), as shown in **Figure 4-13**. The whales then travelled northwards and offshore (238.0±13.9 km) during May towards Indonesia and by June whales were travelling through the Savu and Timor Sea.

Satellite tracking indicates that at least some individuals of this sub-species aggregating and/or feeding in the Bonney Upwelling (another seasonal foraging location off the coast of Portland, Victoria) migrate westward in the austral winter to the Perth Canyon and potentially further north to Indonesia (Gill *et al*. 2011; Blue Planet Marine, 2019). Inter-annual variation in migration trends for this population have, however, been noted; McCauley *et al*. (2018) found a southward migratory pulse along the WA coast between October and December, which extended in some years into January of the following year. Southward migrating individuals were also recorded in close proximity to shore at Geographe Bay (south-west WA, south of the Perth Canyon) between November and December (McCauley *et al*. 2018).

The Perth Canyon (south of the EMBA), an area of high productivity due to the presence of upwelling and interaction of the Leeuwin Current and Undercurrent, is a key seasonal known foraging area for the pygmy blue whale, primarily between November and May (Commonwealth of Australia, 2015). Other possible feeding grounds off the WA coast include the wider area around the Perth Canyon and possible foraging areas off the North West Cape (waters partially within the EMBA) and overlapping Scott Reef (outside of the EMBA; Commonwealth of Australia, 2015c). The western Great Australian Bight is also thought to provide possible foraging grounds, and to act as a transitional feeding area between the Perth Canyon and the Bonney Upwelling. The distribution of the pygmy blue whale at known foraging areas varies seasonally due to seasonal fluctuations in environmental conditions, which influence upwelling events and prey availability (Commonwealth of Australia, 2015).

There are two estimates of the population size of the EIO pygmy blue whale for WA; McCauley and Jenner (2010) calculated the population to be between 662 and 1,559 individuals in 2004 based on passive acoustics (whale callings); and Jenner *et al*. (2008) calculated between 712 and 1,754 individuals based on photographic mark and recapture techniques. However, both estimates did not account for animals travelling further west into the Indian Ocean (McCauley *et al*. 2018). More recent passive acoustic data estimates a 4.3% growth rate that applies to the proportion of EIO pygmy blue whales using the south eastern Australian coast and may not reflect the full population but does imply an increasing population (McCauley *et al*. 2018).

The 'Conservation Management Plan for the Blue Whale' (Commonwealth of Australia, 2015) has delineated the distribution area of blue whales in Australian waters and identified a number of BIAs for WA waters (shown on **Figure 4-13**). The migratory BIA and a BIA for possible foraging for the EOI PBW species overlap with the EMBA. The Operational Area also overlaps with the migratory BIA just barely touching the eastern extent of this migration route as represented by the pygmy blue whale migratory BIA. Although the migratory BIA for this species comprises a corridor centred between the 500 m and 1,000 m depth contours off the WA coast, the satellite tracking data detailed above suggests individuals transit deeper waters to the west of the Operational Area between mid-April to early August (peak in May and June for NWS) during their northern migration. Migrating pygmy blue whales of the EOI pygmy blue whale population are, therefore, expected to occur seasonally within the EMBA and transit the Operational Area during their northbound and southbound migration.



Foraging Area (Annual high use area)	Blue whales are regularly observed feeding on a seasonal basis	Known to occur	Blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections
Known Foraging Area	Known foraging occurs in these areas but is highly variable both between and within seasons	Likely to occur	Blue whales are likely to occur based on occasional observations in the area and nearby areas
Possible Foraging Area	Evidence for feeding is based on limited direct observations or through indirect evidence, such as occurrence of krill in close proximity of whales, or satellite tagged whales showing circling tracks. Blue whales travel through on a seasonal basis, possibly as part of their migratory route	May occur	Evidence for the presence of blue whales through strandings or rare observations
		Historical catch area	Blue whales were caught during the whaling period based on whaling data

Figure 4-12: Distribution of the Pygmy Blue Whale within Australian Waters (Commonwealth of Australia, 2015)

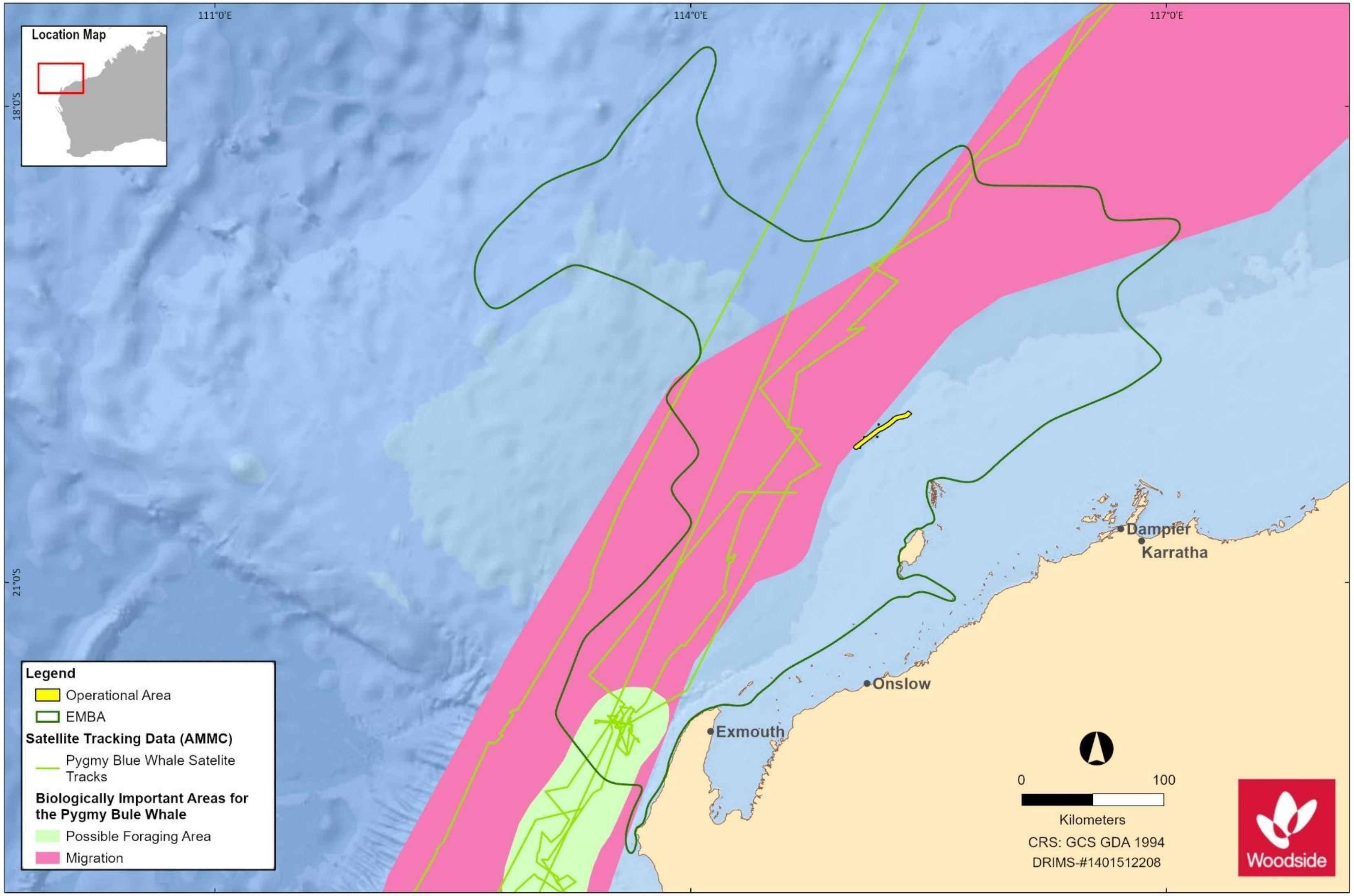


Figure 4-13: Pygmy Blue Whale Northbound Migration Satellite Track (Double *et al.*, 2014) and Biologically Important Areas (DAWE, 2020a; 2020b)

Humpback Whale

The humpback whale, *Megaptera novaeangliae*, is listed as Vulnerable, Migratory and Cetacean under the EPBC Act. Humpback whales are baleen (filter feeding) whales weighing up to 40 tonnes and measuring up to 18 m (TSSC, 2015c). The species has a wide global distribution and displays distinct migration pathways between breeding and calving grounds in lower latitudes and feeding grounds in higher latitudes (DAWE, 2020g). In Australian waters two genetically distinct populations migrate annually along the West (Group IV) and East (Group V) coasts between May and November (RPS, 2010a).

Historically, this species has suffered significant population decline due to unsustainable whaling practices (TSSC, 2015c). Since the 1982 moratorium on commercial whaling, population numbers have recovered significantly; from about 2000 to 3000 individuals in 1991, to between 19,200 and 33,850 individuals in 2008 (Bannister and Hedley, 2001; Bejder *et al*., 2019; Hedley *et al*., 2009). This is in keeping with results of five aerial surveys undertaken between 2000 and 2008 by Salgado-Kent *et al*. (2012), which produced a population estimate for the Group IV population of 26,100 individuals (CI 20,152 - 33,272). Current population growth for the Group IV population is estimated to be between 9.7 and 13% per annum (TSSC, 2015c). Using the Salago-Kent *et al*., (2012) estimate in 2008 of 26,100 individuals and an annual population growth rate of 10%, current population estimates could be greater than 75,000 individuals.

The Group IV population migrates northward from its Antarctic feeding grounds around May each year, reaching the NWMR around early June. The southward migration subsequently starts in mid-September, around the time of breeding and calving (typically August to September) (TSSC, 2015c). There is a resting area in the Exmouth Gulf, adjacent to the EMBA, which provides calm, protected waters for mothers to nurse their calves prior to continuing on their southern migration (Bejder *et al*. 2019).

Surveys (including satellite tracking data; Double *et al*. 2012; **Figure 4-14**) and the known distribution of the humpback whale indicate this species distribution is to the west of the Operational Area and will occur within the EMBA. There are BIAs for migration and breeding and calving for the humpback whale along the WA coast and within the NWMR (see **Section 4.6.2.1**). The migration BIA which extends along most of WA's coastal waters overlaps the EMBA, as shown in **Figure 4-14**. Specifically, the species is expected to occur during its northern and southern migration to the south-east of the Operational Area. Due to this species preference for waters about 50 km offshore during migration (Jenner *et al.* 2010), it is not anticipated that humpback whales will occur in large numbers in proximity to the Operational Area (see **Figure 4-14**).

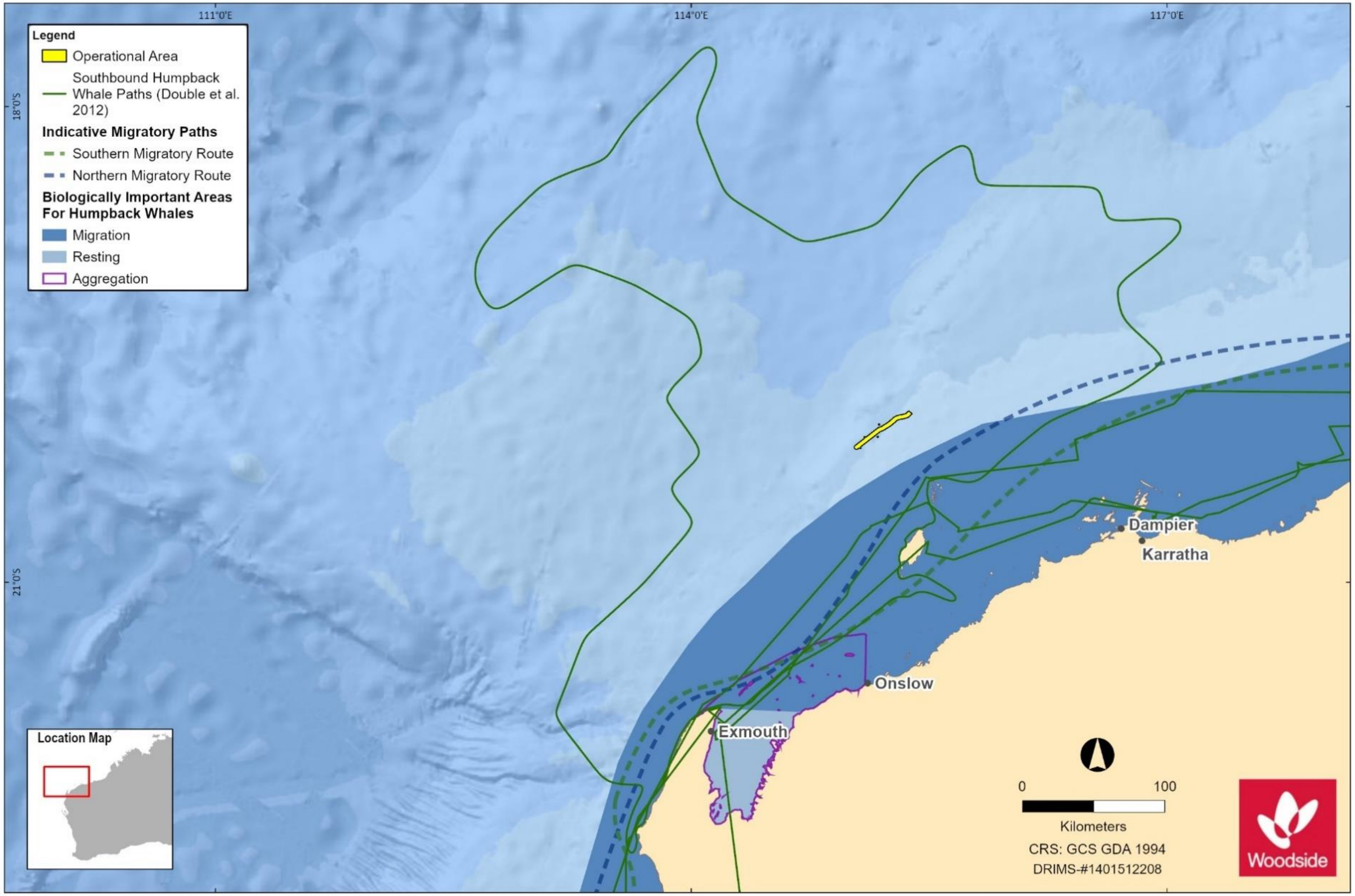


Figure 4-14: Humpback Whale Satellite Tracking Data and Biologically Important Areas

Killer Whale

The killer whale, *Orcinus orca,* (listed Migratory) has a widespread distribution from the polar to equatorial regions of all oceans and has been recorded in waters off all states of Australia (Bannister *et al*. 1996). Killer whales appear to be more common in cold, deep waters; however, they have also been observed along the continental slope and shelf (Bannister *et al*. 1996), as well as in shallow coastal areas of WA (RPS, 2010b). Killer whales are an apex predator and feed on a variety of vertebrate and invertebrate fauna, including other marine mammals, fish and squid. Populations of killer whale tend to display prey specialisation and are grouped according to distinct diets, morphologies and distributions. For example, at least four ecotypes/populations have been identified for killer whales in Antarctic waters (Wellard *et al.*, 2016).

Despite killer whales being sighted in all Australian waters, most records are opportunistic during ecotourism and commercial fishing activities. Dedicated studies and published sightings within WA waters include:

- Published observations of killer whales feeding on humpback whale calves during their migration along the WA coast, including along the Ningaloo Coast and Northwest Cape area (within the EMBA) during July and August (Wellard *et al.* 2016; Pitman et al. 2015)
- Published observations of killer whales preying on beaked whales (*Mesoplodon* spp.) in Bremer Bay (along the south coast of WA) during February and March (Wellard *et al.* 2016)

Recent studies suggest that killer whales aggregating at Bremer Bay may be a separate population to those animals aggregating in central WA waters and at Ningaloo (Meeuwig et al. 2016).

Killer whales are, therefore, expected to occur within the EMBA (and possibly the Operational Area); primarily as they follow humpback whales foraging in waters at Ningaloo and undertaking their southern migration with their calves. Killer whales are expected to be present in groups and to be exhibiting hunting behaviours during this time. Pitmen et al. (2015) suggests that humpback whales travel closer to the coast on their southern migration to protect their calves. Killers whales are likely to travel close to the coast during this period then also.

Sei Whale

The sei whale, *Balaenoptera borealis*, is a moderately large whale reaching up to 21 m in length. The species is listed as Vulnerable and Cetacean under the EPBC Act. Like many large whale species, the sei whale has been subject to historical whaling pressures (TSSC, 2015a). This species is primarily found in deep oceanic waters around much of Australia and exhibits a migration pathway influenced by seasonal feeding and breeding patterns. Sei whales have been infrequently recorded in Australian waters (Bannister *et al.*, 1996). Due primarily to difficulties in distinguishing the sei whale from the blue whale, accurate global population estimates, and migration patterns have not been determined for this species.

Reliable estimates of the sei whale population size in Australian waters are currently not possible due to a lack of dedicated surveys and their natural characteristics, which mean that they range widely over a very large area that poses accessibility issues for survey counts (DAWE, 2020g). However, it is well known and documented that sei whales occur throughout the Southern Hemisphere, predominantly offshore, migrating between low-latitude tropical and subtropical regions in the winter and temperate and subpolar latitudes in summer (Leaper *et al.*, 2008; Reilly *et al.*, 2008). They will typically travel in small pods of three to five individuals, with some segregation by age, sex and reproductive status DAWE, 2020g). Calving grounds are presumed to exist in low-latitudes with mating and calving potentially occurring during winter months (TSSC, 2015g). However, there are no known mating or calving areas in Australian waters (Parker, 1978).

The species has a preference for deep waters and typically occurs in oceanic basins and continental slopes (Prieto *et al*., 2012); records of the species occurring on the continental shelf (<200 m water depth) are uncommon in Australian waters (Bannister *et al*. 1996a). Due to this species' preference for deep oceanic waters, it is considered unlikely that the sei whale will be present within the Operational Area (water depths 71 to 177 m). Individuals may, however, occur within the deeper waters of the EMBA.

Fin Whale

The fin whale, *Balaenoptera physalis*, is listed as Vulnerable and Cetacean under the EPBC Act and is distributed in both the Southern and Northern hemispheres between 20 and 75°. The species is widely distributed within Australian waters (excluding New South Wales and the Northern Territory); however, data indicates this species prefers deeper oceanic waters and is uncommonly encountered in coastal or continental shelf waters (TSSC, 2015b). This species is the second largest of the whales (reaching up to 27 m in length) and has been subject to intense historical whaling; it is estimated that the global population suffered a 70% decline over three generations (1929 – 2007) (TSSC, 2015b).

Fin whales regularly occur from polar to tropical waters but are rarely found in inshore waters (DAWE, 2020g). The fin whale is thought to migrate from higher latitude summer feeding grounds to lower latitude breeding grounds and the species rarely utilises coastal inshore waters. The species has been observed in groups of six to 10 individuals, as well as in pairs and alone (TSSC, 2015b). Accurate distribution patterns are not known within Australian waters and the majority of data is from stranding events (DAWE, 2020g). Stranding events have been reported in small numbers in WA (Bannister *et al*., 1996). One stranding was reported in 1951 near Mandurah, and the other in 1996 at Cottesloe both locations south of the EMBA). Additionally, fin whales have been recorded vocalising off the Rottnest Trench (south of the EMBA) in WA, between January and April 2000 (McCauley *et al.*, 2000).

It is currently not possible to accurately estimate the population size of fin whales in Australian waters predominantly due to the species' behaviour and local ecology, as the proportion of time they spend at the surface varies greatly depending on these factors (DAWE, 2020g). In addition, natural fluctuations of fin whales in Australian waters are unknown; however, long-range movements do appear to be prey-related (DAWE, 2020g). Littaye *et al.* (2004) indicated that fin whales adapt their movements and group size depending on long-term food availability as opposed to short-term environmental conditions.

A recent study by Aulich *et al.* (2019) used passive acoustic monitoring as a tool to identify the migratory movements of fin whales in Australian waters. On the west coast, the earliest arrival of these animals occurred at Cape Leeuwin (south-west WA) in April, and between May and October they migrated along the WA coastline to the Perth Canyon, which likely acts as a waystation for feeding (Aulich *et al*., 2019). Some whales were found to continue migrating as far north as Dampier (Aulich *et al.,* 2019).

The Australian Antarctic waters are important feeding grounds for fin whales (Morrice *et al*., 2004) but there are no known BIAs or important habitat within WA waters. Based on the available information, it is possible that the fin whale may occur within the EMBA (and possibly the Operational Area); most likely as transient individuals and in low numbers.

Bryde's Whale

The Bryde's whale, *Balaenoptera edeni*, is the second smallest of the baleen whales and is listed as Migratory and Cetacean under the EPBC Act. This species is the least migratory of its genus and is restricted geographically from the equator to about 40°N and S, or the 20° isotherm (Bannister *et al*., 1996). The species is subject to whaling in the western North Pacific Ocean, however as there are no population estimates for the Bryde's whale, the impacts of whaling activities or other factors are difficult to determine (DAWE, 2020g). The Bryde's whale is known to exhibit inshore and offshore forms in other international locations, which vary in morphology and migratory behaviours (Bannister *et al*., 1996). This appears to also be the case within Australian waters (DAWE, 2020g).

The Bryde's whale has been recorded in waters off most Australian States and Territories (DAWE, 2020g). McCauley (2011) detected the Bryde's whale using noise loggers deployed in and around

Scott Reef (north of the EMBA) between 2006 and 2009 and found this species to be present in low numbers throughout the year. The data indicated that this species was typically present as individuals, with occasional calls from multiple whales. Individuals were recorded moving slowly and called for long periods. Other noise logger data recorded between Exmouth and north of Darwin also has shown no apparent trend or seasonality (McCauley, 2011). Other surveys indicate that this species transits seasonally through a broad area off the continental shelf (McCauley & Duncan, 2011; RPS, 2012). This species has been detected within the NWS Province from mid-December to mid-June, peaking in late February to mid-April (RPS, 2012).

The Bryde's whale may occur within the EMBA and possibly the Operational Area, with no expected seasonality and low numbers. No known biologically important habitats for this species are documented for the NWMR.

<u>Sperm Whale</u>

The sperm whale has a worldwide distribution in deep waters (greater than 200 m) off continental shelves and sometimes near shelf edges (Bannister *et al*., 1996). In the open ocean, there is a generalised movement of sperm whales southwards in summer, and corresponding movement northwards in winter, particularly for males (Bannister *et al.*, 1996; DAWE, 2020c). Detailed information on the distribution and migration patterns of sperm whales off the WA coast is not available. The only key locality recognised in WA waters for sperm whales is along the southern coastline between Cape Leeuwin and Esperance, averaging 20–30 nautical miles offshore, where a population is recognised off Albany (Bannister *et al*., 1996). This area is outside of the EMBA.

Within the EMBA, sperm whales have been recorded in deep water off North West Cape (Jenner *et al.,* 2010; RPS, 2010b; Woodside, 2010) and appear to occasionally venture into shallower waters in other areas (RPS, 2010b). Twenty-three sightings of sperm whales (variable pod sizes, ranging from one to six animals) were recorded by marine mammal observers during the North West Cape MC3D marine seismic survey conducted between December 2016 and April 2017 (TGS, 2011). 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 (see **Section 4.6.1.5**). 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 (EPI Group, 2017; RPS, 2010b).

Given the wide distribution of sperm whales and their preference for deeper oceanic waters, the Operational Area is unlikely to represent an important habitat for this species. Their presence is likely to be a rare occurrence and limited to a few individuals infrequently transiting the area.

<u>Indo-Pacific Humpback Dolphin</u>

The Indo-Pacific humpback dolphin is now recognised as two distinct species; the Indo-Pacific humpback dolphin (*Sousa chinensis*) and the Australian humpback dolphin (*S. sahulensis*) (Jefferson & Rosenbaum, 2014). This EP will refer to the Australian humpback dolphin (*S. sahulensis*) which occurs in WA waters north of Shark Bay (Raudino *et al*., 2018).

The distribution of the Australian humpback dolphin is associated with warmer coastal currents and the species may inhabit shallow coastal, estuarine habitats in tropical and subtropical regions (Corkeron *et al*., 1997; Jefferson, 2000; Jefferson & Rosenbaum, 2014). This species is known to occur in waters of the NWS and Sahul Shelf from northern Australia to New Guinea (Beasley *et al.*, 2016; Hunt *et* al., 2017; Raudino *et al.*, 2018). The species is generally found in shallow inshore waters (less than 20 m) and less than 20 km from the mainland coast (Raudino *et al.*, 2016). However, the Australian humpback dolphin has also been sighted up to 60 km offshore near Barrow and Lowendal Islands (Hanf, 2015). A five day survey in 2015 also identified this species within the Montebello State Marine Park; a total of 28 individuals were catalogued, including six calves and one neonate (Raudino *et al.*, 2014). Within the EMBA, there is a resident group of this species at Ningaloo Reef (Bannister *et al.,* 1996).

Given their preference for shallow coastal habitats, the Operational Area is unlikely to represent an important habitat for this species, however; it is expected that this species will be present within the EMBA and primarily around island groups and coastal mainland areas.

Spotted Bottlenose Dolphin (Arafura/Timor Sea Populations)

The spotted bottlenose dolphin is generally considered to be a warm water subspecies of the common bottlenose dolphin. The species distribution is primarily within inshore waters, often in depths of less than 10 m (Bannister *et al*., 1996). This species is known to occur from Shark Bay (south of the EMBA) north to the western edge of the Gulf of Carpentaria (Northern Territory).

Given the distribution of spotted bottlenose dolphins and their preference for shallow coastal waters, the Operational Area is unlikely to represent an important habitat for this species. Their presence is likely to be a rare occurrence and limited to infrequent transiting of the area. The species is, however, likely to be present in the nearshore coastal waters of the EMBA.

Dugong

Dugongs are large herbivorous marine mammals that feed on seagrass beds and macroalgae in coastal areas. Dugong distribution has been found to correlate with both seagrass habitat and water temperature (Preen et al., 1997; Chilvers et al., 2004). The distribution of dugong in the Pilbara region is widespread including the Dampier Archipelago, Lowendal Islands, Barrow Island, the Montebello Islands, Exmouth Gulf, Ningaloo and Shark Bay (Woodside, 2006; MPRA, 2007). Dugongs in the Pilbara region may be resident year-round, with some seasonal variations in density (Chevron Australia, 2010).

Aerial surveys undertaken from May 2009 to May 2010 in the West Pilbara offshore region targeting humpback whales also recorded dugongs in waters less than 50 m (primarily less than 10 m deep) year-round with a peak in June. Densities were highest nearer to the Exmouth Gulf (Jenner *et al*., 2010). A survey subsequently undertaken in winter (August) of 2010 inshore of the EMBA indicated the Exmouth Gulf (adjacent to the EMBA) was an aggregation area for this species. Six calves were recorded within the Exmouth Gulf (RPS, 2010). Distribution of the species in the study area is thought to be correlated with the distribution of seagrass and dugong were primarily found to forage in waters less than 10 m depth and within 5 km of the mainland and island coasts (RPS, 2010). Occurrence of dugongs was also found to be six times greater within the Exmouth Gulf compared with the study area further north and offshore of Onslow and Ashburton North (RPS, 2010).

Due to the preference of dugongs for water depths less than 10 m and close to the mainland and island coasts, as well as absence of seagrass habitats within the Operational Area, dugongs are not expected to be present within the Operational Area. Dugong are expected to be present around the mainland and island habitats within the EMBA, however.

Marine Reptiles

Marine Turtles

Five of the six marine turtle species that have been recorded within the NWMR were identified by the PMST as potentially occurring within the EMBA; the loggerhead (Endangered), green (Vulnerable), leatherback (Endangered), hawksbill (Vulnerable), and flatback (Vulnerable) turtle. A summary of these species life cycle habits and their key habitats, as listed in the 'Recovery Plan for Marine Turtles in Australia' (DoEE, 2017), is provided in **Table 4-10**. Habitat Critical to the Survival of Marine Turtle Species and BIAs are shown in **Figure 4-16**. One species, the flatback turtle, has a BIA which overlaps the Operational Area.

Table 4-10: Key Habitats (including Habitat Critical to Survival of Marine Turtle Species and Biologically Important Areas) and Preferred Diet of the Marine Turtle Species which May occur within the EMBA (Source: DoEE, 2017; DAWE, 2020b)

Turtle Species / Genetic Stock within EMBA	Preferred Diet and Habitat (Adults)	Important Nesting Locations within the EMBA	Habitat Critical to the Survival of Marine Turtle Species within the EMBA[6]	Biologically Important Areas within the EMBA
Green turtle (*Chelonia mydas*) *Northwest Shelf Genetic Stock*	**Preferred Diet:** Primarily herbivorous - Seagrass, algae and mangroves **Preferred habitat**: Tidal/sub-tidal habitats including mangroves, sandy beaches, rocky reefs, mud flats with algal turfs and seagrass meadows.	Lacepede Islands, Montebello Islands, Barrow Islands Group, Muiron Islands, Thevenard Island, Lowendal Islands; and various mainland beaches, Shark Bay to Ningaloo and Kimberley Coast (some within the EMBA).	• Barrow Island, Montebello Islands (all with sandy beaches), Serrurier Island and Thevenard Island (20 km internesting buffer) • Exmouth Gulf, Northwest Cape and Ningaloo Coast (20 km internesting buffer)	• Coral Reef habitats west of the Montebello Island Group: foraging, mating, internesting and aggregation • Middle Island (west coast) and Barrow Island (west and north coast): mating, nesting, internesting and basking • Barrow Island: internesting, foraging • Montebello Islands: internesting, nesting, mating, foraging • Muiron Islands: nesting and internesting • North West Cape: internesting • String of islands between Cape Preston and Onslow (inshore of Barrow Island): foraging.
Loggerhead turtle (*Caretta caretta*) *Western Australia Genetic Stock*	**Preferred Diet:** Carnivorous – benthic invertebrates **Preferred habitat**: Tidal /sub-tidal habitats with both hard and soft substrates (e.g. rocky reefs, muddy bays, sand flats and estuaries). Also open ocean.	South Muiron Island, North West Cape; and various mainland beaches from Shark Bay to southern North-West Shelf (some within the EMBA).	• Exmouth Gulf and Ningaloo Coast (and Muiron Islands; 20 km internesting buffer)	• Lowendal Islands: nesting and internesting • Montebello Islands: nesting and internesting • Muiron Islands: nesting and internesting • Ningaloo Coast and Jurabi Coast: nesting and internesting

[6] Those Habitats Critical the Survival of Marine Species whose buffer overlaps the EMBA have been included here.

Turtle Species / Genetic Stock within EMBA	Preferred Diet and Habitat (Adults)	Important Nesting Locations within the EMBA	Habitat Critical to the Survival of Marine Turtle Species within the EMBA[6]	Biologically Important Areas within the EMBA
Flatback turtle (*Natator depressus*) *Pilbara Coast Genetic Stock*	**Preferred Diet:** Primarily carnivorous – soft bodied invertebrates **Preferred habitat**: Soft sediment habitats supporting benthic invertebrates.	Barrow Island, Thevenard Island, Muiron Islands, Montebello Group.	• Barrow Island, Montebello Islands and coastal islands from Cape Preston to Locker Island (60 km internesting buffer)	• Barrow Island: foraging, nesting and mating • Coral reef habitat west of the Montebello Islands Group: foraging, mating, internesting, aggregation • Dampier Archipelago: internesting • Delambre Island: internesting • Intercourse Island: internesting • Legendre Island and Huay Island: internesting • Montebello Islands: foraging, mating, nesting, internesting • North Turtle Island: internesting • String of Islands between Cape Preston and Onslow (inshore of Barrow Island): foraging • Thevenard Island: nesting, internesting
Hawksbill turtle (*Eretmochelys imbricata*) *Western Australia Genetic Stock*	**Preferred Diet:** Omnivorous – algae, sponges, soft corals **Preferred Habitat:** Tidal / sub-tidal coral and rocky reef habitats. Also, reefs, seagrass meadows or soft-bottomed habitats.	Montebello Islands Group (including Ah Chong, South East and Timouille), Sholl Island (part of the Pilbara Islands Group), Lowendal Islands (including Varanus, Beacon, Bridled), Barrow Island, Muiron Islands and some mainland beaches from Cape Range to Ningaloo and Gnaraloo to Red Bluff.	• Cape Preston to mouth of Exmouth Gulf (including Montebello Islands and Lowendal Islands (20 km internesting buffer)	• Montebello Islands (Ah Chong and South East Island): internesting, nesting • Barrow Island: internesting, mating, nesting, foraging • Lowendal Islands Group: internesting, nesting, mating, foraging • Montebello Islands Group (Hermite Island, North West Island, Trimouille Island): foraging, nesting, internesting, mating • Ningaloo Coast and Jurabi Coast: internesting, nesting

Turtle Species / Genetic Stock within EMBA	Preferred Diet and Habitat (Adults)	Important Nesting Locations within the EMBA	Habitat Critical to the Survival of Marine Turtle Species within the EMBA[6]	Biologically Important Areas within the EMBA
				• String of Islands between Cape Preston and Onslow (inshore of Barrow Island): foraging • Thevenard Island: nesting, internesting • Varanus Island: nesting, internesting
Leatherback turtle (*Dermochelys corlacea*) *No differentiated genetic stocks identified within WA or Australian waters*	**Preferred Diet:** Carnivorous – feeding mainly in the open ocean on jellyfish and other soft-bodied invertebrates **Preferred Habitat**: Oceanic waters and Australian continental shelf waters.	None.	None.	None.

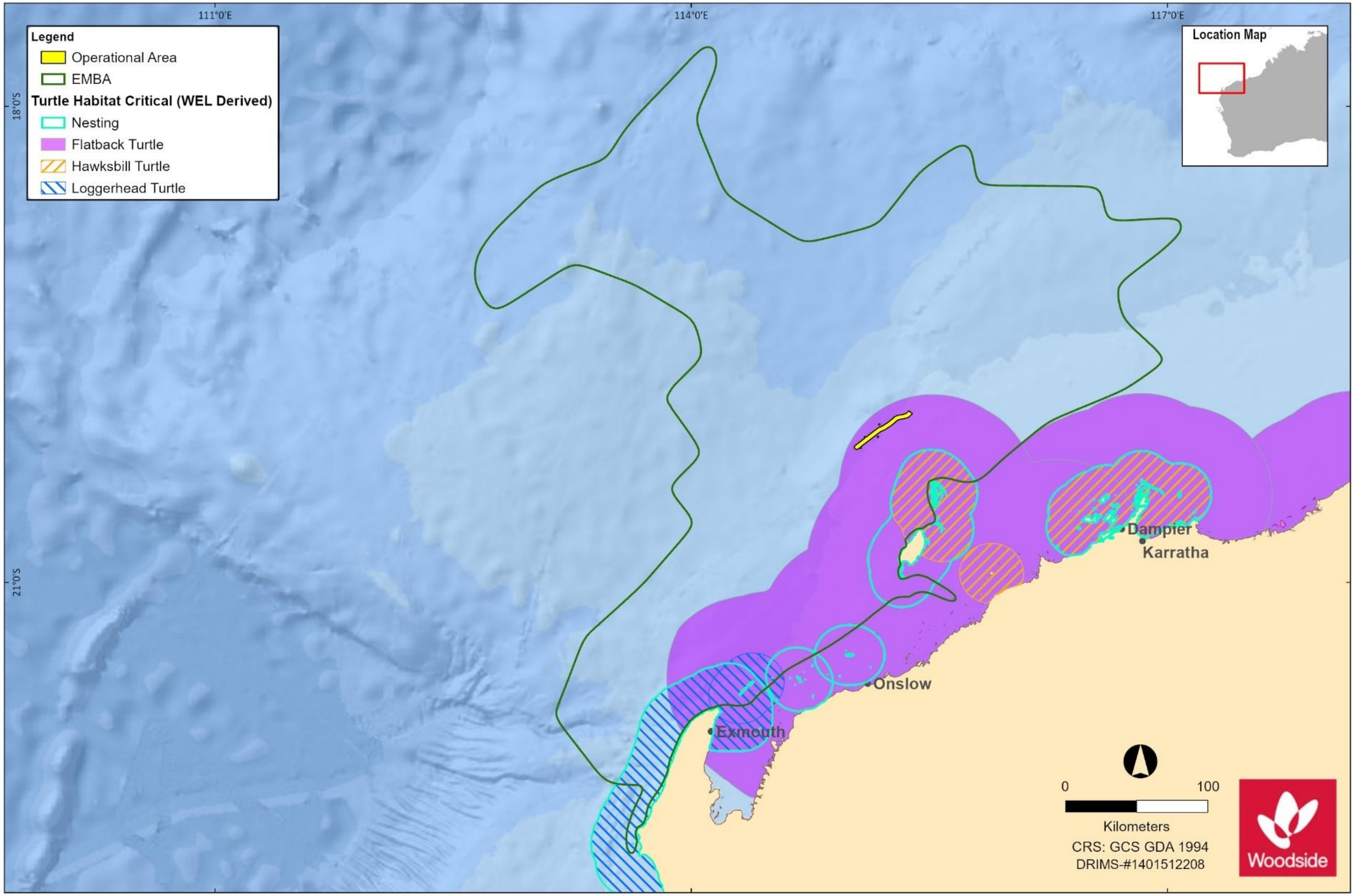


Figure 4-15: Habitat Critical to the Survival of Marine Turtle Species within the EMBA

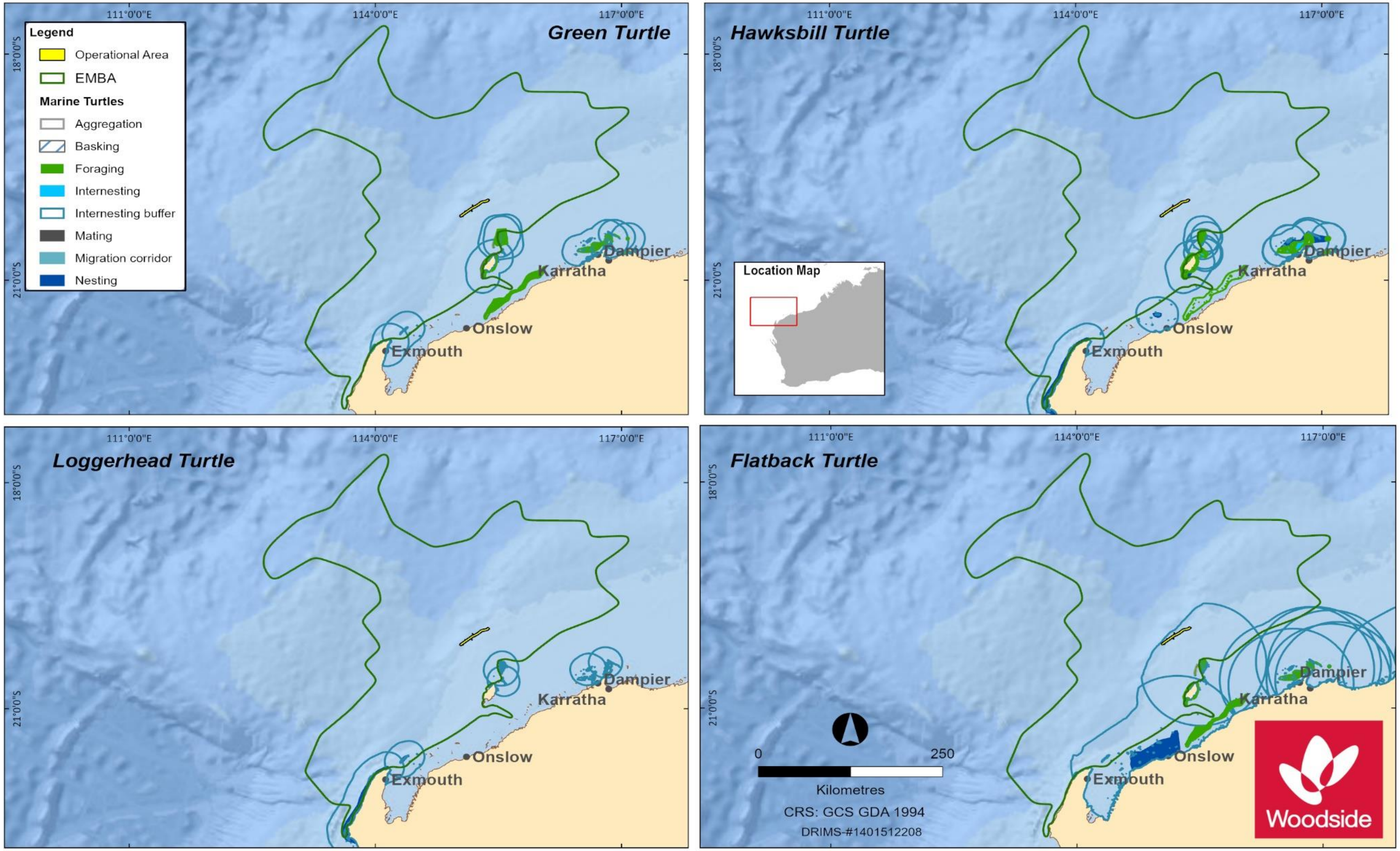


Figure 4-16: Biologically Important Areas for Marine Turtles within the EMBA

Sea Snakes

Sea snakes typically occur in coastal, shallow water habitats (excluding the pelagic yellow-bellied sea snake) as they are air breathing animals (Udyawer *et al*., 2016). They occupy diverse habitats including coral reefs, turbid water habitats and deeper water (Guinea *et al.,* 2004). Species exhibit habitat preferences depending on water depth, benthic habitat, turbidity and season (Heatwole and Cogger, 1993). The majority of information on the occurrence of sea snakes has been sourced from by-catch logs maintained by the Northern Prawn Fishery (DEWHA, 2008; this fishery does not overlap the Operational Area or EMBA).

Sea snake species in waters off WA have experienced population declines in recent decades. For example, Ashmore and Hibernia Reefs (outside of the EMBA) have historically been hotspots for sea snake diversity, however; surveys undertaken between 1978 and 2013 indicate significant population decline at these sites. Known threats to sea snakes within the NWMR include trawling and other fishing activities (Udyawer *et al*., 2016).

The short-nosed sea snake, listed as Critically Endangered under the EPBC Act, was identified as potentially occurring within the EMBA (although not within the Operational Area). This species has a restricted range and is coral dependant, with recorded declines within the NWS (Udyawer *et al.*, 2016). There are a small number of records of individuals collected along the Western Australian coast from the Exmouth Gulf to Broome (Storr *et al.*, 2002; Kangas *et al*., 2018a). The origin of these specimens has not been determined, but they may have been vagrants, or they may represent a population which has not yet been identified. This species may have a wider distribution; however, there are no conclusive records relating to the species distribution outside Australian waters (DSEWPaC, 2011a). The PMST identified 16 other species of sea snake listed as Marine under the EPBC Act within the EMBA.

Sea snakes of the families *Hydrophidae* and *Laticaudidae* are widespread in the EMBA and are protected under the EPBC Act. The most commonly sighted sea snake in the NWMR is the olive sea snake (*Aipysurus laevis*), which is generally found along lower reef edges and upper lagoon slopes of leeward reefs. The olive sea snake is associated with shallow water, as large, deep water expanses create a significant barrier to movement.

Given the water depth of the Operational Area and typical habitat preference of sea snakes, they are not expected to occur within the Operational Area other than as transient individuals. Within the EMBA, sea snakes are most likely to be present around island and coastal waters, particularly reef and complex habitats (e.g. Montebello Islands Group, Barrow Islands Group).

Sharks, Rays and Fish

Whale Shark

The whale shark, *Rhincodon typus*, is listed as Vulnerable and Migratory under the EPBC Act. This species can grow up to 12 m in length and is a filter feeder, primarily feeding on plankton and small fish (DAWE, 2020e). This species undergoes an annual migration along the 200 m isobath of the WA coast between July and November (TSSC, 2015d). Within the EMBA, whale sharks aggregate annually to feed in the waters around Ningaloo Reef. This aggregation occurs between March and July (TSSC, 2015d). However, seasonal aggregation can be variable, with individual whale sharks recorded at other times of the year. The super-population (comprising individuals that visit the reef at some point during their lifetime) has been estimated to range between 300 and 500 individuals. It is expected that the number visiting Ningaloo Reef in any given year will 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 (Woodside, 2002; 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 and possibly up to 1,800 km away into Indonesian waters. Satellite tracking has shown that the sharks may follow three migration routes from Ningaloo (see **Figure 4-17**):

- north-west, into the Indian Ocean;
- directly north, towards Sumatra and Java; or
- north-east, passing through the NWS and travelling along the shelf break and continental slope (Meekan & Radford, 2010).

Although there is a foraging BIA for whale sharks offshore of northern WA (see **Figure 4-17**), the literature indicates this is more likely to be a migration pathway with whale sharks undertaking opportunistic foraging whilst undergoing their migration. The foraging BIA overlaps the Operational Area and the EMBA.

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 the 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 **Figure 4-17**). Opportunistic sightings associated with an ROV survey of the Angel platform jacket during August and September of 2018 observed two male and two female whale sharks (McLean *et al*., 2019).

It is expected that whale sharks may traverse the vicinity of the Operational Area during their migrations to and from Ningaloo Reef. However, it is expected that whale shark presence within the area would 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 (MPRA, 2005).

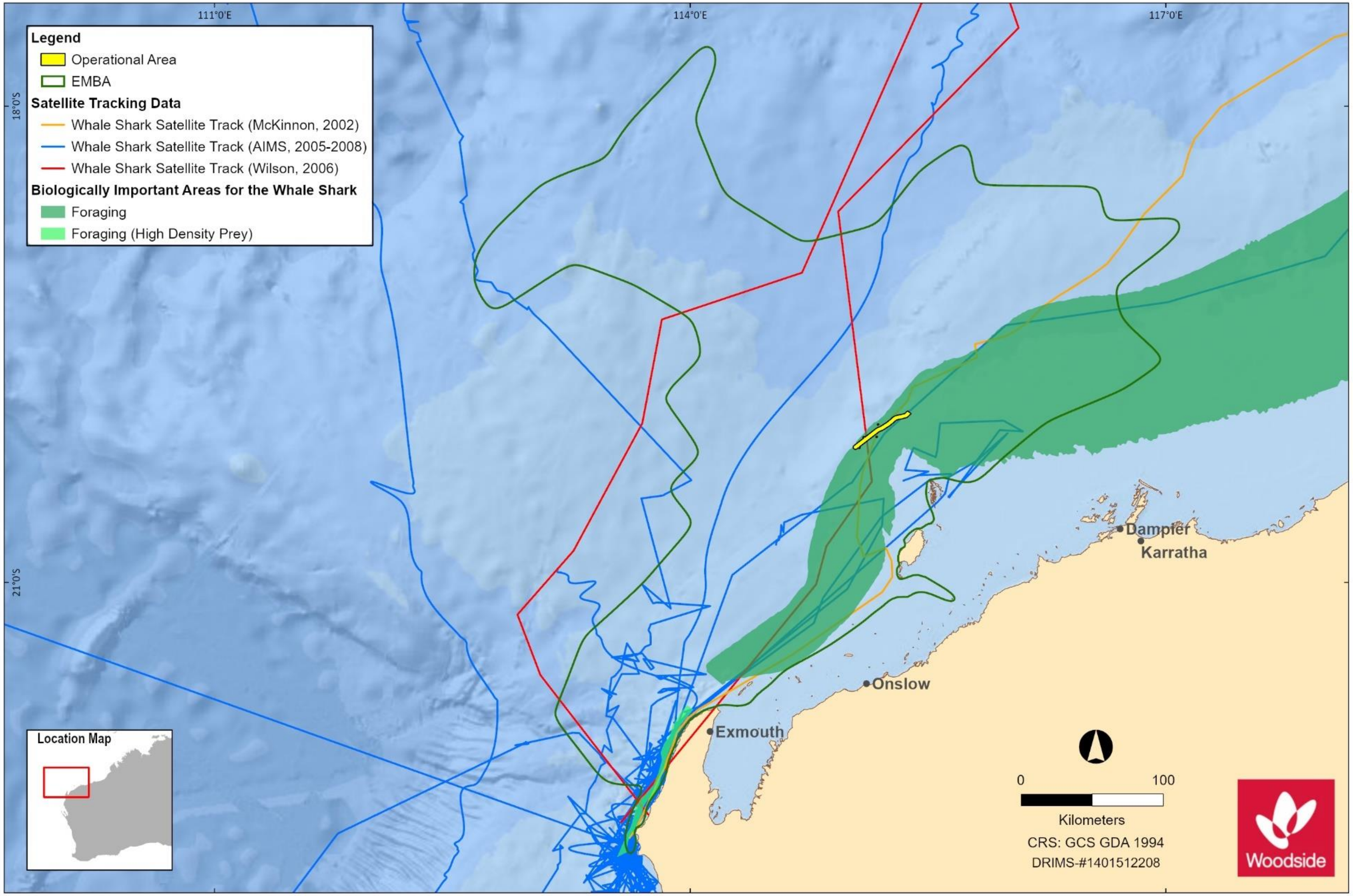


Figure 4-17: Short- and long-term satellite tracking of 15 whale sharks tagged between 2005 and 2008

Grey Nurse Shark

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 (Carcharias taurus, 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 of Western Australian with one record at 135 m depth), (McLean et al. 2018). As the Operational Area is located in water depths of 71 – 177 m deep, grey nurse shark may occur in the Operational Area and the wider EMBA.

Great White Shark

The great white shark typically occurs between the coast and the 100 m depth contour, although adults and juveniles have been recorded diving to depths of 1000 m (Bruce *et al*., 2006; Bruce & Bradford, 2008). They are also known to make open ocean excursions of several hundred kilometres and can cross ocean basins (for instance from South Africa to the western coast of Australia) (Weng *et al*., 2007). Along the WA coastline, great white sharks move up the coast as far as the North West Cape during spring and appear to return to waters further south during the summer (Commonwealth of Australia, 2013). Great white sharks are often found in regions with high prey density, such as pinniped colonies (DEWHA, 2009b).

Due to the lack of prey species and location of the Operational Area about 200 km north of the North West Cape, great white sharks are not anticipated to occur within the Operational Area other than as transient individuals.

Shortfin Mako

The shortfin mako (*Isurus oxyrinchus*) is a wide-ranging oceanic pelagic shark that is widespread in Australian waters, although rarely recorded in water temperatures below 16 °C (DEWHA, 2010). A recent satellite tracking study of this species found individuals spent most of their time in waters less than 50 m deep, with occasional dives up to 880 m deep (Stevens *et al*., 2010; Abascal *et al*., 2011). Little is known about the population size and distribution of shortfin mako sharks in WA; however, it is possible they will transit the Operational Area. It is expected that the number of individuals encountered will be low due to their preference for shallow waters (<50 m) but it is likely they will be within the broader EMBA.

Longfin Mako

The longfin mako (*Isurus paucus*) is a widely distributed but rarely encountered oceanic tropical shark found in Australian waters from Geraldton in WA (outside the EMBA) north and east to at least Port Stephens in New South Wales (DAWE, 2020g). The longfin mako is often confused with the shortfin mako due to their morphological similarities. There is very little information regarding both species in Australia, with no available population estimates or distribution trends. Occurrence within the Operational Area is likely to be infrequent and restricted to transiting individuals due to the lack of significant habitat for this species. However, it is likely this species will occur throughout the EMBA.

Oceanic Whitetip Shark

The oceanic whitetip shark was identified as potentially occurring within the Operational Area and

EMBA. The oceanic whitetip shark is globally distributed in warm-temperate and tropical oceans (Andrzejaczek et al. 2018). The species may occur in tropical and sub-tropical offshore and coastal waters around Australia (DAWE). They primarily occupy pelagic waters in the upper 200 m of the water column, however have been observed diving to depths of around 1000 m, potentially associated with foraging behaviour (Howey-Jordan et al. 2013; D'Alberto et al. 2017). The species is highly migratory, travelling large distances between shallow reef habitats in coastal waters and oceanic waters (Howey-Jordan et al. 2013). They are a slow-growing, late-maturing species which has made them more susceptible to overfishing pressures and population decline in the past (D'Alberto et al. 2017).

Given the migratory nature of the species and its broad distribution in pelagic waters around Australia, oceanic whitetip sharks are likely to be limited to transient individuals within the Operational Area and EMBA. No BIAs for the oceanic whitetip sharks have been defined in Australia.

Dwarf Sawfish

The dwarf sawfish is found in Australian coastal waters extending north from Cairns, around the Cape York Peninsula in Queensland to the Pilbara coast (DoE, 2015a). Dwarf sawfish typically inhabit shallow (2 to 3 m) silty coastal waters and estuarine habitats, occupying relatively restricted areas and moving only small distances (Stevens *et al*., 2008). The majority of capture locations for the species in WA waters have occurred within King Sound and the lower reaches of the major rivers that enter the sound, including the Fitzroy, Mary and Robinson rivers (Morgan *et al*., 2009). Individuals have also been recorded from Eighty Mile Beach in the Pilbara. Occasional individuals have also been taken from considerably deeper water from trawl fishing (Morgan *et al*., 2009).

As the Operational Area is in offshore waters marine waters the dwarf sawfish is not anticipated to occur within the Operational Area. This species is also not expected to occur within the EMBA as it does not encompass the nearshore and inland northern WA habitats typically utilised by this species.

Green Sawfish

Green sawfish were 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 around the Whitsundays in Queensland, across northern Australian waters to Shark Bay in WA (DoE, 2015a). Green sawfish are present in coastal waters and tidal creeks and, despite records for deeper offshore waters, their range is mostly restricted to the inshore fringe with a strong association to mangroves and adjacent mudflat habitats (DoE, 2015a). The Multi-species Recovery Plan for Sawfish and River Sharks indicates ‘known to occur’ distribution includes offshore waters of the NWS, with pupping ‘likely to occur’ south of Port Hedland, Exmouth Gulf and North West Cape (DoE, 2015a).

The Operational Area is not considered important habitat for the green sawfish and, considering the water depths, it is considered highly unlikely that this species will be present within the Operational Area. The green sawfish may however they may be present within the EMBA.

Giant Manta Ray

The giant manta ray is very common in tropical waters of Australia, including the Ningaloo Marine Park, Muiron Islands Marine Park and Management Area, and the Montebello Islands Marine Park/Barrow Island Marine Management Area (all located within the EMBA). The giant manta ray primarily inhabits nearshore 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, Ningaloo Reef, 189 km south of the Operational Area (but within the EMBA) is an important area for giant manta rays year-round, and particularly in autumn and winter (Preen *et al*., 1997). Occurrence of giant manta rays within the Operational Area is likely to be infrequent and restricted to individuals transiting the area, whilst this species is likely to occur within the coastal and island habitats within the EMBA.

Reef Manta Ray

The reef manta ray is globally distributed in tropical and subtropical waters. It is a planktivorous species and is thought to migrate relatively long distances, travelling up to 70 km per day and moving between specific productive areas (Couturier *et al*., 2011; van Duinkerken, 2010). The reef manta ray is most often sighted inshore, around coastal areas and coral reefs. Species residency has been recorded along the WA coastline, most notably at Ningaloo Marine Park.

The Operational Area is not located in or adjacent to any known key aggregation areas for the species (e.g. feeding or breeding). Occurrence of giant manta rays within the Operational Area is likely to be infrequent and restricted to individuals transiting the area, whilst this species is likely to occur within the coastal and island habitats within the EMBA.

Seabirds and Migratory Shorebirds

The PMST identified 12 species of EPBC Act listed Marine, Migratory or Threatened seabird and migratory shorebird which may potentially occur within the Operational Area. Notably, the Operational Area does not contain any emergent land that could be used as roosting or nesting habitat and birds are more likely to occur in the area transitionally as they migrate or move between other sites of importance. The Operational Area also does not contain any known critical habitats (including feeding) for any species. One BIA for the EPBC Act listed Migratory and Marine wedge-tailed shearwater (described below) overlaps the Operational Area.

Within the EMBA there are a number of islands and coastal mainland areas which support seabirds and migratory shorebirds as foraging, resting/staging and roosting habitat. A number of these places (e.g. Montebello Islands) are described in **Section 4.8**.

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.

Southern Giant Petrel

The southern giant petrel was identified as potentially occurring within the Operational Area. The species is widespread throughout the Southern Ocean and breeds on six subantarctic and Antarctic islands within Australia (Patterson *et al*., 2008). The species is found mainly over Antarctic waters but migrates into subtropical waters during winter. No critical habitat associated with the southern giant petrel has been identified within the Operational Area and/or the EMBA and there is no emergent land within the Operational Area which this species may utilise. The presence of this species within the EMBA is likely to be infrequent as individuals traverse the area during winter during their annual migration northward into subtropical waters.

Red Knot

The red knot (a migratory shorebird) is listed as Endangered and Migratory under the EPBC Act. The species undertakes long distance migrations 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). As with other migratory shorebirds, the species occurs in coastal wetland and intertidal sand or mudflats associated with the WA coastline, but is unlikely to occur in the Operational Area, aside from individuals occasionally transiting through during migrations, due to the lack of emergent habitat.

Curlew Sandpiper

The curlew sandpiper (a migratory shorebird) is listed as Critically Endangered and Migratory under the EPBC Act. The species occurs around the coast of Australia and can be found inland (although in smaller numbers). No breeding occurs on the Australian continent, with breeding grounds occurring in Siberia. Within Australia, the curlew sandpiper generally forages on mudflats and wetlands, feeding on invertebrates such as worms, molluscs and crustaceans (DoE, 2015c). They are sparsely distributed between Carnarvon and Dampier Archipelago; however, occur in the thousands at Eighty Mile Beach during migration (Australian summer). Due to the lack of emergent habitat, the curlew sandpiper is not expected to occur within the Operational Area; however, it may be present at coastal locations within the EMBA.

Eastern Curlew

The eastern curlew is Australia’s largest migratory shorebird and is listed as Critically Endangered and Migratory under the EPBC Act. The eastern curlew is a coastal species with a continuous distribution north from Barrow Island to the Kimberley region. The species is endemic to the East Asian–Australasian Flyway. The species is a non-breeding visitor to Australia from August to March, primarily foraging on crabs and molluscs in intertidal mudflats (DoE, 2015d). Due to the lack of emergent habitat, the eastern curlew is not expected to occur within the Operational Area; however, will potentially be present at coastal locations within the EMBA, particularly at the peak of migration during the Australian summer.

Australian Painted Snipe

The Australian painted snipe was identified as potentially occurring within the Operational Area. This species is endemic to Australia and has been recorded at wetlands in all states of Australia (Barrett *et al*., 2003; Blakers *et al*., 1984; Marchant and Higgins, 1993; Rogers *et al*., 2005). The Australian painted snipe is most likely to be found breeding in shallow wetlands and will feed in similar locations containing mudflats (Rogers *et al*., 2005). The species has been recorded breeding year-round (DAWE, 2020g). The wetland habitats this species displays a preference for are not present within the Operational Area and are also not abundant within the EMBA; this species is more likely to be present within the EMBA as a transient individual.

Australian Fairy Tern

The Australian fairy tern is listed as Vulnerable under the EPBC Act. It has a coastal distribution from Sydney, south to Tasmania and around southern Western Australia up to Dampier. The Australian fairy tern feeds on small baitfish and roosts and nests on sandy beaches below vegetation (Higgins & Davies, 1996; Van de Kam *et al*., 2004). Although identified by the EPBC search as occurring within the Operational Area, due to the coastal distribution of the species the Australian fairy tern is unlikely to occur within the Operational Area. However, it is likely to occur in the coastal regions of the EMBA.

Northern Siberian Bar-tailed Godwit

The Northern Siberian bar-tailed godwit was identified as potentially occurring within the EMBA. This species' description is almost identical to the bar-tailed godwit (described above), however it migrates to Australia from breeding in northern Siberia (the bar-tailed godwit breeds in eastern Siberia and west Alaska); and the two subspecies differ in plumage (Gill and Donsker, 2015).

The Northern Siberian bar-tailed godwit is predominately found in the north and north-west of WA during the non-breeding period (Bamford *et al*., 2008). Given this subspecies is found in similar habitats and feeding locations to the bar-tailed godwit, it may also be found within the coastal areas of the EMBA.

Common Noddy

The common noddy is the largest species of noddy found in Australian waters and is listed as Migratory under the EPBC Act. 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 longer 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 (Johnstone *et al*., 2013). The common noddy is thought to undertake seasonal movements, with some nesting sites abandoned during the non-breeding season (which is protracted between spring and autumn). The species is unlikely to occur within the Operational Area, aside from individuals occasionally transiting through during migration periods. The species will occur within the EMBA, particularly around offshore and coastal islands.

Streaked Shearwater

The streaked shearwater is listed as Migratory under the EPBC Act. It is most commonly found in pelagic and inshore waters of the Pacific Ocean. Within Australian waters, the species is commonly distributed from Exmouth, across northern Australia to Queensland, south to New South Wales (DSEWPaC, 2012c). Its diet consists of invertebrates and epipelagic fishes (Atlas of Living Australia, 2019). The species breeds in temperate regions of east and south-east Asia before migrating to tropical regions near the equator; however, little is known about their movements during the non-breeding period (Yamamoto *et al*., 2010).

Lesser Frigatebird

The lesser frigatebird is listed as Migratory under the EPBC Act and was identified as potentially occurring within the Operational Area. This seabird is the most widely distributed frigatebird in Australian tropical seas and is the smallest species of frigatebird. The species is well-adapted for an aerial existence and may range considerable distances from land. Food consists largely of fish taken at the sea surface or stolen from other birds. The lesser frigatebird may occur within the Operational Area and the tropical seas of the EMBA based on its known distribution.

Pectoral Sandpiper

The pectoral sandpiper is listed as Migratory under the EPBC Act. As with other species of sandpiper, the pectoral sandpiper breeds in the northern hemisphere during the boreal summer, before undertaking long distance migrations to feeding grounds in the southern hemisphere. The species occurs throughout mainland Australia between spring and autumn. The pectoral sandpiper prefers coastal and near-coastal environments such as wetlands, estuaries and mudflats. Given the species' preferred habitat the pectoral sand piper is not expected to occur within the Operational Area but is expected to occur in suitable habitats within the EMBA.

Osprey

Ospreys are listed as Migratory under the EPBC Act. Within Australia, Ospreys are most commonly found in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. In Australia Ospreys breed from April to February in individual pairs. Ospreys are mostly resident around breeding territories, foraging more widely during non-breeding season and feeding primarily on fish. Due to the lack of emergent habitat, Ospreys are not expected to occur within the Operational Area; however, will potentially be present at fragmented coastal locations within the EMBA.

Common Sandpiper

The common sandpiper is listed as Migratory under the EPBC Act. The species is a small, migratory sandpiper with a very large range through which it migrates annually between breeding grounds in the northern hemisphere (Europe and Asia) and non-breeding areas in the Asia-Pacific region (Bamford *et al*., 2008). 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 common sandpiper may be present in coastal wetland and intertidal sand or mudflats that occur within some parts of the EMBA, but is unlikely to occur in the Operational Area, aside from individuals occasionally transiting through during migrations, due to the lack of emergent habitat.

Sharp-Tailed Sandpiper

The sharp-tailed sandpiper is listed as Migratory under the EPBC Act. Like other species of sandpiper, the sharp-tailed sandpiper is a migratory wading shorebird and seasonally migrates long distances 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 due to the lack of suitable habitat but may occur seasonally in coastal wetland and intertidal sand or mudflats throughout the EMBA.

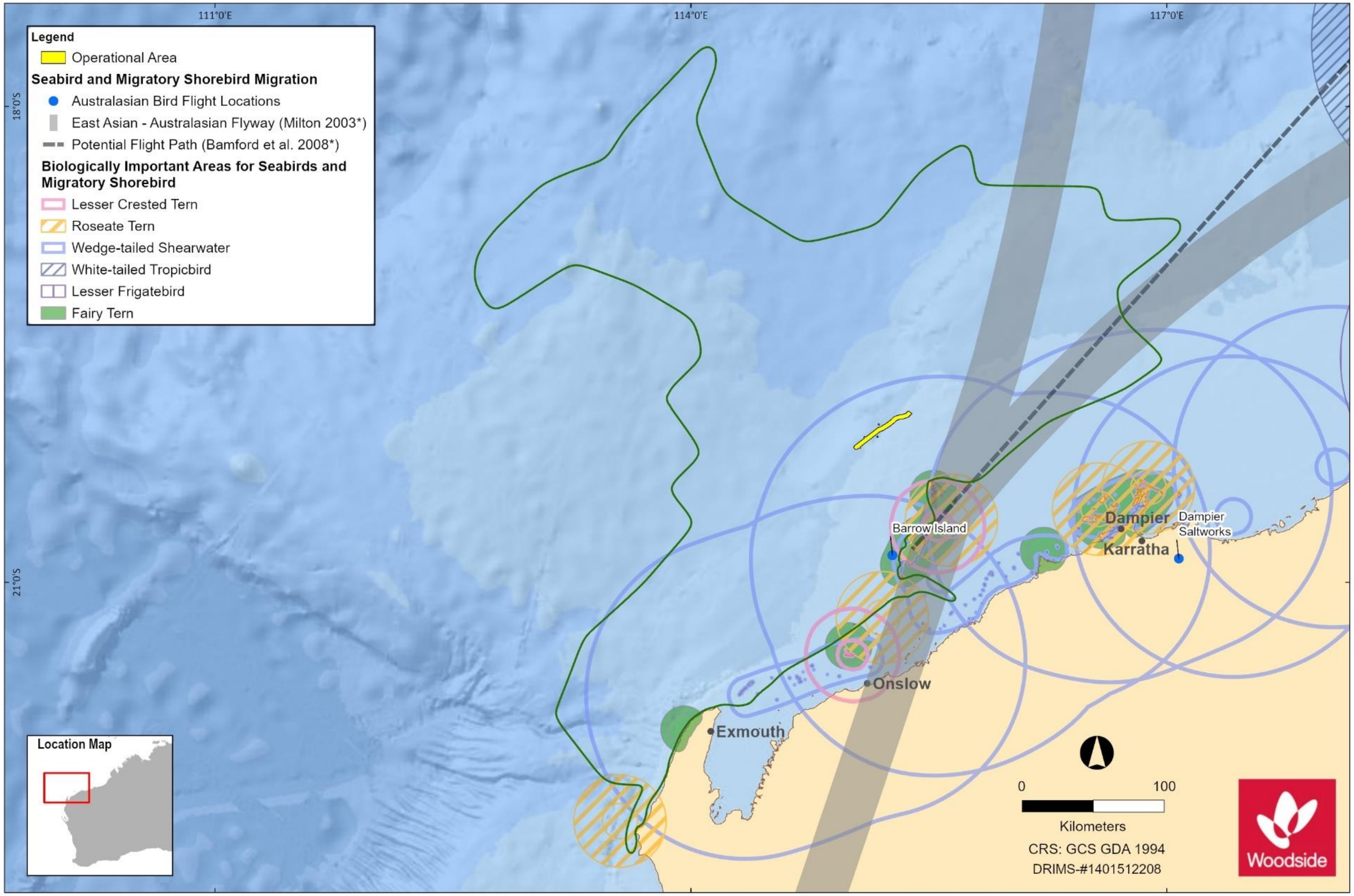


Figure 4-18: Biologically Important Areas for Seabirds and Migratory Shorebirds within the EMBA

4.7 Socio-economic and Cultural

4.7.1 Cultural Heritage

4.7.1.1 Indigenous Sites of Significance

Indigenous heritage places are protected under the *Aboriginal Heritage Act 1972* (WA) or EPBC Act. These sites may include middens, burial, ceremonial, artefacts, rock shelters, mythological, engraving sites and man-made structures of heritage value. A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System (AHIS) was undertaken for the Operational Area and EMBA (reports provided in **Appendix G**). No registered aboriginal sites were identified within the Operational Area. One registered site was identified within the EMBA; Vlaming Head (Site ID 10381). The exact location, access and traditional practices are not disclosed. If required, such as in a major hydrocarbon release, further consultation with key contacts within DPLH and local Aboriginal communities would occur.

4.7.1.2 Historic Shipwrecks

Shipwrecks, sunken aircraft and other underwater cultural heritage are protected under the *Underwater Cultural Heritage Act 2018*. A search of the Australian National Shipwreck Database (ANSD; DAWE, 2020h), which records all known shipwrecks in Australian waters, indicated that there are no known shipwrecks within the Operational Area. However, a number of shipwrecks were identified within the EMBA. Those shipwrecks within the EMBA that are nearest to the Operational Area (within about 35 km) are listed in **Table 4-11**.

Notably, the coordinates provided on the database do not align with the shipwreck locations provided and four of the shipwrecks in **Table 4-11** are listed as occurring in the exact same location. Subsequently, this information should be used as a guide only and, based on location information, these shipwrecks are further from the Operational Area than is listed here.

Table 4-11: Known Shipwrecks Near to the Operational Area

Vessel Name (ID Number)	Year Wrecked	Wreck Location	Distance from the Operational Area According to ANSD Database
Marietta (4457)	1905	Barrow Island	1.5 km
Wild Wave (China) (5113)	1873	Monte Bello Island	
Vianen (5062)	1628	Barrow Island Area	
Curlew (3925)	1911	At Onslow, Monte Bellos Group	
Tanami (4899)	1622	Trial Rocks	30 km
Trial (4938)	1622	Trial Rocks	31 km

4.7.1.3 World, National and Commonwealth Heritage Listed Places

There are no heritage listed sites within or immediately adjacent to the Operational Area.

There is one World Heritage Area (WHA) located within the EMBA; the Ningaloo Coast WHA (about 172 km from the Operational Area). This WHA is described in **Section 4.8.5.1**. The Ningaloo Coast is also listed as a National Heritage Place (‘The Ningaloo Coast’) and a Commonwealth Heritage Place (‘Ningaloo Marine Area – Commonwealth waters’).

Other National Heritage Places within the EMBA include the Barrow Island and the Montebello-Barrow Islands Marine Conservation Reserves. These receptors are described in **Section 4.8.**

4.7.2 Commercial Fisheries

A number of State and Commonwealth fisheries are located within the Operational Area and/or EMBA. These fisheries are described in **Table 4-12** and those fisheries with potential for interaction with the Petroleum Activities Program are shown on **Figure 4-19**.

Table 4-12: State and Commonwealth Fisheries within the Operational Area and/or EMBA

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
Commonwealth Managed Fisheries (Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), 2015 - 2019)					
Southern Bluefin Tuna Fishery	✓	✓	×	Management Area	The Southern Bluefin Tuna Fishery management area encompasses the entire Australian Fishing Zone (AFZ). The fishery overlaps the Operational Area and the EMBA
				Species Targeted	The Fishery targets a single, migratory stock of southern bluefin tuna that spawns in the north-east Indian Ocean and migrates throughout the temperate southern oceans, including a southbound migration past WA.
				Fishing Methods	Both longlining (east coast of Australia) and purse seine net fishing (Great Australian Bite) methods.
				Fishing Depth	Southern bluefin tuna are a pelagic species which can be found to depths of 500 m (AFMA, 2020a).
				Fishing Effort	Fishing mainly occurs in the Great Australian Bight during summer months, and off the New South Wales coastline during winter months (AFMA, 2020). The fishery has not been active in the Operational Areas within the last five years (ABARES, 2019). Fishing efforts for the 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 6,401 tonnes for the Australian 2018 catch year. This however, is the largest catch recorded since 1988 indicating that fishing efforts are increasing for southern bluefin tuna (CCSBT, 2019).
				Active Licenses/Vessels	Seven purse seine vessels and 31 longline vessels were active in the 2017/18 season. 84 Statutory Fishing Rights (SFRs) (i.e.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
					fishing permits) were allocated at the start of the 2017/18 season.
				Potential for Interaction within Operational Area	While there is an overlap with the Southern bluefin tuna 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.
Western Skipjack Fishery	✓	✓	×	Management Area	The combined western and eastern skipjack tuna (*Katsuwonus pelamis*) 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 Areas and EMBA.
				Species Targeted	Western skipjack tuna (*Katsuwonus pelamis*).
				Fishing Methods	Fishers employ purse seine fishing methods (about 98%), with some minor pole-and-line fishing.
				Fishing Depth	Western skipjack tuna is a pelagic species that can be found to depths of up to 260 m (AFMA, 2020b).
				Fishing Effort	No fishing effort for the Western Skipjack Tuna Fishery has been recorded since the 2008/2009 fishing season as a result of the natural variability of skipjack tuna stocks in Australian waters and low unit price for this species.
				Active Licenses/Vessels	No vessels were active in the 2017/18 season, although fourteen permits were held.
				Potential for Interaction within Operational Area	While there is an overlap with the Western Skipjack Tuna Fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery given the recent fishing effort.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
Western Tuna and Billfish Fishery	✓	✓	×	Management Area	The Western Tuna and Billfish Fishery management area encompasses the entire Australian EEZ, extending from the Gulf of Carpentaria westward to the South Australia-Victoria border. The fishery overlaps the Operational Areas and EMBA.
				Species Targeted	• Bigeye Tuna (*Thunnus obesus*) • Yellowfin Tuna (*Thunnus albacares*) • Broadbill Swordfish (Xiphias gladius) • Striped Marlin (Tetrapturus audux)
				Fishing Methods	Fishers mainly use longline fishing gear to catch the targeted species. Minor line (including handline, troll, rod and reel) can also be used.
				Fishing Depth	Off the 200 m isobath.
				Fishing Effort	Fishing effort in the last five years has been concentrated in south-west WA (typically as far north as Carnarvon) and occasionally off South Australia.
				Active Licenses/Vessels	Three active pelagic longline vessels and one minor-line vessel were active in 2018. There were 94 boat SFRs in 2018.
				Potential for Interaction within Operational Area	While there is an overlap with the Western Skipjack Tuna Fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery given the current distribution of fishing effort
Western Deepwater Trawl Fishery	×	✓	×	Management Area	This fishery operates in the Commonwealth waters off WA between roughly the North West cape and south west WA. The Western Deepwater Trawl Fishery management boundary is located within the EMBA.
				Species Targeted	North West cape and south west WA.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
					This fishery targets in excess of 50 species, primarily six finfish species: orange roughy (*Hoplostethus atlanticus*), oreos (*Oreosomatidae*), boarfish (*Pentacerotidae*), eteline snapper (Lutjanidae: Etelinae), apsiline snapper (Lutjanidae: Apsilinae) and sea bream (Lethrinidae). Between 2000 and 2005, deepwater bugs (*Ibacus* spp.) emerged as the most important species (ABARES, 2019a). A wide variety of finfish species made up the catch in 2017-18, with deepwater bugs and ruby snapper (*Etelis* sp.) making up around 50% of the whole catch (ABARES, 2019a).
				Fishing Methods	Demersal trawl.
				Fishing Depth	Water deeper than 200 m.
				Fishing Effort	The number of vessels active in the fishery and total hours trawled have fluctuated from year to year. Notably, total hours trawled were relatively high for a brief period during the early 2000s when fishers targeted ruby snapper and deepwater bugs (ABARES, 2019a). Total fishing effort was comparatively low between 2005-06 and 2016-17. While only three vessels were active again in 2017-18, trawl-hours increased markedly to just over 1100 hours (hrs) (ABARES, 2019a).
				Active Licenses/Vessels	There were seven fishing permits and 3 active vessels for this fishery in 2017/2018.
				Potential for Interaction within Operational Area	As this fishery does not overlap the Operational Area no interaction with the Petroleum Activities Program is expected.
North West Slope Trawl Fishery	×	✓	×	Management Area	This fishery operates in the waters off north-western WA between 114°E and 125°E; and between the 200 m isobath and the Australian Fishing Zone boundary. The fishery management boundary is located within the EMBA.

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Species Targeted	This fishery primarily targets scampi, including Australian scampi (*Metanephrops australiensis*), velvet scampi (*M. velutinus*) and Boschma's scampi (*M. boschmai*).
				Fishing Methods	Demersal trawling
				Fishing Depth	Typically, at depths of 350 to 600 m (Woodhams and Bath, 2017a).
				Fishing Effort	Fishing effort has been focused closer to the 200 m isobath compared with the deeper waters of this fishery management area for the last five years, including fishing in the Rowley Shoals and Scott Reef areas.
				Active Licenses/Vessels	Six fishing permits and four active vessels were reported for the 2017/2018 season.
				Potential for Interaction within Operational Area	As this fishery does not overlap the Operational Area no interaction with the Petroleum Activities Program is expected.
WA State Managed Fisheries (Gaughan et al., 2019)					
Mackerel Managed Fishery	✓	✓	×	Management Area	The Mackerel Managed Fishery extends from Geraldton to the Northern Territory border. There are three managed fishing areas: Kimberley (Area 1), Pilbara (Area 2) and the Gascoyne and West Coast (Area 3). Most fishing effort takes place north of Geraldton. There is an overlap with the Mackerel Managed Fishery management area and the Operational Area and EMBA.
				Species Targeted	• Spanish mackerel (*Scomberomorus commerson*) • Grey mackerel (*S. semifasciatus*) • Other species from the genera Scomberomorus
				Fishing Methods	Near-surface trawling gear and jig fishing methods.

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Fishing Depth	Up to a depth of 70 m.
				Fishing Effort	The majority of fishing activity occurs around the coastal reefs of the Dampier Archipelago and Port Hedland in the Pilbara fishing area (Area 2). Total catch for this fishery in the 2018/2019 season was 214 tonne (t) (DPIRD 2019). Fish Cube data obtained from the Department of Primary Industries and Regional Development (DPIRD) indicates that this fishery has not been active within the 10 NM Catch and Effort System (CAES) Blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were 52 licences in 2018/19 season (DPIRD, 2019a). No vessel information available from 2015 to 2018, however; 14 vessels were reported for the 2013/2014 season (Molony *et al*., 2015).
				Potential for Interaction within Operational Area	Although there is an overlap with the Mackerel Managed Fishery management area and the Operational Area, no fishing effort has been reported in this area in the last five years and subsequently, Woodside considers there to be no potential for interaction with this fishery within the Operational Area.
Pilbara Trap Fishery *Part of the Pilbara Demersel Scalefish Fishery (PDSF)*	✓	✓	✓	Management Area	The Pilbara Trap Managed Fishery (PTMF) covers the area from the North West Cape northwards and eastwards to the 120° line of longitude, and offshore as far as the 200 m isobath. Waters inside of the 50 m isobath are permanently closed to trap fishing (Schedule 2) and Area 3 has also been closed to trapping since 1998 (Schedule 3) (DPIRD, 2017). There is an overlap with the Mackerel Managed Fishery management area and the Operational Area and EMBA.
				Species Targeted	A variety of scalefish species, including snapper and emperor. Fish catch is reported on under the PDSF
				Fishing Methods	The fishery employs trap fishing methods

Fishery	Fishery Management Area spatially overlaps the: Operational Area	Fishery Management Area spatially overlaps the: EMBA	Potential for interaction within the Operational Area?	Description	
				Fishing Depth	There are no stated depth limits for the fishery.
				Fishing Effort	Fish Cube data obtained from DPIRD indicates this fishery has been active in the 60NM CAES Blocks overlapping the Operational Area for the last five years, with less than three vessels active in these blocks each year. Total catch for the Pilbara Trap Fishery in the 2018/2019 season was 563 t (DPIRD, 2019a).
				Active Licenses/Vessels	There were six active licences in PTMF for the 2018/19 season (DPIRD, 2019a) and eight vessels (two in the Pilbara) were active in the in 2017/18 season for the combined North Coast PDSF.
				Potential for Interaction within Operational Area	Woodside considers there to be potential for interaction with fishers within the Operational Area.
Pilbara Line Fishery *Part of the PDSF*	✓	✓	✓	Management Area	The Pilbara Line Fishery encompasses all of the 'Pilbara waters', extending from a line commencing at the intersection of 21°56'S latitude northward to longitude 120°E and bounded by the AFZ (DPIRD, 2017). As with the Pilbara Trap and Trawl Fisheries, ffishing in Area 3 and within inshore waters < 50 m deep is not permitted (DPIRD, 2017).
				Species Targeted	The Pilbara Line Fishery targets tropical demersal scalefish and is the smallest scale fishery within the PDSF in terms of monetary value.
				Fishing Methods	The fishery employs line fishing methods.
				Fishing Depth	There are no stated depth limits for the fishery.
				Fishing Effort	Fish Cube data obtained from DPIRD indicates this fishery was active in the 60NM CAES Blocks overlapping the Operational Area for the last five years. The number of active vessels in

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
					these years has varied between less than three and five within these blocks.
				Active Licenses/Vessels	Woodside considers there to be potential for interaction with fishers within the Operational Area.
				Potential for Interaction within Operational Area	The number of licences for the 2018/2019 season was not specified (DPIRD, 2019a). Eight vessels (2 in the Pilbara) were active in the in 2017/18 season for the combined North Coast PDSF.
Pilbara Trawl Fishery *Part of the PDSF*	✓	✓	×	Management Area	The Pilbara Fish Trawl (Interim) Managed Fishery operates between the 50 m and 200 m isobath of the Pilbara coast, northwards of 21°S and between 114°E and 120°E. The fishery is divided into a number of zones, including a large area which stretches the length of the fishery (and includes Barrow Island and the Muiron Islands) in which fishing is prohibited (Schedule 5) (DPIRD, 2017). The Operational Area is partially located within this prohibited fishing zone. Fishing is also prohibited within the remainder of the Operational Area which lies within 'Zone 1' of the fishery.
				Species Targeted	The Pilbara Fish Trawl (Interim) Managed Fishery target a variety of scalefish species, including tropical demersal fish, snapper and emperor. Fish catch is reported on under the PDSF
				Fishing Methods	The fishery employs trawl fishing methods.
				Fishing Depth	Pilbara trawl is limited to the areas and zones listed above, which comprise water depths from 50 to 100 m (Allen *et al*., 2014).
				Fishing Effort	Fish Cube data obtained from DPIRD indicates this fishery was not active in the 10 NM CAES blocks overlapping the Operational Area in the last five years.

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Active Licenses/Vessels	There were 11 active permits in the PFTIMF for the 2017/18 season (DPIRD, 2019a). Eight vessels (2 in the Pilbara) were active in the in 2017/18 season for the combined North Coast PDSF.
				Potential for Interaction within Operational Area	Woodside considers there to be no potential for interaction with this fishery within the Operational Area, as fishing is prohibited within the management areas overlapping the Operational Area and CAES data indicates it has not recently been active within this area.
WA Sea Cucumber Fishery *(Formerly the Western Australian Bêche-de-mer Fishery)*	✓	✓	×	Management Area	The WA Sea Cucumber Fishery encompasses all WA waters, although fishing to date has only occurred from the Exmouth Gulf to the Northern Territory border. There are also, however, a number of areas closed to this fishery. These areas include part of the east coast of the Burrup Peninsula and several other areas within the Dampier region (DPIRD, 2018a; Gaughan et al., 2019).
				Species Targeted	The sea cucumber Fishery targets two main species; sandfish (*Holothuria scabra*) and redfish (*Actinopyga echinites*).
				Fishing Methods	The sea cucumber Fishery is principally a dive fishery, however, a small percentage (<5%) of fish are collected by wading. Fishing locations are often shallow bays and lagoons accessed and fished by dinghies fitted with hookah systems. No other methods are permitted.
				Fishing Depth	The fishery is restricted to safe diving.
				Fishing Effort	Within the Pilbara region fishing effort primarily targets dense but localised populations found at the Montebello Islands and Dampier Archipelago. Notably, this fishery is only active in ‘pulses’; for example, fish in the Kimberley are generally accessed two or three times per year for up to two or three weeks due to their remote location. Within the Pilbara, fishing

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
					for redfish occurs only for about a two-month period every third year. The total catch for 2017 was 135 t for the fishery. Fish Cube data obtained from DPIRD indicates that this fishery was not active in the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	The number of active vessels and licences was not reported for 2018. This fishery is limited entry and capped at six fishing boat licence holders (with each boat permitted up to four dinghies) and restricted to eight sea cucumber species. Twelve Marine Aquarium Managed Fishery licence holders are also permitted to take a maximum of 3,000 individuals excluding six of the eight species permitted for the WA Sea Cucumber Fishery.
				Potential for Interaction within Operational Area	Although the WA Sea Cucumber management area overlaps with the Operational Area no fishing effort has occurred in this area in the last five years. Subsequently Woodside considers there is no potential for interaction with this fishery within the Operational Area.
Pilbara Crab Managed Fishery	✓	✓		Management Area	The Pilbara Crab Managed Fishery management area encompasses waters off WA north of 23° 34′ south latitude (near Carnarvon) and west of 120° 00′ east longitude (near Pardoo). However, fishing primarily occurs in Nickol Bay (east of the Burrup Peninsula) and there are closed areas of the fishery. These closed areas include a substantial part of the south-western portion of the fishery management area. The Operational Area and EMBA overlaps this Fishery.
				Species Targeted	The Pilbara Crab Managed Fishery targets blue swimmer crabs (*Portunus armatus*).
				Fishing Methods	The Pilbara Crab Managed Fishery uses specific ‘hourglass’ traps with a maximum of 20 traps permitted on one line.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
				Fishing Depth	Up to 50 m deep (DPIRD, 2019b).
				Fishing Effort	Catch (by weight) increased by 63% between 2016 and 2017, however, fluctuation in catch rates has occurred since 2000. Fish Cube data obtained from DPIRD indicates that this fishery has been active within the 60 NM CAES blocks overlapping the Operational Area in the last five years. Less than 3 vessels were active in these blocks for the years in which fishing effort was reported.
				Active Licenses/Vessels	One licence was active in 2018/19 (DPIRD, 2019a). The number of vessel was not reported.
				Potential for Interaction within Operational Area	While there is an overlap with the Pilbara Crab Fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery given the fishing depth.
Specimen Shell Managed Fishery	✓	✓	×	Management Area	The Specimen Shell Managed Fishery encompasses the entire WA coastline. Fishing effort is concentrated in areas adjacent to large population centres, such as Broome, Karratha, Shark Bay, Mandurah, Exmouth, Capes area, Albany and Perth. The Specimen Shell Managed Fishery can fish within the Operational Areas and EMBA.
				Species Targeted	The Specimen Shell Managed Fishery targets the collection of specimen shells for display, collection, cataloguing and sale. About 200 species are targeted.
				Fishing Methods	Collection is predominately by hand when diving or wading in shallow coastal waters, though a deeper water collection aspect to the fishery has been initiated with the employment of ROVs operating at depths up to 300 m.
				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).

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Fishing Effort	Fish Cube data obtained from DPIRD indicates that this fishery has not been active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	31 licences were active in 2018/19 (DPIRD, 2019a).
				Potential for Interaction within Operational Area	Although there is an overlap with the Specimen Shell Managed Fishery management area and the Operational Area there has been no recent fishing effort within the relevant CAES blocks and Woodside considers there to be no potential for interaction.
Nickol Bay Prawn Managed Fishery	×	✓	×	Management Area	The Nickol Bay Prawn Managed Fishery includes all Indian Ocean waters from 116.47°E (Dampier area) to 120.00°E (south of Eighty Mile Beach) on the mainland side of the 200 m isobath (State Law Publisher, 2004). There are a number of sanctioned areas within this limit, however; including nurseries (Nickol Bay Nursery; closed between August and November to allow for recruitment; DEH, 2004) and port.
				Species Targeted	western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*P. esculentus*), endeavour prawns (*Metapenaeus endeavouri*) and banana prawns (*P. merguiensis*).
				Fishing Methods	This fishery uses otter prawn trawl systems.
				Fishing Depth	Information not available.
				Fishing Effort	Total catch in 2017 was 227.1 t, which is the highest catch since 2006 considered to be attributed to increased fishing effort. Fish Cube data obtained from DPIRD indicates that this fishery had not been active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were 14 active licences in 2018/19 (DPIRD, 2019a). The number of vessels is unreported.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
				Potential for Interaction within Operational Area	As there is no overlap with the Nickol Bay Prawn Managed Fishery management area and the Fish Cube data indicates no recent fishing effort within the CAES blocks overlapping the Operational Area, Woodside considers there to be no potential for interaction.
Marine Aquarium Fish Managed Fishery	✓	✓	×	Management Area	The Marine Aquarium Managed Fishery operates throughout WA waters. The fishery is typically active from Esperance to Broome, with popular areas including the coastal waters of the Cape Leeuwin/Cape Naturaliste region, Dampier and Exmouth.
				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 primarily a dive-based fishery and collects fish by hand or using barriers/hand-held nets. The fishery is restricted to safe diving depths (typically <30 m).
				Fishing Depth	Less than 30 m.
				Fishing Effort	Fish Cube data obtained from DPIRD for indicates that this fishery has not been active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were 11 active licences (out of 12 permitted) in 2018/2019 (DPIRD, 2019a).
				Potential for Interaction within Operational Area	Woodside considers there to be no potential for interaction with fishers within the Operational Area due to the lack of recent fishing effort in this location and overlap with the Operational Area and fisheries management area.
Western Australian Abalone Managed Fishery	✓	✓	×	Management Area	The WA Abalone Managed Fishery encompasses all WA coastal waters, however; Shark Bay is considered the northern range limit for the commercial abalone species. In 1999, the fishery was divided into eight management areas. The

Fishery	Fishery Management Area spatially overlaps the: Operational Area	Fishery Management Area spatially overlaps the: EMBA	Potential for interaction within the Operational Area?	Description	
					Operational Area overlaps Area 8, which extends from Moore River to the Northern Territory/WA boarder. However, this management area has been closed to all abalone fishing since 2011 due to mortality following a marine heatwave (Hart *et al*., 2017).
				Species Targeted	The abalone fishery targets the greenlip abalone (*Haliotis laevigata*), brownlip abalone (*H. conicopora*) and Roe's abalone (*H. roei*).
				Fishing Methods	Abalone are harvested by wading and diving, limiting the fishery to relatively shallow waters.
				Fishing Depth	Less than 30 m.
				Fishing Effort	Fish Cube data obtained from DPIRD indicates that this fishery has not been active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were 51 licences active in 2018/19 (DPIRD, 2019a) and 23 vessels active in the 2017/2018 season.
				Potential for Interaction within Operational Area	While there is an overlap with the WA Abalone Managed Fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with fishers within the Operational Area as this area of the fishery (Area 8) is closed to fishing.
Onslow Prawn Managed Fishery	✓	✓	×	Management Area	The Onslow Prawn Managed Fishery encompasses a portion of the Indian Ocean from within the Dampier Archipelago south past Onslow. The fishery is divided into three management areas and there are sanctioned areas within the fishery (e.g. nurseries and fishing ban are areas). The Operational Area is wholly located within Area 2.

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Species Targeted	Western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*P. esculentus*), endeavour prawns (*Metapenaeus endeavouri*) and banana prawns (*P. merguiensis*).
				Fishing Methods	Otter prawn trawl systems.
				Fishing Depth	The targeted species typically inhabit soft sediments in less than 45 m water depth.
				Fishing Effort	Total catch for the 2017/2018 season was reported as negligible (DPIRD, 2019a). Fish Cube data obtained from DPIRD indicates this fishery was not active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were 30 active licences in 2017/18 (DPIRD, 2019a) and one active vessel in 2017.
				Potential for Interaction within Operational Area	While there is an overlap with the Onslow Prawn Managed Fishery Management Area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area as data indicates this fishery has not been active within the Operational Area in recent years.
South-west Coast Salmon Fishery	✓	✓	×	Management Area	The South West Coast Salmon Managed Fishery includes all WA waters north of Cape Beaufort, excluding Geographe Bay. The fishery primarily operates on various beaches south of Perth metropolitan area. No fishing takes place north of the Perth metropolitan area (Smith and Baudains, 2017).
				Species Targeted	The fishery targets WA salmon (*Arripis truttaceus*).
				Fishing Methods	Beach seine nets.
				Fishing Depth	Information not available however, species generally found in shallow waters (up to 30 metres)

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Fishing Effort	Fish Cube data obtained from DPIRD indicates this fishery was not active in the 60 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were six active licences in 2018/19 season (DPIRD, 2019a). The number of vessels is unreported.
				Potential for Interaction within Operational Area	While there is an overlap with the South West Coast Salmon Managed Fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area as fishing is reported as not occurring north of the Perth metropolitan area.
West Coast Deep Sea Crustacean Managed Fishery	✓	✓	×	Management Area	The West Coast Deep Sea Crustacean Managed Fishery extends north from Cape Leeuwin to the Northern Territory border in water depths great than 150 m.
				Species Targeted	The fishery targets deep water crustaceans, including crystal (snow) (*Chaceon albus*), champagne (spiny) (*Hypothalassia acerba*) and giant (king) (*Pseudocarcinus gigas*) crabs. The vast majority (>99%) of catch landed in 2017 comprised of crystal crabs.
				Fishing Methods	The fishery uses baited pots operating in a longline formation in the shelf edge waters.
				Fishing Depth	Deeper than 150 m (and mostly at depths of between 500 to 800 m). Most of the commercial Crystal crab catch is taken in depths of 500 to 800 m.
				Fishing Effort	Fish Cube data obtained from DPIRD indicates that this fishery was not active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	There were seven active licences in the 2018/19 season (DPIRD, 2019a). Six vessels were active in 2017.

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
				Potential for Interaction within Operational Area	Whilst the fishery management area overlaps the Operational Area, fishing is prohibited in water depths of less than 150 m. Therefore, this fishery is not active within about half of the Operational Area, and waters of the EMBA that are less than 150 m. Therefore, Woodside considers there to be no potential for interaction with this fishery within the Operational Area.
Pearl Oyster Fishery	✓	✓	×	Management Area	The WA Pearl Oyster Fishery management area extends from the North West Cape (including the Exmouth Gulf) to the Northern Territory border. Fishing typically occurs for only three to four months of the year (March – July). Variable quotas are applied across three zones within the management area.
				Species Targeted	The fishery targets the Indo-Pacific silver-lipped pearl oyster (*Pinctada maxima*), which are collected in shallow coastal waters (10-35 m depth).
				Fishing Methods	This is a dive-based hand collection fishery.
				Fishing Depth	The fishery is restricted to safe diving.
				Fishing Effort	Fishing effort is primarily focused off the southern Kimberley Coast, at Eighty Mile Beach and the Lacepede Islands. Some fishing has occurred in the Exmouth Gulf historically. Notably, no fishing occurred within Zone 1 (the area in which the Operational Area is wholly located) during 2017. Fish Cube data obtained from DPIRD for 2019 indicates that this fishery was not active within the 10 NM CAES blocks overlapping the Operational Area in the last five years.
				Active Licenses/Vessels	The number of active vessels in 2017 was five. Total catch in the 2017/2018 season was 614,002 oysters (15,637 dive hours) (DPIRD, 2019a).
				Potential for Interaction within Operational Area	While there is an overlap with the WA Pearl Oyster Fishery Management Area and the Operational Area, Woodside

Fishery	Fishery Management Area spatially overlaps the: Operational Area	EMBA	Potential for interaction within the Operational Area?	Description	
					considers there to be no potential for interaction with this fishery within the Operational Area.
Exmouth Gulf Prawn Managed Fishery	×	✓	×	Management Area	The Exmouth Gulf Prawn Managed Fishery is a limited entry fishery operating outside of the Operational Areas but within the EMBA region out of Exmouth and bases to the south. The fishery occupies a total area of 4000 km², with only half of this area being trawled (Sporer *et al*., 2014).
				Species Targeted	• Western king prawn (*Melicertus latisulcatus*) • Tiger prawn (*Penaeus monodon*) • Endeavour prawn (*Metapenaeus endeavouri*) • Banana prawn (*Fenneropenaeus indicus*) • Coral prawn (considered a by-product; *Stenopus hispidus*)
				Fishing Methods	Trawl.
				Fishing Depth	Information not available.
				Fishing Effort	The 2017 season yielded a catch of 713 t; with 366 t brown tiger prawns, 130 t western king prawns and 217 t blue endeavour prawns (DPIRD, 2019). The 2018 season catch was 880 t (DPIRD, 2019a).
				Active Licenses/Vessels	There are currently 15 managed fishery licences available, all of which were held by a single licensee in 2017 (DPIRD, 2018c; DPIRD, 2019a). In 2017 there were six active fishing vessels (DPIRD, 2018c).
				Potential for Interaction within Operational Area	The EMBA overlaps the northern most portion of this fishery. Given the fishery does not overlap the Operational Area, Woodside considers there to be no potential for interaction within the Operational Area.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
West Coast Rock Lobster Managed Fishery	×	✓	×	Management Area	The West Coast Rock Lobster Fishery operates outside of the Operational Areas but within the EMBA, from Shark Bay south to Cape Leeuwin. The fishery is managed using zones, seasons and total allowable catch. The recreational fishery targets the western rock lobsters using baited pots and by diving between North West Cape and Augusta.
				Species Targeted	The fishery targets the western rock lobster (*Panulirus cygnus*).
				Fishing Methods	Baited pots.
				Fishing Depth	Less than 20 m.
				Fishing Effort	Commercial catch effort in the 2018 season was 6,400 t (DPIRD, 2019a).
				Active Licenses/Vessels	There were 234 commercial vessels operating in 2017 and 653 licences were held in 2018 (DPIRD, 2019a).
				Potential for Interaction within Operational Area	Given the fishery does not overlap the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area.
Exmouth Gulf Developing Crab	×	✓	×	Management Area	The Exmouth Gulf Developing Crab fishery operates within the Exmouth Gulf and is managed through spatial closures and operates outside of the Operational Areas but within the EMBA.
				Species Targeted	The fishery targets the blue swimmer crab.
				Fishing Methods	Traps.
				Fishing Depth	Information not available.
				Fishing Effort	Recent catch effort information is not available, however; in 2008 this fisheries’ catch was 737 t and accounted for 85% of WA’s catch of blue swimmer crab.

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
				Active Licenses/Vessels	Currently only two fishers are able to operate; one licenced to use 200 traps and one licenced to use 300 traps (GDC, 2010).
				Potential for Interaction within Operational Area	As this fishery does not overlap the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area.
Land Hermit Crab Fishery *(Reported on under the Marine Aquarium Managed Fishery)*	×	✓	×	Management Area	The Hermit Crab Fishery operates under ministerial exemptions and, at present, the fishery operates in WA waters north of the Exmouth Gulf (Smith *et al*., 2010). The fishery is active year-round and is reported on by DPIRD under the Marine Aquarium Managed Fishery.
				Species Targeted	The Fishery targets the Australian land hermit crab (*Coenobita variabilis*) for live pet trade both domestically and internationally.
				Fishing Methods	Live crabs are collected by hand and accessed on foot by wading or from remote beaches accessed by four-wheel drive (Guaghan *et al*. 2019; Smith *et al.* 2010). The live hermit crabs transported by vehicle to a holding facility, limiting both the number of licences and quantity of crabs that may be collected under each licence
				Fishing Depth	This species occurs in the intertidal zone and up to 100 m from shorelines.
				Fishing Effort	This fishery is active primarily between Onslow and Port Hedland (Smith *et al.*, 2010). Total hermit crab catch in 2017 was 58,643 crabs, which is the lowest catch number in 10 years (Gaughan *et al*., 2019).
				Active Licenses/Vessels	Only a handful of Marine Aquarium Fishery licencees are currently permitted to collect hermit crabs and the majority of fishing is undertaking by this fishery (Smith *et al*., 2010). There have been up to two other licence holders outside of this fishery (Smith *et al*., 2010).

Fishery	Fishery Management Area spatially overlaps the:		Potential for interaction within the Operational Area?	Description	
	Operational Area	EMBA			
				Potential for Interaction within Operational Area	Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program as the fishery does not overlap the Operational Area and due to the target species being primarily terrestrial at the age of collection and limited to shallow, intertidal areas.

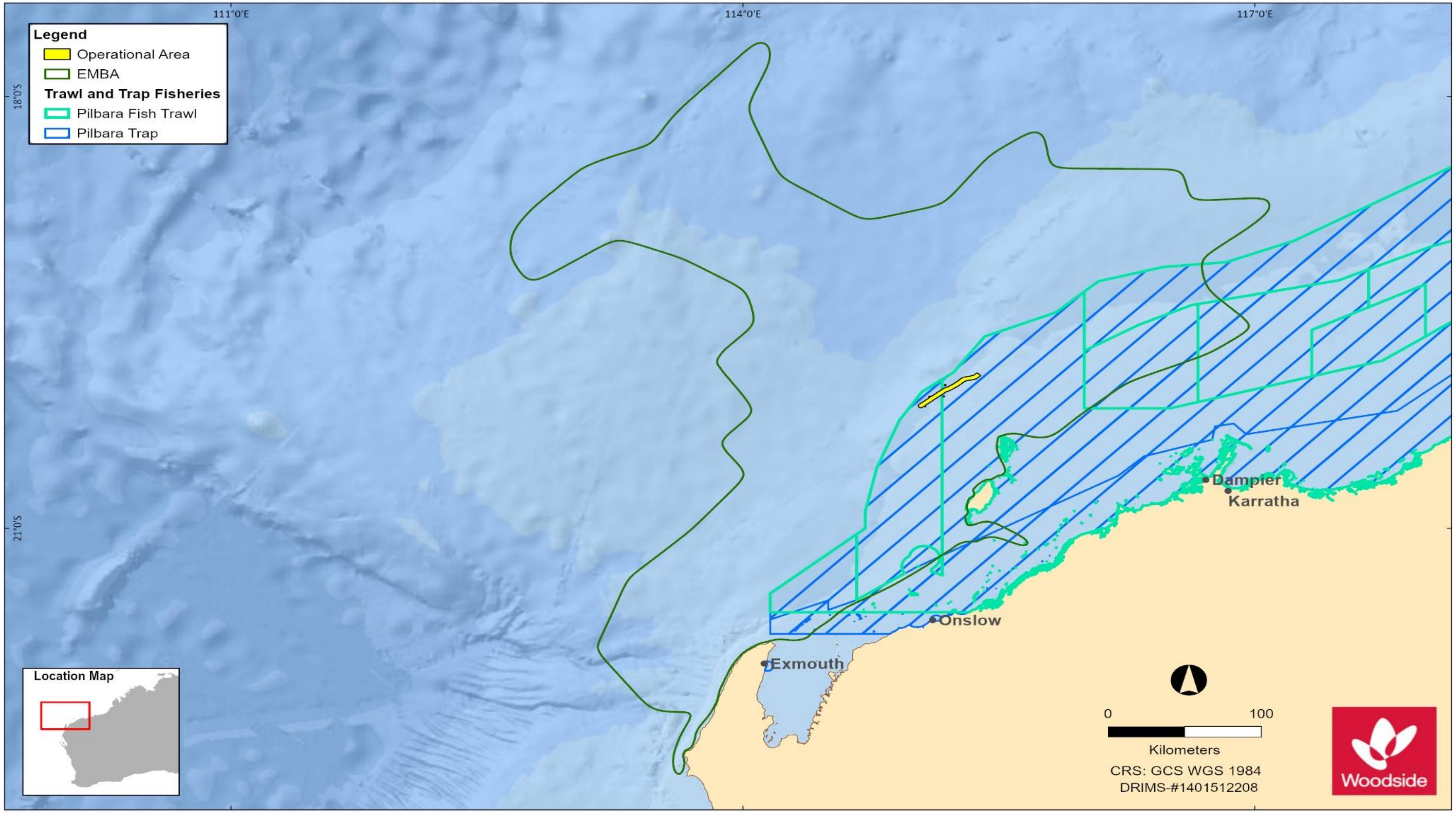


Figure 4-19: State Managed Fisheries with Potential for Interaction with the Petroleum Activities Program

4.7.3 Aquaculture

There are no known aquaculture activities within or adjacent to the Operational Area.

Aquaculture in the wider Gascoyne and Pilbara regions is typically restricted to shallow coastal waters and consists primarily of culturing hatchery, reared and wild caught oysters (*Pinctada maxima*) for pearl production. Pearl farm leases and holding site locations near to the EMBA include those in the Exmouth Gulf, at the Montebello Islands and at the Dampier Archipelago. Primary spawning of the pearl oyster occurs from mid-October to December. A smaller secondary spawning occurs in February and March (Fletcher & Santoro, 2014).

In the Gascoyne Coast region oyster hatcheries are also commercially important, with those located in the Exmouth Gulf supplying significant quantities of *P. maxima* spat to pearl farms in Exmouth Gulf and Montebello Islands (Hart *et al*., 2016). Leases typically occur in shallow coastal waters at depths of less than 20 m (Hart *et al*., 2016).

4.7.4 Traditional Fishing

There are no traditional, or customary, fisheries within the Operational Area; these activities are typically restricted to shallow coastal waters and/or areas with structures such as reef. However, it is recognised that areas within the EMBA, such as the Montebello Islands and the Ningaloo coast have a known history of traditional fishing when areas were occupied (as from historical records).

Areas that are covered by registered native title claims are likely to practice Aboriginal fishing techniques at various sections of the WA coastline (outside of the EMBA). Current Aboriginal usage of these areas includes limited traditional hunting of turtle and dugong permitted in accordance with the *Native Title Act 1993* (MPRA, 2005).

4.7.5 Tourism and Recreation

No tourism activities take place specifically within the Operational Area. Within the EMBA, it is recognised that the Ningaloo region is a growing tourism and recreational sector in Western Australia. Tourism is also the largest revenue earner of all industry sectors in the Gascoyne region (comprised of the Shires of Carnarvon, Exmouth, Shark Bay and Upper Gascoyne), attracting an annual average turnover of $208 million over the years 2011–2013 (GDC, 2014). These sectors have expanded in area over the last couple of decades. Potential for growth and further expansion in tourism and recreational activities in the Gascoyne region is recognised, particularly with the development of regional centres and a workforce associated with the resources sector (GDC, 2014).

The main marine nature-based tourist activities are concentrated around and within the State Waters of the Ningaloo Marine Park and North West Cape area. Activities include snorkelling and scuba diving, whale shark encounters (April to August) and manta ray (September to November), whale watching (July to October) and turtle watching (year-round) (Shire of Exmouth). Recreational use of the Ningaloo Marine Park varies in intensity throughout the year, depending on school holidays and seasonal peaks related to marine fauna observation. Coral Bay (located within the Shire of Carnarvon) is documented as one of the most heavily used areas (MPRA, 2005). The waters of Ningaloo Reef support an abundance of prized table fish and the reef is considered a premier recreational fishing location. The fringing reef provides sheltered waters that are accessible to small recreational vessels and extensive opportunities exist for beach fishing (MPRA, 2005).

Recreational fishing in the Northwest Shelf Province is mainly concentrated around the coastal waters and islands (including the Ningaloo Marine Park, North West Cape area, the Montebello Islands and other islands and reefs in the region) (Hart *et al*., 2016). Recreational fishing in these areas has grown exponentially with the expanding regional centres and increasing residential and fly in/fly out work force, particularly in the Pilbara region. Occasional recreational fishing occurs at

Rankin Bank and Glomar Shoal (located about 25 km and 145 km from the Operational Area, respectively). The Montebello Islands (46 km from the Operational Area) are the next closest location for tourism, with some charter boat operators taking visitors to these remote islands (DEC, 2009).

4.7.6 Commercial Shipping

The NWMR supports commercial shipping activity, the majority of which is associated with the mining and oil & gas industries. The Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways on the NWS of WA to reduce the risk of vessel collisions with offshore infrastructure. These fairways are not mandatory but AMSA strongly recommends commercial vessels remain within the fairway when transiting the region. None of these fairways intersect with the Operational Area and only light traffic occurs in the Operational Area, as shown in **Figure 4-20**. Major shipping routes in the vicinity of the Operational Area are associated with entering the ports of Dampier and Barrow Island.

Shipping activities in the NWMR region include:

- international bulk freighters/tankers arriving and departing from Dampier including mineral ore, hydrocarbons (LNG, liquefied petroleum gas, condensate) and salt carriers
- domestic support/supply vessels servicing offshore facilities and Barrow Island development
- construction vessels/barges/dredges
- offshore survey vessels.

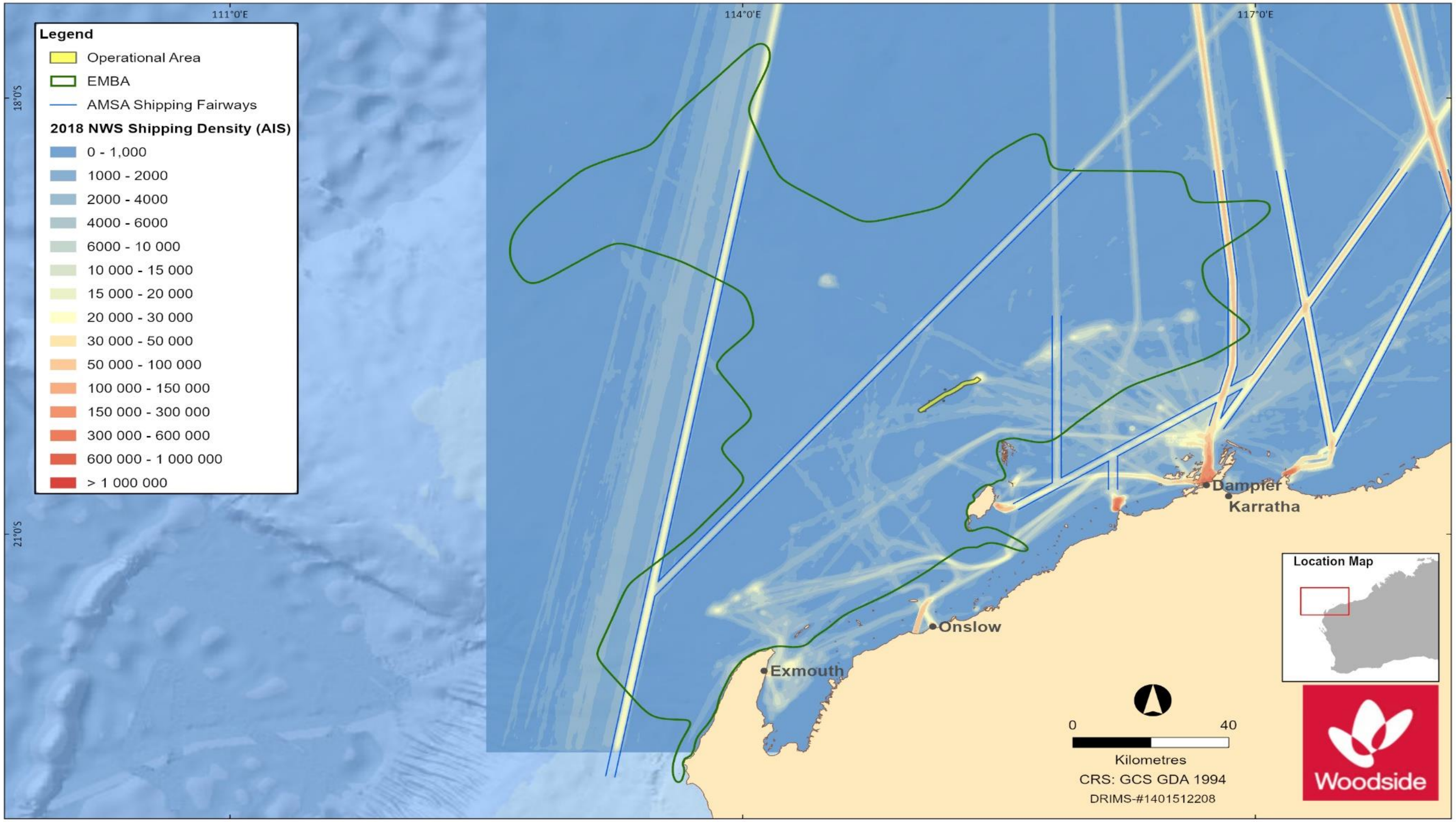


Figure 4-20: Vessel Density Map for the EMBA with Shipping Fairways Overlayed (AMSA, 2020)

4.7.7 Existing Petroleum Facilities

The Operational Area is located within the NWS; an area with a history of established oil and gas operations. Facilities located in proximity to the Operational Area are shown on **Figure 4-21** and listed in **Table 4-13**.

Table 4-13: Petroleum Infrastructure within Proximity to the Operational Area

Facility Name	Facility Owner	Distance and Direction from Operational Area
Pyrenees Floating Production Storage and Offloading (FPSO) facility	BHP Billiton	180 km
Wheatstone Platform	Chevron	0 km
Ningaloo Vision FPSO	Santos	169 km
John Brookes Platform		33 km
Nganhurra RTM	Woodside	181 km
Pluto Platform		4 km
Goodwyn Platform		65 km
Ngujima Yin FPSO		173 km
North Rankin Complex		87 km
Okha FPSO		117 km
Balnaves		1 km

Existing subsea infrastructure is also present within the Operational Area, including the subsea wellheads, umbilicals and flowlines that form the Julimar Field Production System and intercept the north-east portion of the Operational Area.

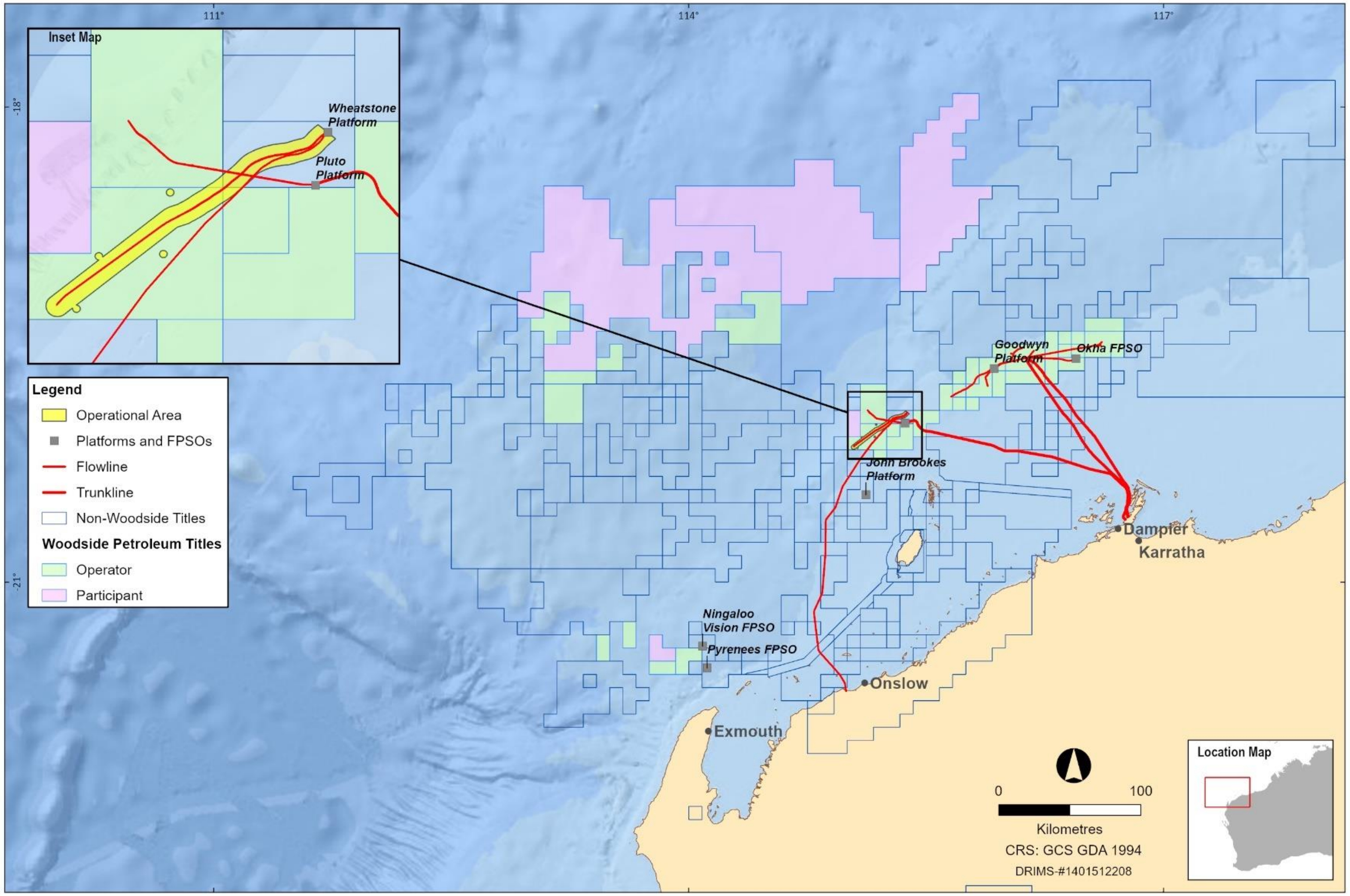


Figure 4-21: Petroleum Facilities within the EMBA

4.7.8 Defence Activities

There are designated defence practice areas located in the offshore marine waters of Australia. The Operational Area overlaps a Military Flying Training area and there is an additional Military Flying and Firing zone adjacent to this and located within the EMBA, as shown on **Figure 4-22**. As these areas are associated with air space and not the marine environment no interaction is anticipated with the Petroleum Activities Program and these areas are not discussed further.

The closest site to the Operational Area where unexploded ordinance potential is recorded by the Department of Fire and Emergency Services (DFES) is at the Montebello Islands (ID 119). This area was subject to testing of nuclear weapons in the 1950s.

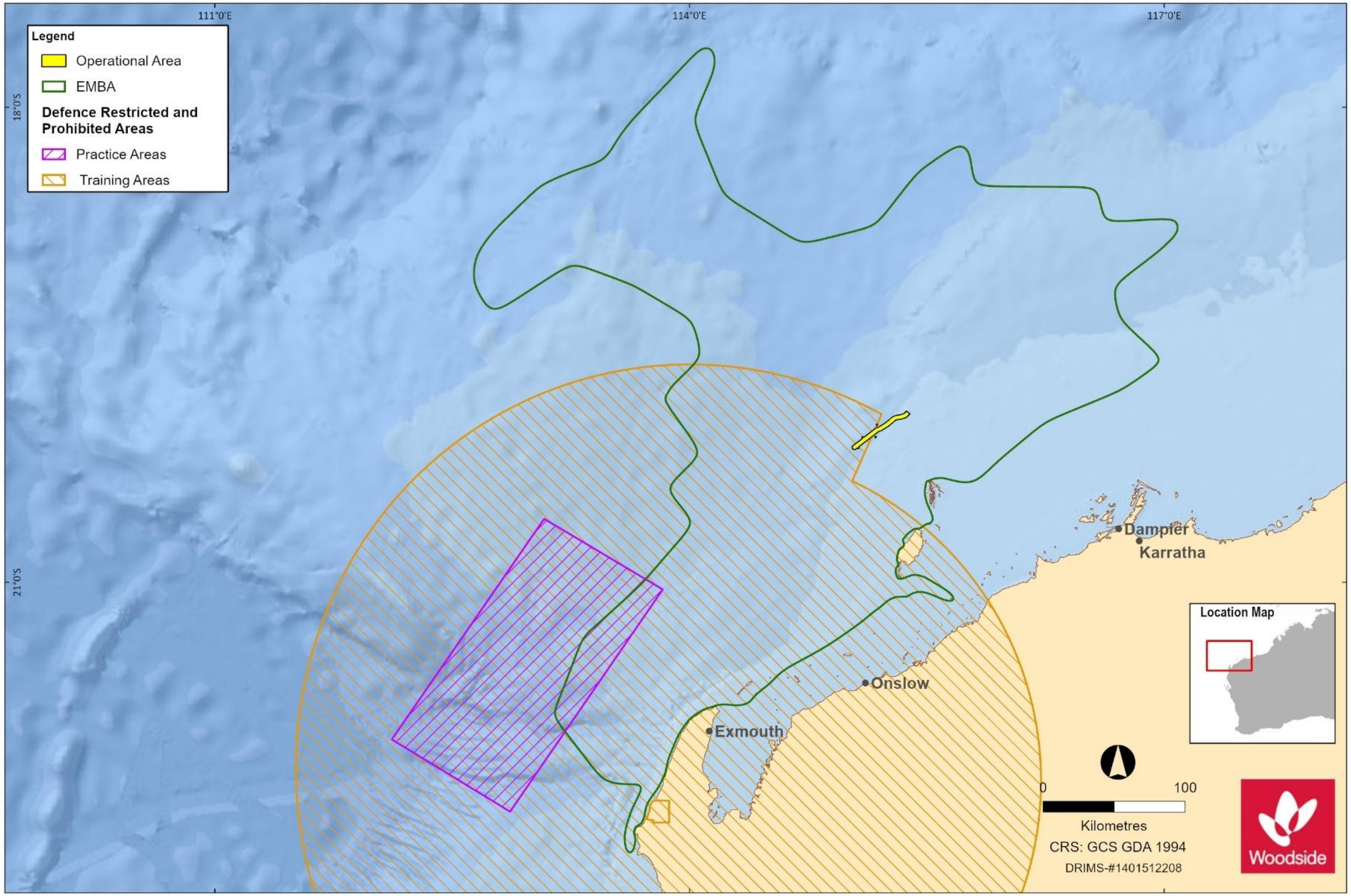


Figure 4-22: Department of Defence Training Areas

4.8 Values and Sensitivities

In addition to the MNES described above, there are several other sensitive receptors within the State and Commonwealth waters of the EMBA; including marine parks, geomorphic features and coastal habitats. These receptors are listed in **Table 4-14** and described in the following subsections.

Table 4-14: Summary of Marine Parks, Geomorphic Features, Islands and Coastal Habitats within the EMBA

Receptor	Distance from Operational Area (nearest point)	Section
Australian Marine Parks		
Montebello Marine Park (IUCN VI - Multiple Use Zone)	0 km (*within Operational Area*)	**4.8.1**
Gascoyne Marine Park (IUCN VI - Multiple Use Zone)	147 km	
Ningaloo Marine Park (IUCN IV – Recreational Use Zone)	187 km	
State Managed Marine Parks		
Barrow Island Marine Management Area	46 km	**4.8.2**
Barrow Island Marine Park	68 km	
Montebello Islands Marine Park	38 km	
Muiron Islands Marine Management Area	171 km	
Ningaloo Marine Park	188 km	
State Managed Terrestrial Parks and Reserves		
Barrow Island Nature Reserve	68 km	**4.8.3**
Montebello Islands Conservation Park	46 km	
Muiron Islands Nature Reserve	171 km	
Pilbara Islands Nature Reserves	146 km	
Shoals, Banks and Reefs		
Rankin Bank	25 km	**4.8.4**
Glomar Shoal	145 km	
Island Groups		
Montebello Islands	46 km	*Discussed in the relevant marine park/nature reserve section.*
Barrow Island	68 km	
Pilbara Islands (*Includes the Muiron Islands*)	146 km	
Coastal Habitats		
Ningaloo Coast	189 km	**4.8.2** and **4.8.5**
World Heritage Areas		
Ningaloo Coast WHA	171 km	**4.8.5**

4.8.1 Australian Marine Parks

A network of Commonwealth managed marine parks, referred to as Australian Marine Parks (AMPs), has been established around Australia as part of a National Representative System of Marine Protected Areas. There are six marine park networks geographically aligned with the Marine Regions of Australia. The objective of the network is to ensure sustainable use and enjoyment of the natural resources within the parks, whilst maintaining the protection and conservation of their biodiversity and natural, cultural, socio-economic and heritage values (DNP, 2018).

The Operational Area overlaps a small portion of the north-west corner of the Montebello Marine Park Multiple Use Zone (IUCN VI) (see **Figure 4-23**). The EMBA also overlaps the Gascoyne Marine Park Multiple Use Zone (IUCN VI) and the Ningaloo Marine Park Recreational Use Zone (IUCN IV). These AMPs and their values are described in **Table 4-15**. These AMPs are part of the North-west Marine Parks Network.

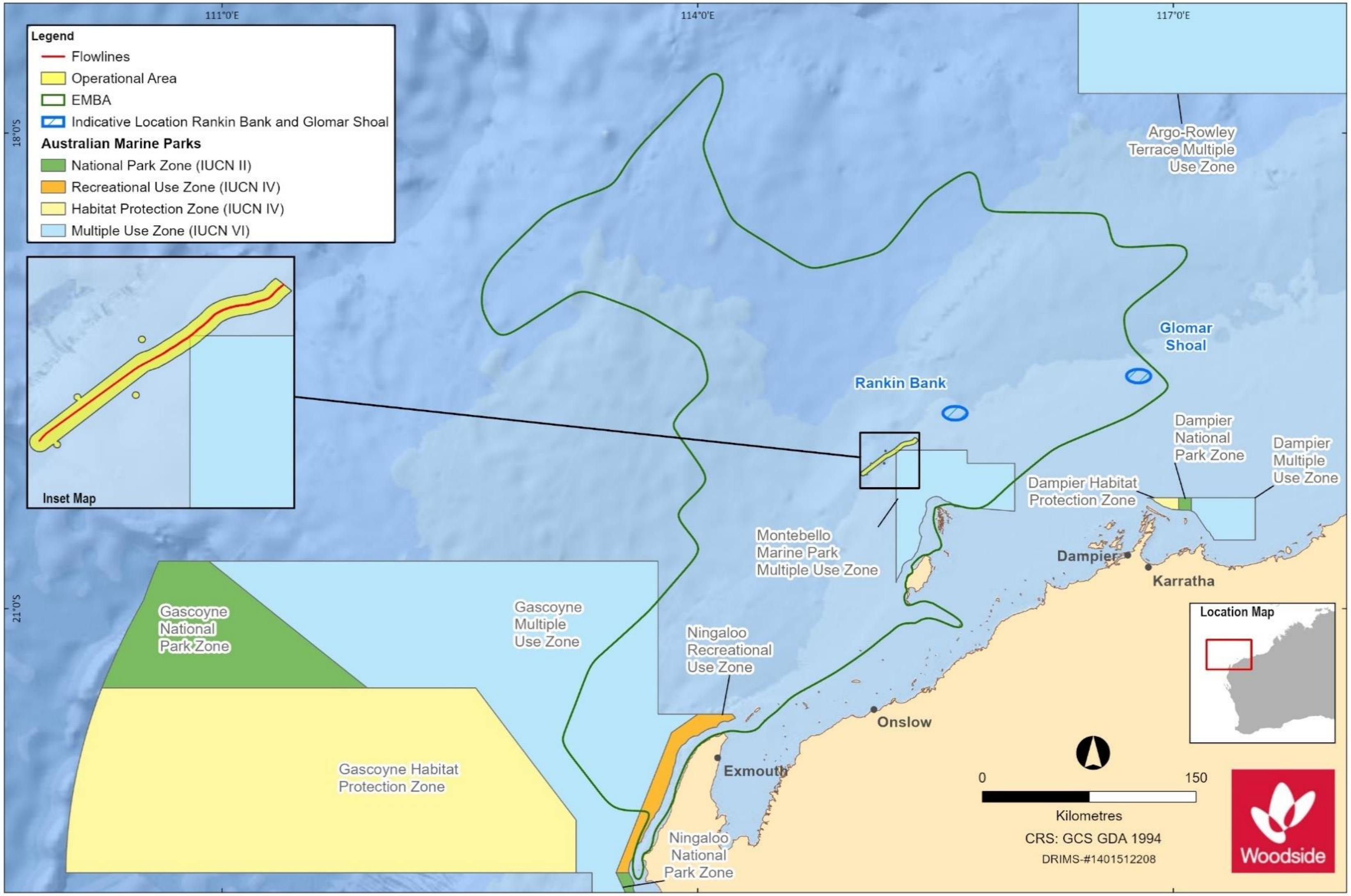


Figure 4-23: Australian Marine Parks that Overlap with the Operational Area and EMBA

Table 4-15: Australian Marine Parks within the EMBA (Source: DNP, 2018)

Australian Marine Park (IUCN Category)	Description of Values	Distance from Operational Area (nearest point)	Marine Park Zones within EMBA
Montebello Marine Park (IUCN VI)	The Montebello Marine Park comprises an area about 3,413 km², all of which is zoned as a Multiple Use Zone (IUCN VI). This AMP ranges in depth from less than 15 m up to 150 m. The Montebello Marine Park includes shallow shelf environments and provides protection for shelf and slope habitats, as well as pinnacle and terrace seabed features. The AMP also includes a small portion of the Ancient coastline at 125 m depth contour KEF (see **Section 4.6.1.5**), which is a unique seabed feature that provides areas of enhanced biological productivity. The reserve contains several other conservation values, including: • ecosystems representative of the Northwest Shelf Province (in which the Operational Area is located) • habitat for a variety of EPBC Act listed species, including: foraging and staging areas adjacent to important breeding areas for migratory seabirds; foraging areas for the Vulnerable and Migratory whale shark; foraging areas adjacent to important nesting sites for marine turtles; part of the migratory pathway and resting area of the protected humpback whale • wreck of the *Trial* – the earliest known shipwreck in Australian waters • key socio-economic values of tourism, commercial fishing, mining and recreation. There is limited information regarding the cultural significance of the marine park, however; the country is valued for its Indigenous cultural identity, health and wellbeing. This AMP is contiguous with the existing Montebello Marine Park in State waters (see **Section 4.8.2**).	0 km	Multiple Use Zone (IUCN VI)

Australian Marine Park (IUCN Category)	Description of Values	Distance from Operational Area (nearest point)	Marine Park Zones within EMBA
Gascoyne Marine Park (IUCN IV)	The Gascoyne Marine Park covers about 81,766 km² and includes waters from less than 15 m deep to 6,000 m deep. The marine park provides protection for four KEFs, including the Exmouth Plateau and Continental slope demersal fish communities (most diverse slope bioregion in Australia with high species diversity of over 500 recorded species and high endemism of 76 species) (see **Section 4.6.1.5**), as well as other complex seafloor features, including canyon, terrace, ridge, knolls, deep hole/valley and continental rise features. Additional conservation values identified within the reserve include: • values representative of the ecosystems of the Central Western Shelf Transition, the Central Western Transition and Northwest Province provincial bioregions • sponge gardens in the south of the AMP, adjacent to WA coastal waters • a range of EPBC Act listed Threatened, Migratory, Marine and Cetacean species. It contains BIAs (see **Section 4.6.2.2**) for breeding and foraging for seabirds, internesting and foraging areas for marine turtles, migratory pathways for humpback whales, and foraging habitat and migratory pathways for pygmy blue whales and whale sharks • socio-economic values of the marine park include commercial fishing, mining and recreation • five shipwrecks listed under the UCH Act • the Gnulli people hold responsibilities for sea country values within the AMP.	147 km	Multiple Use Zone (IUCN VI)

Australian Marine Park (IUCN Category)	Description of Values	Distance from Operational Area (nearest point)	Marine Park Zones within EMBA
Ningaloo Marine Park (IUCN IV)	The Ningaloo Australian Marine Park covers about 2,435 km² and is located about 10 km north of Exmouth. It is contiguous with the State Ningaloo Marine Park (see **Section 4.8.2**). The Ningaloo Australian Marine Park provides additional protection to the Ningaloo Reef, which lies in State waters within the State managed Marine Park. Water depths range from 30 m depth to oceanic waters 500 m deep. The AMP features shallow shelf environments (ranging from 15 to 150 m water depth) and provides protection for shelf and slope habitats, as well as pinnacle and terrace sea-floor features. This includes three KEFs (see **Section 4.6.1.5**): Canyons linking the Cuvier Abyssal Plain and Cape Rand Peninsula; Commonwealth waters adjacent to Ningaloo reef; and Continental slope demersal fish communities. Major conservation values of the reserve include: • natural values representative of the Central Western Shelf Transition, Central West Transition, Northwest Province and Northwest Shelf Province provincial bioregions • important habitat for a number of EPBC Act listed species, including: foraging areas adjacent to important breeding areas for migratory seabirds; important nesting sites for marine turtles; part of the migratory pathway of the humpback whale • sea country values which are the responsibility of the Gnulli people • at least 15 shipwrecks listed under the UCH Act • socio-economic values of tourism and recreation. The reserve has international and national significance due to its diverse range of marine species and unique geomorphic features. The reserve 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 ecosystem. The Ningaloo Coast (which overlaps this marine park) is listed on the National Heritage List and the commonwealth waters of Ningaloo are also listed on the Commonwealth Heritage list (see **Section 4.7.1.3**). The Ningaloo Marine Park is also within the Ningaloo Coast World Heritage Area (see **Section 4.8.5.1**)	187 km	Recreational Use Zone (IUCN IV)

4.8.2 State Managed Marine Parks

WA State Marine Parks are managed by the Department of Biodiversity, Conservation and Attractions (DBCA). There are no WA Marine Parks within the Operational Area, however; there are five within the EMBA (**Table 4-14**). These Marine Parks and their values are described in the sections below.

4.8.2.1 Barrow Island Marine Management Area, Barrow Island Marine Park and the Montebello Marine Park

The Barrow Island (BWI) Marine Management Area (MMA), BWI Marine Park and Montebello Islands Marine Park are jointly managed. Their ecological values are similar due to their proximity and have, therefore, been discussed together here.

The marine and coastal environments of both the Montebello Islands and BWI comprise a complex seabed and island topography, featuring a unique combination of offshore islands, rocky shores, intertidal and subtidal coral reefs, mangroves, macroalgal and seagrass communities and sheltered lagoons, and are considered a distinct coastal type with very significant conservation values (DEC, 2007; MPRA, 2007).

The intertidal habitats of the BWI and Montebello Island region are influenced by the passage of regular tropical cyclones that shape the sandy beaches (RPS Group, 2005). 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 Group, 2005).

The BWI MMA covers 114,693 ha and includes most of the waters surrounding BWI (and the Lowendal Islands). The port areas around Barrow and Varanus islands are excluded from the MMA. The Montebello Islands Marine Park covers an area of about 58,331 ha which includes all of the emergent island areas and their surrounding waters.

Key conservation and environmental values within these marine parks include (DEC, 2007):

- the complex and diverse marine and coastal habits described above
- 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
- important habitat for EPBC Act listed species, including cetaceans, dugongs, marine turtles, seabirds and migratory shorebirds
- an abundance of finfish, boasting at least 456 species
- pearling aquaculture (species Pinctada maxima) within the reserves, producing some of the highest quality p earls in the world.

These islands also support significant colonies of wedge-tailed shearwaters and bridled terns. BWI is ranked equal tenth among 147 sites in Australia that are important for migratory shorebirds. BWI and the Montebello islands are internationally significant sites for six species of migratory shorebirds, supporting more than 1% of the EAAF population of these species (DSEWPaC, 2012c). 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 region, 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.

4.8.2.2 Ningaloo Marine Park and Muiron Islands Marine Management Area

The Ningaloo Marine Park (State waters) extends 300 km from the North West Cape south to Red Bluff. It encompasses the State waters covering the Ningaloo Reef system and a 40 m wide strip along the upper shore. The State Marine Park is located partially within the EMBA. The Ningaloo Marine Park is part of the Ningaloo Coast WHA (see **Section 4.8.4.2**). The Muiron Islands MMA and Nature Reserve are jointly managed with the Ningaloo Marine Park.

The values of these management areas are very similar and include (MPRA, 2005):

- unique geomorphology which has contributed to habitat and species diversity
- high sediment and water quality.
- Habitats & Communities:
- – subtidal and intertidal coral reef communities which provide food, settlement substrate and shelter for marine flora and fauna
- – filter feeding communities (particularly sponge gardens) occur in the northern part of the North West Cape and the Muiron 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 provide habitat for vertebrate and invertebrate fauna
- – mangrove communities occur only in the northern part of the Ningaloo Marine Park and are important for reef fish communities (Cassata & Collins, 2008) and support a high diversity of infauna, particularly, molluscs (600 mollusc species).
- Fauna:
- – annual mass coral spawns 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 (Simpson, 1991)
- – diversity of fish fauna (about 460 species)
- – whale sharks aggregate annually to feed in the waters around Ningaloo Reef, from March to July, with the largest numbers recorded around April and May (Sleeman et al., 2010) with seasonal variability in timings noted. Timing of the whale sharks' migration to and from Ningaloo coincides with the mass coral spawning period.
- – 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. 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.
- – 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 1,000 individuals, with a similar number in Exmouth Gulf (MPRA, 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).

- foreshores and nearshore reefs of the Ningaloo coast and Muiron Islands provide internesting, nesting and hatchling habitat for several species of marine turtles including the loggerhead, green, flatback and hawksbill turtles.
- nesting and foraging habitat occurs for seabirds and shorebirds. About 33 species of seabird have been 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 Islands.

4.8.3 State Managed Terrestrial Parks and Reserves

WA State Nature Reserves and Parks are managed by DBCA. There are no WA Terrestrial Reserves or Parks within the Operational Area, however; there are four within the EMBA (**Table 4-14**). These Marine Parks and their values are described in the sections below.

4.8.3.1 Barrow Island Nature Reserve

The Barrow Island Nature Reserve is a Class A Nature Reserve covering about 235 km^2 and extends to the low water mark adjacent to the Montebello Islands and Barrow Island Marine Parks. The Barrow Island coastline consists of dry creek beds, beaches, clay and salt flats, mangroves, intertidal flats and reefs; and is bordered by high cliffs on the western side.

Key conservation values within the reserve include (DPaW, 2015):

- the second largest island off the WA coast
- important biological refuge site because of isolation from certain threatening process on the mainland
- contains flora that are restricted in distribution and at or near the limit of their range
- a high number of fauna species with high conservation value
- extensive hydrogeological karst system that supports a subterranean community of high conservation significance
- regionally and nationally significant rookeries for green and flatback turtles
- important habitat for migratory shorebirds (including acting as a staging and destination terminus)
- a significant fossil record that indicates local historical biodiversity and evolution
- sites of Aboriginal cultural significance.

4.8.3.2 Montebello Conservation Park

The Montebello Islands are a group of islands located north of Barrow Island and about 46 km south east of the Operational Area. The island group comprises 265 low lying limestone and sandstone islands (DEC, 2007), including North West Island, Trimouille Island, Bluebell Island and Hermite Island. The islands are typically irregularly shaped with complex coastlines featuring varied habitats, such as lagoons, channels, inlets and rocky intertidal areas (DEC, 2007). Terrestrial habitats of the islands generally comprise bare rocky terrain, although some feature sand dunes reaching up to 40 m in height (DEC, 2007).

The intertidal zones (which include mangrove, mudflat and intertidal reef communities; see **Section 4.6.1**) provide important habitat for seabirds and migratory shorebirds, as well as numerous protected species (DEC, 2007). These intertidal zones are part of the terrestrial reserve area which extends to the low water mark (DEC, 2007). The zones are managed in tandem with the adjacent marine park to ensure conservation outcomes are maximised.

The islands also support nature-based tourism and commercial and recreational fishing

4.8.3.3 Muiron Islands Nature Reserve

The Muiron Islands comprise North and South Muiron Islands which are located about 14 km north-east of North West Cape and 171 km south of the Operational Area (within the EMBA). The terrestrial nature reserves encompass all land to the high water mark (MPRA, 2005). The islands are a continuation of the Cape Range Peninsula and are low and domed limestone islands separated by a deep channel (MPRA, 2005). The western side of the islands features limestone cliffs and sandy beaches with intertidal rock platforms, whilst the eastern shores are sandy shores which give way to low dunes. There are also patchy reef habitats which feature coral bommies. The variable geomorphology of the two islands has contributed to high species and habitat diversity.

4.8.3.4 Pilbara Islands Nature Reserves

Within the nearshore waters of the Pilbara, between the Muiron Islands and the Dampier Archipelago, are a series of islands collectively termed the Northern, Middle and Southern Pilbara 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.

The Northern Island Group includes more than 30 islands that range from east of Cape Preston south to the mouth of the Robe River, 10–35 km offshore, including the Great Sandy Islands Nature Reserve and the Passage Islands. The Northern Island Group is located about 146 km south-east of the Operational Area at the nearest point (Little Rocky Island).

The Middle Island Group includes the Mary Anne Reefs and neighbouring small islands. The Southern Island Group includes the larger Serrurier, Bessieres and Thevenard Islands Nature Reserves. 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, 2010). The coral community structure within this area, and others within the region, is highly temporally variable due to cyclonic activity.

The larger islands of the groups provide important nesting habitat for seabirds and marine turtles (Chevron, 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. Thevenard Island supports a significant flatback turtle rookery along with small numbers of green turtles and is a known feeding area for green turtles.

Chevron (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.

4.8.4 Shoals, Banks and Reefs

4.8.4.1 Rankin Bank

As described in **Section 4.5.4**, Rankin Bank comprises three main sedimentary banks rising steeply from between 80 and 120 m below sea level, reaching 20 – 40 m below the sea surface and featuring plateaus and troughs (Abdul Wahab *et al*., 2018). This geomorphic feature is located about 25 km from the Operational Area and is within the EMBA (see **Figure 4-11**). Rankin Bank is one of only two large, complex bathymetrical features on the outer western shelf of the West Pilbara (the other being Glomar Shoal; see **Section 4.8.4.2**) (Abdul Waheb *at el.*, 2018).

Surveys of Rankin Bank were undertaken by the Australian Institute of Marine Science (AIMS) in 2013 (September to November) as part of a co-investment project between Woodside and AIMS to better understand the habitats and complexity of the submerged shoal ecosystems (AIMS, 2014; Abdul Waheb *at al.*, 2018). The surveys were undertaken using various methods, including multibeam survey, towed video, Stereo Baited Underwater Video Survey (SBRUVS) and beam transmissions (to measure turbidity), at depths between 20 and 115 m (Abdul Waheb *at al.*, 2018). Water column data was also collected in 2017 (January) to examine potential temporal variation in these parameters (Abdul Waheb *at al.*, 2018).

AIMS (2014) found that sediments at Rankin Bank were primarily carbonate with a grain size of mostly sand, with finer muds found at the deeper sample sites. Sand was also found to increase with depth and unconsolidated reef exceeded 30% at all depths by Abdul Waheb e*t al.* (2018). Hydrocarbon and trace metal concentrations in sediments indicated the bank was unaffected by anthropogenic pollution (AIMS, 2014). Turbidity was lower at Rankin Bank than Glomar Shoal during the survey, with beam transmissions remaining above 95% at all depths (Abdul Waheb *et al.*, 2018). Turbidity was slightly lower in 2017, whereas temperature and salinity was slightly higher at all depths (Abdul Waheb *et al.*, 2018).

Proportion of cover by benthic taxa was highest for macroalgae and hard corals, particularly at depths less than 40 m, and decreased with increasing depth. Other benthic taxa included soft corals and sponges which were present in lower proportions at all depths. Encrusting corals were common, reaching cover of about 12.5% at depths less than 40 m. Solitary corals were also present (about 10% cover) primarily at depths between 40 and 60 m. Foliose and submassive/columnar corals were also present (Abdul Waheb *et al.*, 2018).

Fish abundance and diversity at Rankin Bank were found to be comparable within other reefs in north west Australia, and notably twice as abundant and 1.5 times more diverse than those fishes identified in a comparable survey at Glomar Shoal (Abdul Waheb *et al.*, 2018). A total of 205 fish species were recorded at Rankin Bank, 100 of which were common to both Glomar Shoal and Rankin Bank. Depth, location, sand, sponges and hard coral were all found to contribute to the fish communities present. Specifically, fish communities were primarily associated with hard coral and shallow depths at Rankin Bank (Abdul Waheb *et al*., 2018).

4.8.4.2 Glomar Shoal

Glomar Shoal is situated about 145 km east-north east of the Operational Area. This shoal is a large (215 km^2) and complex bathymetrical feature situated on the outer continental shelf off the Pilbara. Glomar Shoal is about 8.5 times wider than Rankin Bank at the 60 m contour. Glomar Shoal rises from 80 m depth on its south-west side and 70 m depth on its north-eastern side to form a single plateau at 40 m depth (Abdul Waheb *et al.*, 2018). Together with Rankin Bank, these remote shallow water areas represent regionally unique habitats and are considered likely to play an important role in the productivity of the Pilbara region (AIMS 2014b, Abdul Wahab *et al*. 2018).

As mentioned in **Section 4.8.4.1**, surveys of the benthic habitats and communities at Glomar Shoal and Rankin Bank were undertaken in 2013 and 2017 by AIMS (2014) and Abdu Waheb *et al.* (2018), respectively. Salinity and temperature were found to be slightly higher in 2017 compared with the

2013 values (Abdul Wahab *et al.*, 2018), most likely due to seasonality. Substrates at Glomar Shoal were found to vary with depth, from coarse unconsolidated sediment at depths greater than 60 m and hard substrate (i.e. consolidate reef) supporting benthic communities comprising hard and soft corals, sponges and macroalgae at depths < 40 m (Abdul Wahab *et al.*, 2018). Total cover of benthic taxa (hard coral, soft coral, sponges and other benthic biota) was highest at depths < 40 m and decreased with depth (Abdul Wahab *et al*., 2018). At depths of 60-80 m benthic cover was low (about 2%) and at depths greater than 80 m benthic cover was barely present (Abdul Wahab *et al.*, 2018).

A total of 170 fish species were identified at Glomar Shoal and fish abundance and diversity of the demersal fish communities of Glomar Shoal were found to vary with seabed habitat type; sand, hard coral and sponge coverage influenced fish communities, with higher abundance and diversity of fish associated with shallow hard coral habitats. (Abdul Wahab *et al.*, 2018). In general, the fish abundance and diversity of Glomar Shoal are considered comparable with other reefs and the submerged shoals and banks in the region, although less diverse and abundant than fish assemblages at Rankin Bank (Abdul Wahab *et al.*, 2018).

4.8.5 World Heritage Areas

As mentioned in **Section 4.7.1.3**, there is one WHA within the EMBA (described below). WHAs are listed under the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) which seeks to 'protect heritage around the world that is of such outstanding universal value that its conservation is important for current and future generations' (DAWE, 2020i).

4.8.5.1 Ningaloo Coast World Heritage Area

The Ningaloo Coast is located about 189 km south east of the Operational Area and is partially within the EMBA. The EMBA also overlaps the Ningaloo Coast WHA, a 604,500 ha area which encompasses the Muiron Islands; the Bundegi and Jurabi coastal parks at the tip of the Cape Range National Park; the Learmonth Air Weapons Range; and the Ningaloo Australian and State Marine Parks (described in **Sections 4.8.1** and **4.8.2**)

The Ningaloo Coast was listed as a WHA under the following criteria (DAWE, 2020j):

- Criterion vii: to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; and
- Criterion x: to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation

More specifically, the Ningaloo Coast WHA is significant for the following and more (DBCA, 2019):

- one of the longest continuing fringing reefs in the world (Ningaloo Reef);
- high diversity of coral, fish and invertebrate species which occur on the shelf, slope and deep-sea habitats;
- large aggregation of whale sharks (refer to Section 4.6.2.9), including high numbers of juveniles, as well as important sites and aggregation areas for other marine megafauna such as marine turtles, whales, dolphins and dugongs (see Section 4.6.2.9); and
- important transitional terrestrial habitats representing a transition zone between tropic, temperate and desert climate, as well as a complex karst system featuring subterranean fauna.

The region has a high diversity of marine habitats including coastal mangrove systems, lagoons, coral reef, open ocean, continental slope and the continental shelf (MPRA, 2005). The dominant feature of the Ningaloo Coast WHA is Ningaloo Reef, the largest fringing reef in Australia. Ningaloo Reef supports both tropical and temperate species of marine fauna and flora and more than 300 species of coral (MPRA, 2005).

It is these natural heritage values, iconic wilderness, seascapes, wildlife and biodiversity which are major attractions of the Ningaloo Coast WHA. The Ningaloo WHA is managed via the Ningaloo Australian Marine Park and State Marine Park (see **Sections 4.8.1** and **4.8.2**).

5 STAKEHOLDER CONSULTATION

5.1 Summary

Woodside is committed to consulting relevant stakeholders to ensure stakeholder 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.

Woodside has followed the requirements of section 11A (1) of the Environment Regulations to identify relevant stakeholders. Woodside's assessment of stakeholder relevance is outlined in Table **5-1**.

5.2 Stakeholder Consultation Objectives

In support of this EP, Woodside has sought to:

- ensure all relevant stakeholders are identified and engaged in a timely and effective manner
- develop and make available communications material to stakeholders that is relevant to their interests and information needs
- incorporate stakeholder feedback into the management of the Petroleum Activities Program where practicable
- provide feedback to stakeholders on Woodside's assessment of their feedback and keep a record of all engagements
- make available opportunities to provide feedback during the life of this EP.

5.3 Stakeholder Expectations for Consultation

Stakeholder consultation for this activity has also been guided by stakeholder organisation expectations for consultation on planned activities. This guidance includes:

NOPSEMA:

- *GL1721 - Environment plan decision making - Rev 5 - June 2018*
- *GN1847 - Responding to public comment on environment plans - Rev 0 - April 2019*
- *GN1344 - Environment plan content requirements - Rev 4 - April 2019*
- *GN1488 - Oil pollution risk management - Rev 2 - February 2018*
- *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*

Commonwealth Government:

- *Offshore Petroleum and Greenhouse Gas Activities: Consultation with Australian Government agencies with responsibilities in the Commonwealth Marine Area*

Australian Fisheries Management Authority:

- *Petroleum industry consultation with the commercial fishing industry*

Department of Agriculture, Water and the Environment:

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

Department of Primary Industries and Regional Development:

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

Department of Transport

- *Offshore Petroleum Industry Guidance Note*

Woodside acknowledges that additional relevant stakeholders may be identified prior to or during the Petroleum Activities Program. These stakeholders will be contacted, provided relevant information to their interests and invited to provide feedback about the proposed activity. Woodside will assess their feedback, respond to the stakeholder and incorporate feedback into the management of the Petroleum Activities Program where practicable.

Woodside consultation arrangements typically provide stakeholders up to 30 days (unless otherwise agreed) to review and respond to Petroleum Activities Program where stakeholders are potentially affected. Woodside considers this consultation period an adequate timeframe in which stakeholders can assess potential impacts of the Petroleum Activities Program and provide feedback.

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

Stakeholder	Relevant to Activity	Reasoning
Commonwealth Government Department or Agency		
Australian Customs Service (ACS) – Border Protection Command	Yes	Responsible for coordinating maritime security.
Australian Fisheries Management Authority (AFMA)	No	Responsible for the management of Commonwealth fisheries. There is no potential for interaction with Commonwealth fisheries within the Operational Area, based on an assessment of the past five ABARES Fishery Status Reports and previous engagements with AFMA.
Australian Hydrographic Office (AHO)	Yes	Responsible for maritime safety and Notices to Mariners.
Australian Maritime Safety Authority (AMSA)	Yes	Responsible for maritime safety and oil pollution response in Commonwealth waters. Proposed activity has a potential hydrocarbon spill risk, which may require AMSA assistance for spill response.
Department of Agriculture, Water and the Environment (DAWE)	Yes	Responsible for implementing Commonwealth policies to support the agriculture, water resources, the environment and heritage. The proposed activity has the potential impact to DAWE's interests in the prevention of introduced marine species. There is no potential for interaction with Commonwealth fisheries within the Operational Area, based on an assessment of the past five ABARES Fishery Status Reports and previous engagements with AFMA.
Department of Defence (DoD)	Yes	Responsible for supporting Australia's strategic and national security interests. The Operational Area overlaps a Department of Defence Training Area.
Department of Industry, Science, Energy and Resources (DISER)	Yes	Responsible for implementing Commonwealth policies to support businesses, science and provide adequate, reliable and affordable energy. Department of the relevant Commonwealth Minister and is required to be consulted under the Regulations.
Director of National Parks (DNP)	Yes	Responsible for the management of AMPs and therefore requires an awareness of activities that occur within and understanding of potential impacts and risks to the values of parks (NOPSEMA guidance note: N-04750-GN1785 A620236, June 2020). Titleholders are required consult DNP on offshore petroleum and greenhouse gas activities where they occur in, or may impact on the values of marine parks, including where potential spill response activities may occur in the event of a spill (i.e. scientific monitoring).
WA Government Department or Agency		
Department of Biodiversity, Conservation and Attractions (DBCA)	Yes	Responsible for the management of Western Australia's marine parks and reserves.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department of relevant State Minister and is required to be consulted under the Environment Regulations.
Department of Primary Industries and Regional Development (DPIRD)	Yes	Responsible for the management of State fisheries. There is potential for interaction with State fisheries within the Operational Area.
Department of Transport (DoT)	Yes	Responsible for oil pollution response in State waters. Proposed activity has a potential hydrocarbon spill risk, which may require DoT assistance for spill response.

Stakeholder	Relevant to Activity	Reasoning
Commonwealth Managed Fisheries*		
Southern Bluefin Tuna Fishery	No	While there is an overlap with the Southern Bluefin Tuna Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of previous ABARES Fishery Status Reports.
Western Skipjack Tuna Fishery	No	While there is an overlap with the Western Skipjack Tuna Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of previous ABARES Fishery Status Reports.
Western Tuna and Billfish Fishery	No	While there is an overlap with the Western Tuna and Billfish Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of previous ABARES Fishery Status Reports.
State Managed Fisheries*		
Mackerel Managed Fishery	No	While there is an overlap with the Mackerel Managed Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
Pilbara Demersal Scalefish Fisheries • Pilbara Trap	Yes	The fishery overlaps with the Operational Area and DPIRD data indicates active fishing within the Operational Area.
Pilbara Demersal Scalefish Fisheries • Pilbara Line	Yes	The fishery overlaps with the Operational Area and DPIRD data indicates active fishing within the Operational Area.
Pilbara Demersal Scalefish Fisheries • Pilbara Trawl	No	While there is an overlap with the Pilbara Trawl management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data. Additionally, the Operational Area overlaps Zone 1 of the Fishery, which has been closed to trawling since 1998.
WA Sea Cucumber Fishery	No	While there is an overlap with the WA Sea Cucumber Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
Pilbara Crab Managed Fishery	No	While there is an overlap with the Pilbara Crab Fishery management area and the Operational Area, the fishery targets shallow water depths (information sourced from DPIRD) not found in the Operational Area and DPIRD data indicates the fishery has not been active in the Operational Area in recent years.
Specimen Shell Managed Fishery	No	While there is an overlap with the Specimen Shell Managed Fishery management area and the Operational Area, this fishery it is a dive and wade fishery with activities generally restricted to less than 30 m water depth (engagement with WAFIC).
Nickol Bay Prawn Managed Fishery	No	The fishery does not overlap with the Operational Area and DPIRD data indicates the fishery has not been active in the Operational Area within the last five years.
Marine Aquarium Fish Managed Fishery	No	While there is an overlap with the Marine Aquarium Fish Managed Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
Western Australian Abalone Managed Fishery	No	While there is an overlap with the Western Australian Abalone Managed Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.

Stakeholder	Relevant to Activity	Reasoning
Onslow Prawn Managed Fishery	No	While there is an overlap with the Onslow Prawn Managed Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
South-west Coast Salmon Fishery	No	While there is an overlap with the South-west Coast Salmon Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
West Coast Deep-sea Crustacean Managed Fishery	No	While there is an overlap with the West Coast Deep-sea Crustacean Managed Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
Pearl Oyster Fishery	No	While there is an overlap with the Pearl Oyster Fishery management area and the Operational Area, the fishery has not been active in the Operational Area within the last five years, based on an assessment of DPIRD data.
Industry		
Chevron	Yes	Adjacent titleholder, the field production system operator.
Industry Representative Organisations		
Australian Petroleum Production and Exploration Association (APPEA)	Yes	Represents the interests of oil and gas producers and explorers in Australia.
Commonwealth Fisheries Association (CFA)	No	Represents the interests of commercial fishers with licences in Commonwealth waters. There is no potential for interaction with Commonwealth fisheries in the Operational Area, based on an assessment of the past five ABARES Fishery Status Reports and previous engagement with AFMA.
Pearl Producers Association (PPA)	Yes	Represents the interests of the Australian South Sea Pearling industry. There is unlikely to be any interaction with the Pearl Oyster Managed Fishery within the Operational Area, however the PPA has requested that they be kept informed of Woodside's proposed activities.
Recfishwest	Yes	Represents the interests of recreational fishers in Western Australia. Recfishwest has advised that activities do not have the potential to impact recreational fishers.
Marine Tourism Association of Western Australia (MTAWA)	Yes	Represents the interests of the charter sector in Western Australia. Activities have the potential to impact charter operators.
Western Australian Fishing Industry Council (WAFIC)	Yes	Represents the interests of commercial fishers with licences in State Waters. There is potential for interaction with commercial fishers in the Pilbara Trap and Pilbara Line fisheries.
Other Stakeholders		
Charter boat, tourism and dive operators	Yes	DPIRD data indicates charter boat tour operators have been active in the Operational Area in the past five years.

** Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed Operational Area, as well as consideration of fishing effort data, fishing methods and water depth.* ***Table 4-12*** *provides a detailed assessment of Commonwealth and State fisheries within or adjacent to the Operational Area.*

5.3.1 Stakeholder Consultation Plan

Consultation activities undertaken for the proposed activity are outlined in **Table 5-2.** The Consultation Information Sheet (**Appendix F**, ref 1.2) is published on the Woodside website and includes a toll free 1800 phone number.

Table 5-2: Stakeholder Consultation Activities

Stakeholder	Information Provided	Stakeholder Response	Woodside Response
Australian Government Department or Agency			
ACS – Border Protection Command	On 7 July 2020 Woodside emailed ACS advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Email and consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed ACS to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Email and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
AHO	On 7 July 2020 Woodside emailed AHO advising of the proposed activity (Appendix F, reference 1.3), provided a shipping fairways map (Appendix F, reference 1.4), and a consultation information sheet (Appendix F, reference 1.2).	On 8 July 2020 AHO emailed Woodside acknowledging receipt of its consultation information, and that the information supplied would be registered, assessed, prioritised and validated in preparation for updating its navigational charting products.	Email and consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed AHO to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.24). An updated shipping fairways map (Appendix F, reference 1.25) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	On 7 January 2021 AHO emailed Woodside AHO be informed when the permanent exclusion zones are implemented for the activity.	On 22 January 2021, Woodside responded to AHO. Woodside noted that a permanent exclusion zone was already active around the Brunello manifold, as per the Julimar Operations EP accepted by NOPSEMA in 2016. Woodside noted that a permanent exclusion zone would be implemented around the Julimar manifold, following completion of installation activities in 2021. Woodside noted it would provide notification to AHO once the Julimar permanent exclusion zone has been implemented.

AMSA – Marine Safety	On 7 July 2020 Woodside emailed AMSA advising of the proposed activity (Appendix F, reference 1.3), provided a shipping fairways map (Appendix F, reference 1.4), and a consultation information sheet (Appendix F, reference 1.2).	On 8 July 2020 AMSA emailed Woodside requesting the Master to email AMSA's Joint Rescue Coordination Centre (JRCC) at least 24–48 hours before operations commence and provided details of information required by the Centre in that communication. AMSA requested that the AHS be contacted through datacentre@hydro.gov.au no less than four working weeks before operations commence for the promulgation of related notices to mariners. AMSA provided advice on obtaining vessel traffic plots, including digital data sets and maps.	On 4 September 2020 Woodside responded to AMSA. Woodside proposed to notify AMSA's JRCC of stationary vessels based IMMR activities undertaken within shipping lanes before activity commencement or where vessel activities are undertaken for extended periods of time outside of shipping lanes. This notification approach was proposed on the basis that vessel activities associated with operations are typically in field for short durations and not located in trafficable areas. Furthermore, vessel activities associated with operations are typically conducted at short notice and subject to change, and therefore long-lead notifications may not be as accurate. Woodside also noted it would continue to notify the AHO to generate a temporary Maritime Safety Information Notifications (MSIN) and temporary NTMs for activities where vessels will be in field for more than 3 weeks. Woodside noted it would call AMSA to discuss the proposed approach further. On 8 September 2020 Woodside called AMSA's general contact phone number. Woodside was not connected to an operator. On 9 September 2020 Woodside emailed AMSA requesting AMSA notify Woodside of a suitable time, should AMSA wish to discuss the proposed approach further. On 26 October 2020 Woodside called AMSA's general contact phone number. Woodside was connected to an operator. Woodside noted it wished to discuss the proposed notification approach for activities covered under the Julimar Operations Environment Plan. The operator requested Woodside email AMSA regarding the proposed notification approach and that they would pass the email on to the relevant representative. On 26 October 2020 Woodside emailed AMSA, thanking AMSA for its time over the phone, re-iterating its proposed notification approach, indicating its interest in discussing the

		On 30 October 2020, AMSA called Woodside to discuss the proposed notification approach for activities covered under the Julimar Operations Environment Plan. AMSA advised they had no objections to the proposal. On 30 October 2020, AMSA emailed Woodside to reiterate that they had no objections to Woodside's proposed notification approach for activities covered under the Julimar Operations Environment Plan.	proposed notification approach with AMSA further and requesting Woodside be connected with an AMSA representative. Woodside will notify AMSAs JRCC of stationary vessels based IMMR activities undertaken within shipping lanes before activity commencement. Additionally, Woodside will also commit to notifying AMSAs JRCC, where vessel activities are undertaken for extended periods of time outside of shipping lanes. Woodside will also continue to notify the Australian Hydrographic Office to generate a temporary Maritime Safety Information Notifications (MSIN) and temporary NTMs for activities where vessels will be in field for more than 3 weeks.
	On 6 January 2021 Woodside emailed AMSA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.24). An updated shipping fairways map (Appendix F, reference 1.25) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	On 8 January 2021 AMSA emailed Woodside requesting the Master to email AMSA's Joint Rescue Coordination Centre (JRCC) at least 24–48 hours before operations commence and provided details of information required by the Centre in that communication. AMSA requested that the AHS be contacted through datacentre@hydro.gov.au no less than four working weeks before operations commence for the promulgation of related notices to mariners. AMSA provided advice on obtaining vessel traffic plots, including digital data sets and maps. AMSA also provided a reminder of the obligation for vessels to comply with the International Rules for Preventing Collisions at Sea.	On 21 January 2021, Woodside emailed AMSA seeking AMSA's confirmation that it was comfortable with the revised notification process agreed to for the activity on 30 October 2020.

		On 27 January 2021 AMSA emailed Woodside advising it was comfortable proposed notification approach for activities covered under the Julimar Operations Environment Plan	Woodside will notify AMSAs JRCC of stationary vessels based IMMR activities undertaken within shipping lanes before activity commencement. Additionally, Woodside will also commit to notifying AMSAs JRCC, where vessel activities are undertaken for extended periods of time outside of shipping lanes. Woodside will also continue to notify the Australian Hydrographic Office to generate a temporary Maritime Safety Information Notifications (MSIN) and temporary NTMs for activities where vessels will be in field for more than 3 weeks
AMSA – Marine Pollution	On 7 July 2020 Woodside emailed AMSA advising on its consultation approach for the Oil Pollution First Strike Plan (Appendix F, reference 1.5), and a consultation information sheet (Appendix F, reference 1.2). On 1 September 2020 Woodside emailed a copy of Woodside's Oil Pollution First Strike Plan for the activity was shared (Appendix F, reference 1.6).	No feedback received.	Email, consultation Information Sheet and Oil Pollution First Strike Plan provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed AMSA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Email and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
DAWE	On 7 July 2020 Woodside emailed DAWE advising of the proposed activity and provided information on invasive marine species (Appendix F, reference 1.7) and a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside has addressed maritime biosecurity and Commonwealth fishing related issues in **Section 6** of this EP based on previous offshore activities. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed DAWE to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Email and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
DoD	On 7 July 2020 Woodside emailed DoD advising of the proposed activity (Appendix F, reference 1.20), provided a	No feedback received.	Email, defence areas map and consultation Information Sheet provided. Woodside considers the level of consultation to be adequate

	map of defence areas relevant to the activity (Appendix F, reference 1.21) and a consultation information sheet (Appendix F, reference 1.2).		
	On 7 January 2021, Woodside emailed DoD to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.35). An updated defence areas map (Appendix F, reference 1.36) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	No feedback received.	Email, updated defence areas map and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate
DISER	On 7 July 2020 Woodside emailed DISER advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Email and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed DISER to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Email and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate
DNP	On 3 August 2020 Woodside emailed DNP advising of the proposed activity (Appendix F, reference 1.8) and provided a consultation information sheet (Appendix F, reference 1.2).	On 28 August 2020, DNP emailed Woodside thanking Woodside for providing it with the opportunity to comment. DNP noted NOPSEMA's EP Guidance Note, the North-west Marine Parks Management Plan 2018, and the values of the Montebello Marine Park DNP noted the Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Pilbara region. The DNP requested it be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible.	8 October 2020, Woodside responded to DNP noting Woodside had considered the DNP's guidance note and management plan in undertaking its revision to the Julimar Operations EP. Woodside noted the Julimar Operations EP identifies and manages impacts to marine parks, as part of planned and unplanned activities, to an acceptable level and demonstrates that the activity will not be inconsistent with the DNP's management plan Woodside noted a Commonwealth Government approved oil spill response plan would be in place for the duration of the activities, and that the DNP will be advised if an environmental

		Additionally, the DNP requested notification to marineparks@awe.gov.au if the EP is approved. The DNP also requested notification at least 10 days prior to all activities occurring within the marine park (excluding transiting) and at the conclusion of that activity.	incident occurs that may impact on the values of a marine park Woodside noted the DNP will also be advised when the Julimar Operations EP is approved by NOPSEMA, and notified at least 10 days prior to all activities occurring within the marine park (excluding transiting) and at the conclusion of that activity.
	On 6 January 2021 Woodside emailed DNP to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Email and updated consultation Information Sheet provided. Woodside considers the level of consultation to be adequate
Western Australian Government Department or Agency or Advisory Body			
DBCA	On 3 August 2020 Woodside emailed DBCA advising of the proposed activity (Appendix F, reference 1.9) and provided a consultation information sheet (Appendix F, reference 1.2).	On 6 August 2020 DBCA emailed Woodside acknowledging Woodside's advice. DBCA noted ecologically important areas including marine parks and island/coastal conservation reserves located in the vicinity of the ongoing operations. DBCA encouraged Woodside to ensure it possessed all baseline information required to implement a Before-After, Control-Impact (BACI) framework in planning its management response in the event of a substantial hydrocarbon release. DBCA recommended that Woodside refer to the Commonwealth Department of Agriculture, Water and the Environment's National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. DBCA provided contact details in the event of a hydrocarbon release.	On 11 August 2020 Woodside responded and reaffirmed the areas of ecological importance in the proximity of the operational area will not be impacted by planned activities. Woodside noted it maintains sound knowledge and understanding of areas of ecological importance through the regular maintenance of an information system detailing; credible published scientific research, industry and research agencies (government and university) baseline and monitoring programs, and Woodside studies that can be accessed to support the implementation of an oil spill scientific monitoring program in the highly unlikely event of a hydrocarbon spill. Woodside noted it had considered the Commonwealth Department of Agriculture, Water and the Environment's National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. Woodside noted its Nearshore Pipelines Oil Pollution First Strike Plan was being revised and would include a

		DBCA requested that Woodside commit to the monitoring and clean-up of any DBCA interests affected by an oil spill in consultation with DBCA. DBCA noted that it will not implement an oiled wildlife management response on behalf of a petroleum operator except as part of a whole of government response mandated by regulatory decision makers, and any advice or assistance from DBCA, at any scale, will occur on a full cost recovery basis.	commitment that DBCA will be notified via phone call as soon as practicable in the event of a hydrocarbon release. Woodside noted this plan would describe the incident management structure, notification and reporting requirements, the operational area, activity specific credible spill scenarios, and the hydrocarbon spill response strategies available for the protection of priority receptors. Links would be included in this plan to a suite of existing Operational Plans and Tactical Response Plans (TRPs) to commence the mobilisation of response resources immediately, including Operational Monitoring, Scientific Monitoring and Shoreline-Clean up where required. Woodside noted that DBCA will not implement an oiled wildlife management response on behalf of a petroleum operator.
	On 6 January 2021 Woodside emailed DBCA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	On 25 January 2021, DBCA emailed Woodside thanking Woodside for advising of the revised scope of the proposed activity. DBCA noted it had no additional comments to make.	Woodside notes DBCA advice that it has no additional comments on the activity.
DMIRS	On 7 July 2020 Woodside emailed DMIRS advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	On 23 July 2020 DMIRS emailed Woodside acknowledging receipt of the consultation information and advised that no further information was required at this stage.	Woodside notes DMIRS advice that no further information is required.
	On 6 January 2021 Woodside emailed DMIRS to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	On 19 January 2021, DMIRS emailed Woodside thanking Woodside for advising of the revised scope of the proposed activity. DMIRS noted it had no additional comments to make.	Woodside notes DMIRS advice that it has no additional comments on the activity.

DPIRD	On 20 July 2020 Woodside emailed DPIRD advising of the proposed activity (Appendix F, reference 1.10) and provided a State fisheries map relevant to the proposed activity (Appendix F, reference 1.11) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	On 30 October Woodside sent DPIRD a follow-up email requesting DPIRD notify Woodside should they have any feedback on the proposed activity. Email and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed DPIRD to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.26). Updated state fishery maps relevant to the proposed activity (Appendix F, reference 1.31; reference 1.32) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	No feedback received.	Email, updated state fisheries map and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
DoT	On 7 July 2020 Woodside emailed DoT advising on its consultation approach for the Oil Pollution First Strike Plan (Appendix F, reference 1.12), and a consultation information sheet (Appendix F, reference 1.2). On 1 September 2020 Woodside emailed a copy of Woodside's Oil Pollution First Strike Plan for the activity was shared (Appendix F, reference 1.13).	On 9 July 2020 DoT emailed Woodside acknowledging receipt of the consultation information and advised it looked forward to receiving the Oil Pollution First Strike Plan and any other oil spill related documentation. On 2 October 2020 DoT emailed Woodside with a comment on Woodside's Oil Pollution First Strike Plan for the activity. DoT noted the closest DoT stockpile for this activity would likely be Karratha, rather than Exmouth.	Email, consultation Information Sheet and Oil Pollution First Strike Plan provided. Woodside considers the level of consultation to be adequate. On 14 October 2020, Woodside emailed DoT thanking DoT for its feedback and advising the Oil Pollution First Strike Plan had been updated to reference the DoT stockpile as being the closest to the activity.
	On 6 January 2021 Woodside emailed DoT to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	On 15 January 2021, DoT emailed Woodside thanking Woodside for advising of the revised scope of the proposed activity. DoT requested Woodside confirm that there was no change to spill risk associated with the revised scope. On 22 January 2021 DoT emailed Woodside thanking Woodside for confirming that that there was no material change in the potential oil spill risk associated with the activity, following the revision to the scope of the activity.	On 18 January 2021 Woodside emailed DMIRS confirming that there was no material change in the potential oil spill risk associated with the activity under the revised scope.
State Fisheries			

Pilbara Demersal Scalefish Fishery • Pilbara Trap Fishery	On 20 July 2020 Woodside emailed licence holders in the Pilbara Trap Fishery advising of the proposed activity (Appendix F, reference 1.14) and an provided a State fisheries map relevant to proposed activity (Appendix F, reference 1.11) and a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Email and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed Pilbara Trap Fishery licence holders to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.28). An updated Pilbara Trap Fishery map relevant to the proposed activity (Appendix F, reference 1.31) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	No feedback received.	Email, updated state fisheries map and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
Pilbara Demersal Scalefish Fishery • Pilbara Line Fishery	On 20 July 2020 Woodside emailed licence holders in the Pilbara Line Fishery advising of the proposed activity (Appendix F, reference 1.15) and provided a State fisheries map relevant to proposed activity (Appendix F, reference 1.11) and a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Email and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed Pilbara Line Fishery licence holders to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.29). An updated Pilbara Line Fishery map relevant to the proposed activity (Appendix F, reference 1.32) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	No feedback received.	Email, updated state fisheries map and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
Industry			
Chevron	On 7 July 2020 Woodside emailed Chevron advising of the proposed activity (Appendix F, reference 1.16) and provided a titles map relevant to the proposed activity (Appendix F, reference 1.17) and a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed Chevron to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five	No feedback received.	Email, updated titles map and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.

	temporarily abandoned exploration wells (Appendix F, reference 1.33). An updated titles map (Appendix F, reference 1.34) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.		
Industry Representative Organisations			
APPEA	On 7 July 2020 Woodside emailed APPEA advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed APPEA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Woodside considers the level of consultation to be adequate.
PPA	On 20 July 2020 Woodside emailed PPA advising of the proposed activity (Appendix F, reference 1.18) and provided a State Fisheries map relevant to proposed activity (Appendix F, reference 1.11) and a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside considers the level of consultation to be adequate.
	On 22 January 2021 Woodside emailed PPA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.30). Updated state fishery maps relevant to the proposed activity (Appendix F, reference 1.31; reference 1.32) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	No feedback received.	Email, updated state fisheries map and Consultation Information Sheet provided. Woodside considers the level of consultation to be adequate.
WAFIC	On 15 July 2020 Woodside emailed WAFIC advising of the proposed activity (Appendix F, reference 1.19) and provided a State Fisheries map relevant to the proposed activity (Appendix F, reference 1.11) and a consultation information sheet (Appendix F, reference 1.2).	On 15 July 2020 Woodside called WAFIC to discuss the proposed activity including location, relevant fisheries, water depth, exclusionary and cautionary zones and potential risks and mitigations. WAFIC raised no concerns regarding the activity, but requested Woodside streamline the consultation materials for fishers. Specifically, WAFIC requested that the consultation materials should: - Note that the proposed activity is not new, rather it is ongoing.	Woodside noted that WAFIC has no concerns with the proposed activity and has revised the consultation materials to fishers, addressing the points raised by WAFIC. These revisions included:

		- Note that there is a requirement to update Operational EPs such as the Julimar Operations EP every five years. - Better clarify the activity description. - Further streamline and shorten the level of detail provided	- Specifying that the consultation was being undertaken for revision to an EP covering an ongoing operational activity - Specifying that EPs covering operational activities must be revised every five years. - Clarify the description of the activity covered by the EP. - Woodside also further reduced the level of unnecessary detail included in the consultation material
	On 6 January 2021 Woodside emailed WAFIC to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.27). Updated state fishery maps relevant to the proposed activity (Appendix F, reference 1.31; reference 1.32) and an updated consultation information sheet (Appendix F, reference 1.23) were provided.	On 7 January 2021 WAFIC emailed Woodside raising no concerns regarding the activity, but requested Woodside further streamline the consultation materials for fishers. Specifically, WAFIC requested that the consultation materials should better clarify the application of exclusion zones under the revised scope of the proposed activity. WAFIC asked Woodside to provide previous feedback provided by WAFIC to Woodside on the activity. WAFIC also thanked Woodside for its advice that exclusion zones would no longer apply around production wells. On 8 January 2021 WAFIC thanked Woodside for clarifying the application of exclusion zones under the proposed activity.	On 8 January 2021 Woodside emailed WAFIC to clarify that exclusion zones would not be implemented around any of the six exploration wells now included as part of the revised Julimar Operations EP. Woodside also provided an updated activity location table clarifying the application of exclusion zones around the structures covered under the Julimar Operations EP. Woodside also provided the feedback provided previously by WAFIC to Woodside on the activity.
Recfishwest	On 7 July 2020 Woodside emailed Recfishwest advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	On 13 July 2020 Recfishwest emailed Woodside advising that, given the distance from shore, it did not foresee the activity impacting its stakeholders.	Woodside notes Recfishwest advice that the activity is unlikely to impact Recfishwest's stakeholders.
	On 6 January 2021 Woodside emailed Recfishwest to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	On 12 January 2021 Recfishwest emailed Woodside reiterating its advice that given the distance from shore, it did not foresee the activity impacting its stakeholders.	Woodside notes Recfishwest advice that the activity is unlikely to impact Recfishwest's stakeholders.

Marine Tourism Association of WA	On 7 July 2020 Woodside emailed the Marine Tourism Association of WA advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed Marine Tourism Association of WA to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Woodside considers the level of consultation to be adequate.
Other			
Charter boat, tourism and dive operators	On 7 July 2020 Woodside emailed relevant charter boat, tourism and dive operators advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation information sheet (Appendix F, reference 1.2).	No feedback received.	Woodside considers the level of consultation to be adequate.
	On 6 January 2021 Woodside emailed relevant charter boat tourism and dive operators to advise that the scope of the proposed activity had been revised to include the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells (Appendix F, reference 1.22). An updated consultation information sheet (Appendix F, reference 1.23) was provided.	No feedback received.	Woodside considers the level of consultation to be adequate.

5.4 Ongoing Stakeholder Consultation

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

Table 5-3: Assessment Ongoing Stakeholder Consultation

Stakeholder	Activity
AMSA	Woodside will notify AMSAs JRCC, where vessel activities are undertaken for extended periods of time outside of shipping lanes.
AHO	Woodside will notify the AHO to generate a temporary Maritime Safety Information Notifications (MSIN) and temporary NTMs for activities where vessels will be in field for more than 3 weeks. Woodside will notify the AHO once the exclusion zone around the Julimar manifold has been implemented.

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

6.1 Overview

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

6.2 Analysis and Evaluation

As required by Regulation 13(5) and 13(6) of the Environment Regulations, the analysis and evaluation demonstrate that the identified risks and impacts associated with the Petroleum Activities Program are reduced to ALARP, are of an acceptable level and consider all operations of the activity, including potential emergency conditions.

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

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

Within these categories, impact and risk assessment groupings are based on environmental aspect[7] (e.g. emissions, physical presence, etc.). For all hazardous events considered, the worst credible consequence was assumed.

The ENVID identified seven impacts and eight risks associated with the Petroleum Activities Program. Planned activities and unplanned events are summarised in **Table 6-1** and **Table 6-2**. The assigned risk ratings were determined with controls in place as described in **Section 2.6.3**.

The analysis and evaluation for the Petroleum Activities Program indicate that current environmental risks and impacts associated with the activity are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 6.6, 6.7, and 6.8**.

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

Table 6-1: Environmental Impact Analysis Summary of Planned Activities

Aspect	EP Section	Source of Impact	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Residual Impact Level (ALARP controls in place)	Consequence Rating	Acceptability of Impact
Planned Activities (Routine and Non-routine)						
Physical Presence: Disturbance to Marine Users	**6.6.1**	Presence of support vessels and/or presence of permanent subsea infrastructure could result in interference with shipping/displacement of commercial fishing, e.g. bottom trawl fishing.	Isolated social impact potentially resulting from interference with other sea users (e.g. commercial and recreational fishing, and shipping).	Social & Cultural - No lasting effect (<1 month). Localised impact not significant to area /item of cultural significance.	F	Broadly Acceptable
Physical Presence: Disturbance to Seabed	**6.6.2**	Presence of subsea infrastructure modifying marine habitats. Subsea operations, inspection, maintenance and repair activities resulting in disturbance to seabed (e.g. ROV/AUV activities, jetting, dredging, marine growth cleaning, CP survey, installation of mattresses/ stabilisation of pipeline, use of tool baskets).	Temporary and localised disturbance to the seabed, which is largely composed of soft sediments with cemented sediment outcrops providing habitat for sessile filter feeding communities comprising gorgonians (sea whips and fans), sponges, epifauna and invertebrates.	Environment - Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	E	Broadly Acceptable
Routine Acoustic Emissions: Generation of Noise during Operations	**6.6.3**	Underwater noise and vibration generated by support vessel movements, mechanical equipment, opening and closing of valves, pipeline vibration, use of side scan sonar for inspection purposes and/or helicopters.	Localised behavioural disturbance (e.g. avoidance or attraction) to megafauna such as migratory whale species, including protected species; impact to local fish populations and seabed dwelling organisms (e.g. crustaceans).	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	F	Broadly Acceptable
Routine and Non-Routine Discharges from Activity Vessels	**6.6.4**	Presence of support vessels discharging sewage, putrescibles, bilge, deck drainage, cooling water, brine, drainage water.	Localised and temporary effects to water quality and marine biota.	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	F	Broadly Acceptable
Routine and Non-Routine Discharges: Discharge of Chemicals and Hydrocarbons to the Marine Environment	**6.6.5**	Subsea infrastructure marine growth removal, manipulation of valves, potential loss of hydrocarbons during IMMR and operational activities.	Localised and temporary effects to water quality and marine biota.	Environment - Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	E	Broadly Acceptable
Routine Atmospheric Emissions: Fuel combustion	**6.6.6**	Exhaust gas emissions from internal combustion engines (vessel engines and generators) on IMR vessels.	Reduced local air quality from atmospheric emissions/ contribution to increased greenhouse gas (GHG) concentrations in the atmosphere.	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	F	Broadly Acceptable
Routine Light Emissions: Activity Vessels	**6.6.7**	Night-time operations and work place/ navigational lighting on activity vessels/ROV/AUV operations.	Minor and temporary disruption to marine fauna, including protected species.	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	F	Broadly Acceptable

Table 6-2: Environmental Risk Analysis Summary of Unplanned Events (Including MEE)

Aspect	EP Section	Source of Risk	Key Potential Environmental Impacts (Refer to relevant EP Section for details)	Risk Rating				Acceptability of Risk
				Consequence Classification	Potential Consequence/Level of Impact	Likelihood	Risk Rating	
Unplanned Events (Accidents/Incidents)								
Unplanned Hydrocarbon Release: Vessel Collision	**6.7.2**	Presence of activity vessels causing navigational hazard for commercial shipping and other oil and gas operators within the immediate area; night-time operations; human error/inclement weather.	Potential impacts on marine communities (e.g. oiling of mammals, reptiles and seabirds). Potential interference with or displacement of other sea users (e.g. fishing and shipping).	D	Minor, short-term impact (1-2 years) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	1	M	Broadly Acceptable
Unplanned Hydrocarbon Release: Loss of Containment of Subsea Infrastructure	**6.7.3**	Failure of integrity of subsea infrastructure (i.e. internal erosion or corrosion/mechanical), anchor drag or dropped object from activity vessels onto live flowline, excessive seabed currents acting on unsupported and weakened flowline spans.	Potential contamination of seawater and sediment and impacts to marine fauna (e.g. oiling of mammals, reptiles and seabirds). Potential interference with or displacement of other sea users (e.g. fishing and shipping) Potential interference with activities of other regional petroleum operators.	D	Minor, short-term impact (1-2 years) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	1	M	Broadly Acceptable
Unplanned Hydrocarbon or Chemical Release: Hydrocarbon or Chemical during Transfer, Storage or Use	**6.7.4**	Accidental discharge of hydrocarbons or chemicals from vessel deck activities, and equipment used in subsea IMMR activities.	Potential contamination of seawater leading to impacts on other marine habitats and communities, as well as marine users.	F	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	3	M	Broadly Acceptable
Unplanned Discharge: Loss of Hazardous or Non-Hazardous Waste	**6.7.5**	Loss of solid wastes generated by activity vessels including packaging, domestic wastes and hazardous wastes such as oil rags, batteries and waste oil.	Potential impacts to marine fauna, including protected species.	F	Environment - No lasting effect (<1 month). Localised impact not significant to environmental receptor.	1	L	Broadly Acceptable
Physical Presence: Vessel Collision with Marine Fauna	**6.7.6**	Vessel movements resulting in collisions between the vessel (hull and propellers) and marine fauna.	Potential injury or death of marine fauna (single animal), including protected species. No credible effect at a population level.	E	Environment - Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	1	L	Broadly Acceptable
Physical Presence: Introduced Marine Species	**6.7.7**	Support vessels may not be locally sourced and may introduce Invasive Marine Species (IMS) through hull fouling, in particular seams, strainers, unpainted surfaces and sea chests, or IMS in ballast tanks.	Potential establishment of invasive marine species with potential for altering existing ecosystem/ displacing native species.	E	Environment - Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	1	L	Broadly Acceptable
Unplanned Events (Accidents/Incidents) – MEEs								
Unplanned Hydrocarbon Release: Loss of Well Containment (MEE-01)	**6.8.2**	Over pressurisation of Xmas tree in combination with failure of technical well barriers (e.g. due to a faulty equipment/internal tree erosion) and/or mechanical damage (e.g.) anchor drag (or similar event) removing the Xmas tree.	Potential contamination of seawater with hydrocarbons, chemicals (e.g. MEG), heavy metals and NORMs leading to toxic impacts to marine biota, particularly sessile benthos in the shallow sub-tidal and intertidal zone of the coral reefs. Potential impacts on marine communities (e.g. oiling of mammals, reptiles and seabirds). Potential interference with or displacement of other sea users (e.g. fishing and shipping). Potential interference with activities of other regional petroleum operators.	B	Environment - Major, long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute. Social and Cultural – Major, long-term impact (5–20 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	1	M	Acceptable if ALARP

6.2.1 Cumulative Impacts

Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other relevant development activities which could potentially result in overlapping temporal and spatial extents. This has resulted in review of the following developments, with impacts discussed, as relevant in each section of **Sections 6.6, 6.7, and 6.8**:

- Wheatstone production – Operations and IMMR
- Pluto production - Operations and IMMR associated with the Pluto trunkline and chemical supply line
- Balnaves operations cessation and decommissioning – which involves monitoring and plugging and abandonment activities.

Additionally, where relevant the cumulative impacts of activities associated with undertaking multiple concurrent or parallel activities associated with this Petroleum Activities Program have been assessed for cumulative impacts as relevant in **Sections 6.6, 6.7, and 6.8.**

Given that unplanned activities are not intended to occur during the life of the infrastructure, no reasonable estimate of the frequency, intensity or duration of such activities can be made. If these activities are undertaken, they will be discrete events and any impacts will be localised. As such, Woodside has reasonably assessed unplanned events are not credible, with no consideration of cumulative impacts of repeated unplanned events from the Petroleum Activities Program or compounding impacts from other petroleum facilities within the region.

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 and impacts of the activity to ALARP and Acceptable levels.

EPOs, EPSs and MC for the Petroleum Activities Program have been identified to allow Woodside's environmental performance to be measured and through the implementation of this EP, to determine whether the EPOs and EPSs 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 legislation, codes and standards, good industry practices and professional judgement outlined in **Sections 2.6.1.4** and **2.8**, as part of the acceptability and ALARP justification process.

The EPOs, EPSs and MC are presented throughout this section and in **Appendix D**. A breach of these EPOs or EPSs constitutes a 'Recordable Incident' under the Environment Regulations (refer to **Section 7.8.4**).

6.4 Presentation

The analysis and evaluation (ALARP and acceptability), EPOs, EPSs and MC are presented in tabular form throughout this section, as shown in the sample below. Italicised text in this example table denotes the purpose of each part of the table, with reference to the relevant sections of the Regulations and/or this EP.

Context *Description of the context for the impact/risk. Regulation 13(1, 13(2) and 13(3)*		
Description of the Activity – Regulation 13(1)	*Description of the Environment – Regulations 13(2)(3)*	*Consultation – Regulation 11A*

Impacts and Risks Evaluation Summary

Summary of ENVID outcomes

Source of Risk *Regulation 13(1)*	***Environmental Value Potentially Impacted*** *Regulations 13(2)(3)*							***Evaluation*** *Section 2*						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Summary of source of risk/ impact														

Description of Source of Risk or Impact

Description of the identified risk/impact including sources or threats that may lead to the impact/risk or identified event. Regulation 13(1).

Impact or Consequence Assessment

Environmental Value/s Potentially Impacted

Discussion and assessment of the potential impacts to the identified environment value/s. Regulation 13(5) (6).

Description of potential impacts to environmental values aligned to Woodside Risk Matrix consequence descriptors.

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP/Hierarchy of Control Tools Used - Section 2.6.2				
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/risk that could be averted/ environmental benefit gained if the cost/ sacrifice is made and the control is adopted.*	*Proportionality of cost/sacrifice vs 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 No. provided.*

Major Environment Events

MEEs are subject to additional analysis and evaluation as outlined in **Sections 2.7** and **6.8.1**. ALARP is demonstrated through controls being analysed for selection, based on their independence, and prioritised in accordance with hierarchy of controls, and further analysed to consider the type of effect the control provides.

[8] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP Statement Made on the basis of the environmental risk/impact assessment outcomes, use of the relevant tools appropriate to the Decision Type (**Section 2.6**) and a proportionality assessment. Regulation 10A (b).				

Demonstration of Acceptability
Acceptability Statement Made on the basis of applying the process described in **Section 2.8** and taking into account internal and external expectations, risk/impact to environmental thresholds and use of environment decision principles. Regulation 10A(c)

EPOs, EPSs and MC			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO No. **S**: *Specific performance that addresses the legislative and other controls that manage the activity, and against which performance by Woodside in protecting the environment will be measured.* **M**: *Performance against the outcome will be measured through 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 will be relevant to the source of risk/impact and the potentially impacted environmental value[9]* **T**: *The outcome will state the timeframe during which the outcome will apply or by which it will be achieved.*	**C No.** *Identified control adopted to ensure that the impacts and risks are continuously reduced to ALARP.* *Regulation 13(5) (c).*	**PS No.** *Statement of the performance required of a control measure. Regulation 13(7)(a).*	**MC No.** *Measurement criteria for determining whether the outcomes and standards have been met. Regulation 13(7)(c).*

6.5 Environment Risks/Impacts not Deemed Credible

The ENVID assessed shallow/nearshore activities as not being an applicable (i.e. not credible) source of environmental risk/impact within or outside the Operational Area as the Petroleum Activities Program is located in water depths of about 71 to 177 m and at a distance of about 46 km from the nearest landfall (this being the Montebello Islands) and, therefore, was determined to not form part of this EP (refer **Section 2.5**).

[9] Where impact/consequence descriptors are capitalised and presented within EPOs in **Section 6**; performance level corresponds with those aligned with the Woodside Risk Matrix (refer **Section 2.6.3**).

6.6 Planned Activities (Routine and Non-routine)

6.6.1 Physical Presence: Interaction with Other Marine Users

Context		
Activity Components - **Section 3.5** Support Vessel Operations - **Section 3.6**	Socio-economic and Cultural – **Section 4.7**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Presence of vessels and subsea infrastructure excluding or displacing other users from the Operational Area (commercial shipping, fishing, other oil and gas operations).							X	A	F	N/A	N/A	LCS GP PJ	Broadly Acceptable	**EPO 1**

Description of Source of Impact
Activity vessels are present in the Operational Area intermittently throughout the Petroleum Activities Program, including during JDP2 start-up. The duration and location of these activities varies depending on the activity being undertaken. Vessels undertaking the Petroleum Activities Program meet maritime requirements, including appropriate lighting and communication with other vessels. Additionally, vessels associated with the Wheatstone operations, Pluto operations and other oil and gas activities, may be present in the Operational Area during the course of the Petroleum Activities Program. Vessels associated with these activities may include IMMR vessels and supply vessels. The AHO has been notified of the location of subsea infrastructure, including ETA wellheads, for marking on nautical charts. Water depths of subsea infrastructure range between about 71 and 177 m. There is a 250 m Petroleum Safety Zone (PSZ) around the Brunello Manifold that excludes vessels from entering this area, similarly a 250 m PSZ will be applied for around the JULA Manifold.

Impact Assessment
Interactions with Other Marine Users <u>Commercial Fishing Activities</u> The Operational Area overlaps the fisheries management areas of three Commonwealth and 13 State managed commercial fisheries. Based on an assessment of fishing gear type, historical effort (**Table 4-12**), water depth and feedback from consultation, only one of these fisheries (the Pilbara Demersal Scalefish (Trap and Line) Fisheries) is considered to have potential to interact with the Petroleum Activities. The overlap of the Operational Area with commercial fishing activity may temporarily exclude fishers from the area resulting in a potential displacement and potential loss of gear (particularly in relation to deployed traps). The potential impact to commercial fisheries in the Operational Area is considered to be localised displacement/avoidance by commercial fishing vessels within the immediate vicinity. In observance of good seamanship, all support vessels will avoid any close and/or disruptive engagement with any commercial fishing activity. As such, the potential impact is considered to be localised with no lasting effect. The presence of permanent subsea infrastructure, over the 25-year field life could present a hazard to bottom trawl fisheries due to the risk of equipment entanglement and subsequent equipment damage/loss. The only potential for contact with subsea infrastructure would potentially be with trawl fishery operations. However, **Section 4.7.2** and stakeholder engagement undertaken for the Petroleum Activities Program (**Section 5**) indicates that trawl fisheries are not undertaken in the Operational Area; therefore, trawl fisheries are not at risk of interference and impacts to fishers are not considered credible. <u>Commercial Shipping</u> The presence of activity vessels could potentially cause temporary disruption to commercial shipping. To reduce the likelihood of interactions between commercial vessels and offshore facilities, AMSA has introduced a series of shipping fairways within which commercial vessels are advised to navigate. The fairways are not mandatory however AMSA strongly recommends that commercial vessels remain within the fairways when transiting the region. The use of shipping fairways is considered to be good seafaring practice; Australian Ship Reporting System data from AMSA indicates that cargo ships and tankers routinely navigate within the established fairways. Notably, no recognised shipping fairways overlap the Operational Area (see **Figure 4-20**); the nearest fairway lies about 36 km north-west of the Operational Area. The presence of the subsea infrastructure and vessels should not result in impacts beyond the temporary displacement of commercial shipping from subsea support vessels as a result of vessels undertaking activities in the Operational Area. This is considered a localised impact, and of no lasting effect. <u>Tourism and Recreation</u> Stakeholder consultation did not identify any key recreational fishing activity within the Operational Area. Recreational fishing is concentrated around the coastal waters and islands of the NWS Province such as the Montebello Islands which are 46 km from the Operational Area (**Section 4.7.5**). Occasional recreational fishing is identified as occurring at Rankin Bank, about 25 km from the Operational Area (**Section 4.8**). Fish Cube data requested from DPIRD for 2019 indicates that tour operators were not active within the vicinity of the Operational Area during this season. The data for previous years, however; indicates tour operators have been active, within the vicinity of the Operational Area, in years prior. However, due to the distance offshore and water depths recreational fishing is unlikely to occur in the Operational Area. In the event that a charter boat was fishing within the Operational Area, displacement as a result of the Petroleum Activities Program would be minimal. Therefore, the potential impact, including over the life of field, is considered to be localised with no lasting effect. <u>Oil and Gas Operations</u> The Wheatstone Platform and associated subsea infrastructure are located at the northern end of the Operational Area. Uncontrolled access in the vicinity of this facility could increase the potential for interference with the facility and supporting vessels. Vessel based activities for the Julimar Field Production System are managed via the Wheatstone Platform Operator Permit to Work (PTW) process, which limits the potential for any non-compatible cumulative activities.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[10]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Vessels compliant with Marine Orders for safe vessel operations: • Marine Order 21 (Safety and emergency procedures) 2016 • Marine Order 27 (Safety of navigation and radio equipment) 2016 • Marine Orders 30 (Prevention of Collisions) 2016 Compliance with Marine Order 21, 27 and 30 reduces the likelihood of adverse interaction of vessels with other marine users.	F: Yes CS: Minimal cost. Standard practice.	Marine Orders 21, 27 and 30 are required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Control based on legislative requirement – must be adopted.	**Yes** **C 1.1**
Good Practice				
Notify AHO of activities, where vessels will be in field >3 weeks, no less than four working weeks prior to scheduled activity commencement date.	F: Yes. CS: Minimal cost. Standard practice.	Notification of AHO will enable them to issue a Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) thereby reducing the likelihood of unplanned interactions with other vessels.	Benefits outweigh cost sacrifice.	Yes **C 1.2**
Vessel based activities, within 500 m of the Platform, completed under Wheatstone Platform Operator's PTW system (*Permit to Work Manual*), see **Section 7.1.1**.	F: Yes. CS: Minimal cost. Standard practice.	Ensures that activities are properly planned, risk assessed, controlled, co-ordinated, and safely executed to not adversely impact others.	Benefits outweigh cost/sacrifice.	Yes **C 1.3**
Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities where vessels will be in the field >3 weeks, 24 to 48 hrs before activities commence.	F: Yes. CS: Minimal cost. Standard practice.	Communicating the Petroleum Activities Program to other marine users ensures they are informed and aware should emergency response be required.	Benefits outweigh cost/sacrifice.	Yes **C 1.4**
Notify AHO of new exclusion zone implemented around infrastructure.	F: Yes. CS: Minimal cost. Standard practice.	Notification of AHO will enable them to issue a Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) thereby reducing the likelihood of unplanned interactions with other vessels.	Benefits outweigh cost/sacrifice.	Yes **C 1.5**

[10] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[10]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Over-trawl protection on flowlines.	F: Yes. Over-trawl protection on the flowlines could mitigate against the potential for commercial fishing trawl gear to damage the pipeline/flowline and/or result in loss of trawl gear. CS: Significant additional cost. Over-trawl protection study confirms remote likelihood and frequency of commercial trawl fishing in the vicinity of the flowline.	No reduction in addition to adopted controls.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts of the physical presence of the subsea infrastructure and vessels on other users. As no reasonable additional/alternative controls were identified that would further reduce the impacts without disproportionate sacrifice, the impacts and risks are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that, given the adopted controls, the ongoing physical presence of the subsea infrastructure and infrequent and brief presence of the vessels represents a localised displacement to commercial fishing, shipping and other oil and gas titleholders with no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good practice and meet requirements of Marine Orders 21, 27 and 30. The potential impacts and risks are considered broadly acceptable, if the adopted controls continue to be implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of the physical presence of the state waters trunklines and support vessels to a level that is broadly acceptable.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Prevent adverse interactions between vessels and other marine users during the Petroleum Activities Program.	**C 1.1** Vessels complying with Marine Orders for safe vessel operations: • Marine Order 21 (Safety and emergency procedures) • Marine Order 27 (Safety of navigation and radio equipment) • Marine Order 30 (Prevention of Collisions).	**PS 1.1** Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 21, 27 and 30).	**MC 1.1.1** Marine verification records demonstrate compliance with standard maritime safety procedures (Marine Orders 21, 27 and 30).
	C 1.2 Notify AHO of activities where vessels will be in field >3 weeks. no less than four working weeks prior to scheduled activity commencement date.	**PS 1.2** Woodside to notify AHO of activities where vessels will be in field >3 weeks.	**MC 1.2.1** Records demonstrate that AHO notifications complete.
	C 1.3 Wheatstone Platform operator's PTW system (*Permit to Work Manual).*	**PS 1.3** Vessel based activities, within 500 m of the Platform, completed under the Wheatstone Platform operator's PTW system (*Permit to Work Manual).*	**MC 1.3.1** Records demonstrate PTW documentation completed.
	C 1.4 Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities where vessels will be in the field >3 weeks, 24 to 48 hrs before activities commence.	**PS 1.4** AMSA's JRCC is notified 24 to 48 hrs before mobilisation, for activities in the field >3 weeks, for awareness should emergency response be required.	**MC 1.4.1** Consultation records demonstrate a once-off notification provided to AMSA's JRCC within required timeframes, before mobilisation.
	C 1.5 Notify AHO of new exclusion zone implemented around infrastructure.	**PS 1.5** Woodside to notify AHO when the exclusion zone around the Julimar manifold has been implemented.	**MC 1.5.1** Records demonstrate that AHO notifications complete.

6.6.2 Physical Presence: Disturbance to Seabed

<table>
<tr><th colspan="16">Context</th></tr>
<tr><td colspan="7">Activity Components - Section 3.5
Subsea IMMR Activities – Section 3.9</td><td colspan="9">Physical Environment – Section 4.5
Biological Environment – Section 4.6</td></tr>
<tr><th colspan="16">Impact Evaluation Summary</th></tr>
<tr><th rowspan="2">Source of Impact</th><th colspan="7">Environmental Value Potentially Impacted</th><th colspan="8">Evaluation</th></tr>
<tr><th>Soil and Groundwater</th><th>Marine Sediment</th><th>Water Quality</th><th>Air Quality (incl Odour)</th><th>Ecosystems/ Habitat</th><th>Species</th><th>Socio-economic</th><th>Decision Type</th><th>Consequence/Impact</th><th>Likelihood</th><th>Risk Rating</th><th>ALARP Tools</th><th>Acceptability</th><th>Outcome</th><th></th></tr>
<tr><td>Disturbance to Seabed from Petroleum Activities Program</td><td></td><td></td><td>X</td><td></td><td>X</td><td></td><td></td><td>A</td><td>F</td><td>N/A</td><td>N/A</td><td>GP
PJ</td><td>Broadly Acceptable</td><td>EPO 2</td><td></td></tr>
<tr><th colspan="16">Description of Source of Impact</th></tr>
<tr><td colspan="16">Some minor disturbance to the seabed may result from physical presence of the Petroleum Activities Program (where equipment is installed, retrieved or placed on the seafloor) including:
• ROV/AUV activities
• clump weight installation/use
• jetting or dredging
• marine growth removal
• CP survey and corrosion management (including placement of sacrificial anodes)
• installation of mattresses/ grout bags/ rocks/stabilisation of subsea infrastructure
• laydown and use of tool baskets
• jumper and umbilical replacement
• unburied infrastructure creating localised seabed disturbance (erosion and scouring).
A number of activities may result in direct disturbance to the seabed, from installation of subsea infrastructure (e.g. mattresses) to the temporary placement of materials on the seabed during IMMR activities (e.g. ROV toolbox) in the immediate vicinity of the subsea infrastructure.
Use of grout and placement of small volumes of rocks or mattresses to stabilise equipment is limited to within the immediate footprint of subsea infrastructure to prevent or remediate scour, if detected. Stabilising or other IMMR activities are of short duration in the field (single days to weeks) rather than extended campaigns over several months. Subsea infrastructure such as the pipeline/flowlines and raised manifold structures / ETA wellheads, may create conditions that cause localised erosion/scouring of the seabed.</td></tr>
</table>

Impact Assessment

IMMR activities can be categorised into two potential impacts:

- direct physical disturbance of benthic habitat
- indirect disturbance to benthic habitats from sedimentation

Rock placement and mattresses installation provide hard substrate which may be colonised by sessile benthic invertebrates, such as sponges or soft corals. These may subsequently result in habitat creation for demersal fish populations.

Water Quality

Seabed disturbance may include localised and temporary decline in water quality due to increased suspended sediments; increased sediment deposition caused by IMMR activities and during disturbance to seabed from subsea infrastructure. However, sediment loads are not expected to be significant due to the relatively small footprint and duration of each activity and event (described above, and in **Section 3.9**).

Ecosystem / Habitats

Soft Sediment Benthic Communities

The benthic habitat within the Operational Area is predominantly soft sediment with sparsely associated epifauna (RPS Group, 2011), which is broadly represented throughout the Northwest Province. Benthic communities of the soft sediment seabed are characterised by burrowing infauna, such as polychaetes, with biota such as sessile filter feeders occurring on areas of hard substrate (such as existing subsea infrastructure). IMMR activities, such as span rectification, flowline protection and stabilisation, will typically disturb a small area (typically 15 m^2 but can range up to 100 m^2) of soft sediment habitat. Scour and flowline movement may result in localised impacts to soft sediment habitats, typically on the scales of metres to tens of metres. Each discrete IMMR activity near the seabed is likely to cause a brief disturbance which may result in suspended sediment. This sediment will subsequently be deposited down current as particles resettle. Such localised and short-term events may affect small areas of the seabed and, consequently, impact the associated biota (typically sparsely distributed infauna and sessile epifauna). Given the expected nature and scale of resuspension resulting from these disturbances, impacts such as smothering or burial are not expected. Rather, impacts are likely to be restricted to increased ingestion of inedible sediments by filter feeders. Biota in the region are well adapted to periodic turbidity events caused by cyclones and tidal movements. As such, impacts from turbidity caused by these disturbances are not expected to have any lasting effect on benthic biota. The estimated overall extent of such direct seabed disturbance is extremely small in relation to the extent of the soft sediment habitats, which are broadly represented within the Operational Area and the wider Northwest Province. Operational experience indicates disturbance to soft sediment habitats around subsea infrastructure associated with the Petroleum Activities Program is localised with no lasting effect.

Hard Substrate Benthic Communities

Areas of cemented sediments occur about 3 km along the north-eastern end of the Operational Area in proximity to the Wheatstone Platform (**Figure 4-10**) and support benthic invertebrate communities of sessile filter feeding biota, including large sea fans, sponges, soft corals, sea whips and ascidians (Neptune Geomatics, 2010a; RPS Group, 2010, 2011), likely providing habitat for demersal fish populations. The filter feeding community associated with these hard substrates is considered of higher ecological value than the surrounding soft sediment habitat but encompasses a relatively small proportion of the Operational Area.

Activities near the seafloor may result in slight and temporary impacts to filter feeders from localised burial (sedimentation) and minimal direct permanent loss of filter feeder habitat as a result of seabed disturbance during IMMR activities (see impacts discussed in ‘Soft Sediment Benthic Fauna Communities’ above). Although impacts to filter feeding communities resulting from project activities may result in permanent loss, this is expected to be restricted to a small portion of filter feeder habitat. Loss of a small portion of filter feeder habitat due to this Petroleum Activities Program may temporarily impact demersal fish populations associated with the cemented sediment outcrops, however, the ecological integrity of filter feeder communities within the region is expected to be maintained. Impacts are, therefore, expected to be localised with no lasting effect.

Ancient Coastline at the 125 m Depth Contour KEF

The Operational Area overlaps about 0.16% (or 24.41 km^2) of the 16,190 km^2 Ancient Coastline KEF. It is noted that the Ancient Coastline at 125 m KEF is associated with areas of seabed outcroppings but the only evidence of such seabed habitat is that found in the north-eastern end of the Operational Area in proximity to the Wheatstone platform (See *Hard Substrate Benthic Communities* above) with the majority of the Operational Area seabed habitat composed of unconsolidated, soft sediment, such habitats are widely distributed in the NWMR (**Section 4.5.4**). The Operational Area represents a buffer around the subsea infrastructure to facilitate vessel operations; however the potential for seabed disturbance is much more localised (i.e. within tens of metres of the subsea infrastructure). Therefore, potential impacts to this KEF are expected to be localised with no lasting effect.

Montebello Australian Marine Park

A small proportion (0.07% or 2.7 km^2) of the Operational Area overlaps the Montebello AMP Multiple Use Zone. The AMP includes values associated with the shallow shelf environments. No regionally significant benthic habitats or

fauna, or shelf/slope or pinnacle and terrace habitats associated with this AMP were recorded during seabed surveys of a portion of the Operational Area (Advisian, 2019). As described above, a sessile filter feeder community is associated with the outcroppings of cemented sediments in the north eastern extent of the Operational Area, outside the AMP boundary (refer to **Section 4.8.1**). A total of 0.29 km of the Julimar/Brunello pipeline/flowlines is present within the AMP boundary. Minimal, direct loss of seabed habitat in the AMP may be possible if IMMR activities or placement of infrastructure occurs within the AMP boundary. Indirect impacts may occur as a result of sedimentation. These direct and indirect impacts are discussed in relation to soft sediment benthic fauna communities above. Further, cumulative impacts are not predicted to occur as it is expected that any Pluto, Balnaves or Wheatstone subsea infrastructure IMMR activities will be spatially and temporally separated. The predicted impacts of these other activities will be similar to those described above, with localised seabed impacts in the vicinity of the subsea infrastructure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[11]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified				
Good Practice				
An ROV as left survey will be undertaken to confirm temporary equipment has been removed and to record location of subsea infrastructure	F: Yes CS: Minimal cost. ROV as left surveys are standard practice.	In accordance with OPGGS Act Section 572 temporary equipment is removed when no longer in use	Benefits outweigh cost sacrifice.	**Yes** **C 2.1**
Location of subsea infrastructure, brought into the Operational Area, will be tracked and recorded.	F: Yes CS: Minimal cost. Standard practice.	In accordance with OPGGS Act Section 572 the location of equipment is tracked to enable future removal	Benefits outweigh cost sacrifice.	**Yes** **C 2.2**
Supplementary impact assessment undertaken for all IMMR activities within 500 m of identified sensitive benthic habitat (ENV001, ENV002 and ENV003).	F: Yes CS: Minimal cost. Standard practice.	By limiting the size of disturbance potential impacts to benthic habitats are reduced.	Benefits outweigh cost sacrifice.	**Yes** **C 2.3**
Professional Judgement – Eliminate				
All vessels used for IMMR activities are DP capable – use of DP instead of anchoring reduces potential impacts to benthic habitats.	F: Yes CS: Minimal. Subsea support vessels undertaking IMMR activities routinely use DP to hold station.	By using DP, the potential impacts to benthic habitats are reduced.	Benefits outweigh cost sacrifice.	**Yes** **C 2.4**

[11] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[11]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Do not use ROV or AUV 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 / AUV is an integral part of IMMR activities. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Do not undertake IMMR activities that have potential for sediment disturbance or turbid discharge.	F: No. Undertaking IMMR activities of subsea infrastructure is critical to verifying the operability and integrity to avoid hydrocarbon releases to the marine environment. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Professional Judgement – Substitute				
Substitute the use of ROV/AUV with divers	F: No. System is not designed for diver intervention and it introduces an HSE Risk. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Professional Judgement – Engineered Solution				
Subsea infrastructure designed to prevent scour in accordance with the Basis of Design	F: Yes. Infrastructure with potential for scour (erosion) was identified during design and incorporated where required. Scour is not anticipated around pipelines or flowlines and is monitored. CS: Cost is justified based on maintenance of integrity of infrastructure via stabilising.	Minimises the potential to impact the seabed.	Business as usual. Infrastructure designed to minimise scour and maintain integrity.	Implemented during design and construction. No Control.
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts of seabed disturbance from planned activities. As no reasonable additional/alternative controls were identified that would further reduce the impacts without a disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[11]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, seabed disturbance from subsea activities is unlikely to result in an impact greater than a slight and short-term impact to benthic habitats, sediment and water quality. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of operations and subsea activities to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 2 Limit adverse impacts to benthic habitats to Localised (F) within the Operational Area during the Petroleum Activities Program.	**C 2.1** A ROV survey will be undertaken post maintenance or repair activity to confirm temporary equipment has been removed and to record location of new subsea infrastructure.	**PS 2.1** Temporary equipment is removed.	**MC 2.1.1** As left survey confirms temporary equipment is removed.
	C 2.2 Location of subsea infrastructure, brought into the Operational Area, will be tracked and recorded.	**PS 2.2** Location of equipment, including those made redundant by the installation of a replacement, are recorded and updated in the inventory.	**MC 2.2.1** Records confirm location of replacement equipment and remaining redundant equipment.
	C 2.3 Supplementary impact assessment undertaken for all IMMR activities within 500 m of identified sensitive benthic habitat (ENV001, ENV002 and ENV003).	**PS 2.3** Assessment outcomes for IMMR activities within (ENV001, ENV002 and ENV003) demonstrate impacts to benthic habitats are negligible[12].	**MC 2.3.1** Records demonstrate outcome of additional impact assessment are negligible.
	C 2.4 All vessels used for IMMR activities will be DP capable.	**PS 2.4** Use of DP by IMMR activity vessels (no anchoring required) unless an emergency or Woodside authorisation provided.	**MC 2.4.1** Records demonstrate that all subsea support vessels are equipped with DP system.

[12] Negligible impact is defined as an F consequence under the Woodside Risk Matrix.

6.6.3 Routine Acoustic Emissions: Generation of Noise during Operations

Context	
Activity Components - **Section 3.5** Subsea IMMR Activities – **Section 3.9**	Physical Environment – **Section 4.5** Biological Environment – **Section 4.6**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Noise generated within the Operational Area from: • Vessels • IMMR activities • Helicopters • Subsea infrastructure						X		A	F	N/A	L	LCS GP PJ	Broadly Acceptable	**EPO 3**

Description of Source of Impact

Support vessels

Activity vessels generate noise (both in the air and underwater) due to the operation of thrusters, engines, propeller movement, etc. These noises contribute to and can exceed ambient noise levels which range from about 90 dB re 1µPa rms (Sound Pressure Level, SPL) under very calm, low wind conditions, to 120 dB re 1µPa rms (SPL) under windy conditions (McCauley, 2005).

Subsea activities are typically undertaken from vessels with DP thrusters to allow manoeuvrability and avoid anchoring when undertaking works near subsea infrastructure. Activity vessels holding station (e.g. using dynamic positioning [DP] systems; relying on thrusters and main propellers) are considered to be the main source of underwater noise generated during the Petroleum Activities Program. Noise generated from these activities is for discrete work packages and therefore will be intermittent and of short duration. The main source of noise from a DP vessel relates to using DP thrusters. Subsea support vessels may use DP while the vessel is maintaining position. McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa at 1 m (RMS SPL) from a support vessel holding station in the Timor Sea; it is expected that similar noise levels will be generated by support vessels used for this Petroleum Activities Program.

IMMR Activities

SSS and MBES may be required for IMMR to identify buckling, movement, scour and seabed features. If required, the activity is of a very short duration. Sources proposed have a frequency range from 12 to 700 kHz (MBES) and 75 to 900 kHz (SSS). Transponders may be used for ROV positioning, which have a frequency of 19-34 kHz and a source level of 187 – 196 dB.

MBES and SSS are considered to 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.

Helicopters

Helicopter engines and rotor blades are recognised as a source of noise emissions, that may constitute a source of environmental risk resulting in behavioural disturbance to marine fauna. Activities relevant to the Operational Area relate to the landing and take-off of helicopters on the subsea activity vessels infrequently (**Section 3.7**). During these critical stages of helicopter operations, safety takes precedence. Helicopter flights are at their lowest (i.e. closest point to the sea surface) during these periods of take-off and landing from Heli-decks, that constitutes a short phase of routine flight operations. Noise levels for typical helicopters used in offshore operations (AW139, AW189 and S92) at 150 m separation distance have been measured at up to a maximum of 99.1 EPNdB. Unconstrained point source noise in the atmosphere (such as helicopter noise) spreads spherically (Truax, 1978), with noise received at the sea surface decreasing with increasing distance from the aircraft (Nowacek et al., 2007).

Positioning Equipment

An array of LBL and/or USBL transponders may be used for positioning during IMMR activities. 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 consist of short 'chirps' with a duration that ranges from three to 40 milliseconds. Transponders will not emit any sound when on standby. When required for general positioning, they will emit one chirp every five seconds (estimated to be required for 4 hrs at a time). When required for precise positioning, they will emit one chirp every second (estimated to be required for 2 hrs at a time).

Wellhead and Flowlines Noise

The noise produced by an operational wellhead was measured by McCauley (2002). The broadband noise level was very low, 113 dB re 1 µPa, that is only marginally above rough sea condition ambient noise. For a few nearby wellheads, the sources would have to be in very close proximity (<50 m apart) before their signals summed to increase the total noise field (with two adjacent sources only increasing the total noise field by three dB). Hence, for multiple wellheads in an area, the broadband noise level near the wellheads would be expected to be of the order of 113 dB re 1 µPa. This would drop very quickly to ambient conditions on moving away from the wellhead, falling to background levels within <200 m from the wellhead.

Based on the measurements of wellhead noise discussed in McCauley (2002), that included flow noise in pipelines, noise produced along a pipeline may be expected to be similar to that described for wellheads, with the radiated noise field falling to ambient levels within a hundred meters of the pipeline.

Acoustic measurements were undertaken on the noise generated by the operation of choke valves associated with the Angel facility (JASCO, 2015) and a similar design is employed across Julimar subsea valves. These measurements indicated choke valve noise is continuous, and the frequency and intensity of noise emitted is dependent on the rate of production from the well. Noise intensity at low production rates (16% and 30% choke positions) were about 154- 155 dB re 1 µPa, with higher production rates (85% and 74% choke positions) resulting in lower noise levels (141-144 dB re 1 µPa). Noise from choke valve operation was broadband in nature, with most noise energy concentrated above 1 kHz. Noise from choke valve operation was considered minor compared to noise generated by vessels using thrusters in the area.

Impact Assessment

The Operational Area lies in waters about 71 to 177 m deep on the continental shelf. The fauna associated with this area is predominantly open-water pelagic fish species. Threatened and/or migratory fauna, particularly, the flatback turtle, pygmy blue whale, foraging wedge-tailed shearwaters and migratory whale sharks are described as potentially transiting the wider area seasonally. The Operational Area overlaps with BIAs for these EPBC Act listed and the potential for noise impacts are discussed below for all except the shearwater, given noise impacts to avifauna are not credible as helicopters will only be utilised infrequently and there is no emergent land that could be used for roosting or nesting habitat in the Operational Area so any individuals are expected to only be transiting through the area and able to avoid the noise source

The Operational Area overlaps a portion of the Ancient Coastline at 125 m KEF. Fauna associated with the KEF seabed areas of hard substrate (such as outcropping) are assumed to include diverse and abundant demersal fish species as compared to the bare, soft sediment areas. As such demersal fish were evaluated for potential impacts of noise emissions. It is noted that the Ancient Coastline at 125 m KEF is associated with areas of seabed outcroppings but the only evidence of such seabed habitat was in the northeast area of the Operational Area in proximity to the Wheatstone platform with the majority of the Operational Area seabed habitat composed of unconsolidated, soft sediment (**Section 4.5.4**). Also of note, is that some demersal fish species are also likely to be associated with existing subsea infrastructure and probably similar in composition as that described for other subsea infrastructure on the NWS (McLean *et al.*, 2017).

Vessel Noise – Dynamic positioning

Vessels holding station are considered to be the predominant noise source related to the Petroleum Activities Program. McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa SPL (rms) at 1 m from a support vessel holding station in the Timor Sea. Similar noise levels are expected to be generated by vessels used for the Petroleum Activities Program

The thresholds that could result in behavioural response for cetaceans is expected to be 120 dB re 1 µPa SPL (rms) for continuous noise sources, and 160 dB re 1 µPa SPL (rms) for impulsive noise sources Southall et al. (2007). Potential for injury to hearing would be expected to occur at 230 dB re 1 µPa (pk) (Southall et al., 2007). Typical noise levels generated by a support vessel using DP do not exceed that level, so injury to protected species is not anticipated.

Potential behavioural response impacts may include:

- Cetaceans: Potential behavioural disturbance from the DP vessel out to about 7.5 km 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).
- 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. 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 (i.e. the Ancient Coastline at 125 m KEF).
- Marine turtles: Potential masking and behavioural disturbance at intermediate and far range, likelihood of PTS or TTS is considered not to be credible given turtles would need to be directly next to the noise source.

Fauna such as cetaceans, fish, and turtles are capable of moving away from potential noise sources, and there are no constraints to the movement of these fauna within the Operational Area.

IMMR Activities

JASCO (2013) conducted noise modelling for five low energy survey instruments off the coast of California. Two of these instrument types are comparable to those proposed for use; MBES and SSS. 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 IMMR survey equipment.

The modelling reported distances to specific threshold levels for different types of marine mammals. Where applicable M-weighted R_{max} (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 R_{max}, 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 at the following distances (R_{max}):

- MBES – 290 m
- SSS – 682 m

Potential behavioural response impacts may include:

- Cetaceans: Potential behavioural disturbance from the IMMR 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.
- 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. 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 (i.e. the Ancient Coastline at 125 m KEF).
- Marine turtles: Likelihood of potential masking and behavioural disturbance or PTS or TTS is considered not to be credible given the frequency of the noise source.

Fauna such as cetaceans, fish, and turtles are capable of moving away from potential noise sources, and there are no constraints to the movement of these fauna within the Operational Area.

Helicopter Noise

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) – the majority 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 to exceed the behavioural thresholds is not considered credible.

Positioning Equipment Noise

Transponders used for positioning during IMMR activities have the potential to cause some temporary behavioural disturbance to marine fauna; however, noise levels are generally well below injury thresholds. Based on empirical spreading loss estimate measured by Warner and McCrodan (2011), received levels from USBL transponders are expected to exceed the cetacean behavioural response threshold for impulsive sources out to about 42 m. Due to the short duration chirps, the temporary and intermittent use and the mid frequencies used by positioning equipment, the acoustic noise from the transponders is unlikely to have a substantive effect on the behavioural patterns of marine fauna.

Wellheads and Flowlines and Subsea Infrastructure Noise

Given the low levels of noise emitted by subsea infrastructure such as wellheads, choke valves and flowlines, no impacts to marine fauna from these noise sources are expected. Measurements of noise generated by choke valves indicated it is relatively high frequency (>1 kHz), and hence will attenuate over relatively short distances in the water column; significant impacts to marine fauna are not considered credible.

Summary

Cetaceans

There is the potential for cetaceans to be exposed to underwater noise from the Petroleum Activities Program. The migration BIA for the pygmy blue whale has slight overlap with a portion of the Operational Area and the species may be seasonally present in the wider area (deeper offshore waters). Only behavioural impacts are credible and to an estimated 7.5 km distance from a DP vessel and up to 700 m from IMMR activities; any other potential impacts (PTS and TTS) are considered negligible. Impacts are expected to be limited to localised avoidance of the noise source as there are no physical barriers in or near the Operational Area that may prevent cetaceans from moving away from vessels.

Fishes

Fish may temporarily be displaced from the immediate vicinity of a noise source; however, they would be expected to behave normally once the noise emissions ceased. A foraging BIA for whale sharks overlaps the Operational Area, and the species may be seasonally present (particularly between March and July) during their annual migration to and from the aggregation area off Ningaloo Reef. Whale sharks are not considered to be particularly vulnerable to underwater noise, and they do not have a swim bladder (considered to increase the vulnerability of a fish to noise related impacts). Potential impacts to whale sharks from continuous noise (e.g. vessel noise) are expected to consist of no more than a short-term temporary displacement from noise sources while transiting the Operational Area. The IMMR activities noise sources are all higher in frequency (>12 kHz) therefore they are outside the range of fish hearing (2-4 kHz)

Demersal and pelagic fish species are present in the Operational Area, including fish communities associated with the Ancient Coastline at 125 m Depth KEF. Impacts to fish are expected to be localised, of short duration, and restricted to behavioural responses such as avoidance of noise sources.

Marine Turtles

Noise interference is listed as a key threat to threatened marine turtles identified as potentially occurring within the Operational Area (**Section 4.6.2.9**). Turtles may transit the Operational Area although the area does not contain any known significant foraging habitat (i.e. no emergent islands, reef habitat or shallow shoals/banks) it does overlap the flatback turtle Montebello Islands internesting buffer, which is deemed a BIA.

Turtles may exhibit behavioural responses when exposed to underwater noise (e.g. vessel noise), such as diving. IMMR related noise is not expected to result in behavioural response, injury or mortality of individuals, or any other lasting effect, as the source frequency of proposed equipment (12 -900 kHz) is well outside the known hearing frequency range of turtles (0.1 - 0.7 kHz). Furthermore, marine turtle presence within the Operational Area is considered low and transient given the flatback turtle internesting buffer (80 km BIA and 60 km habitat critical to survival) are not supported given the nesting females behaviour and movements are to the east of the key nesting beaches of the Montebello Islands and important foraging areas for other marine turtle species are recorded in shallow waters closer to the mainland. The potential impact of underwater noise is considered here given noise interference is listed as a key threat to marine turtles as per the Recovery Plan.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Maintain helicopter separation from cetaceans as per EPBC Regulations 2000 Part 8 Division 8.3 (Regulation 8.07), which include the following measures: • Helicopters shall not operate lower than 1650 feet or within a horizontal radius of 500 m of a cetacean known to be present in the area, except for take-off and landing.	F: Yes CS: Minimal cost. Standard practice.	Reduces likelihood of disturbance to cetaceans by maintaining separation distance.	Controls based on legislative requirements – must be adopted.	Yes **C 3.1**
Good Practice				
Implementing a shutdown zone around MBES, SSS and SBP for the following fauna: • whales • marine turtles • whale sharks.	F: Yes. However, as equipment is underwater, 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.	Limited. The areas of disturbance for these devices are limited to within about 700 m of the source. In addition, it is noted that for MBES and SSS, the frequency range of these devices are outside the estimated frequency hearing range of identified protected species (whales, turtles and whale sharks).	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
Have a dedicated experienced and trained Marine Fauna Observer (MFO) onboard vessels to undertake marine fauna observations.	F: Yes, however additional cost for dedicated and experienced MFO to be present during IMMR CS: Moderate, requires the provision of a dedicated experienced MFO to undertake Marine Fauna Observations.	Use of an MFO may detect fauna in the area, however control provides limited benefit when managing impacts associated with vessel noise alone.	Given limited benefit associated with the management of vessel noise impacts and costs associated with control implementation an experienced MFO is not considered necessary.	No

[13] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Eliminating the use of DP on vessels during the Petroleum Activities Program.	F: No. Subsea support vessels are required to reliably hold station during the Petroleum Activities Program. Failure to do so may lead to loss of separation between vessels and infrastructure. This would result in unacceptable safety and environmental risk CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Restricting IMMR activities to outside of ecologically sensitive periods for cetaceans, whale sharks and turtles.	F: Yes. IMMR activities can be rescheduled however they may be required within ecologically sensitive periods for turtles and cetaceans to ensure equipment integrity and to reduce potential environmental and safety risks. CS: Moderate, costs associated with rescheduling activity.	Limited – IMMR activities emit low frequency sounds and are short and temporary in nature.	The source levels and frequency range of these devises are outside the estimated frequency hearing range of identified protected species (cetaceans, whale sharks and turtles), so costs are considered disproportionate to benefits.	No
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the Decision Type, Woodside considers the continued impacts from routine acoustic emissions from vessels, helicopters, wellheads, flowline and IMMR activities to be ALARP in its current impact classification. As no reasonable additional/ alternative controls were identified that would further reduce the impacts without disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, in its current state, impacts from routine acoustic emissions from vessels, helicopters, wellheads, flowline and IMMR activities represent a localised potential impact/disturbance to marine fauna within the Operational Area, with no lasting effect. Threatened and/or migratory EPBC Act listed species with BIAs within the Operational Area potentially impacted by noise emissions include migrating pygmy blue whales, and migratory and possibly foraging whale sharks. Internesting flatback turtles were essentially dismissed as scientific evidence does not support the offshore (western) interesting buffer as defined for the 80 km BIA. As demonstrated in the impact assessment the residual impact of acoustic emissions are not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans (**Section 6.9**). Regard had been given to the relevant conservation advice and applicable wildlife conservation management plans during assessment of potential impacts. Further opportunities to reduce the impacts and risks have been investigated above. The impacts are consistent with good oil-field practice/industry best practice and are considered broadly acceptable in its current state. Therefore, Woodside considers standard operations appropriate to manage the impacts of acoustic emissions to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 3 Limit impacts on fauna from noise emissions during the Petroleum Activities Program.	**C 3.1** Maintaining helicopter separation from cetaceans as per EPBC Regulations 2000 Part 8 Division 8.3 (Regulation 8.07) which include the following measures: • Helicopters shall not operate lower than 1,650 feet or within a horizontal radius of 500 m of a cetacean known to be present in the area, except for take-off and landing.	**PS 3.1** Interactions between helicopters and cetaceans will be consistent with EPBC Regulations 2000 Part 8 Division 8.3 (Regulation 8.07) Interacting with cetaceans.	**MC 3.1.1** Records demonstrate no breaches with EPBC Regulations 2000 Part 8 Division 8.3 (Regulation 8.07) Interacting with cetaceans.

6.6.4 Routine and Non-Routine Discharges Activity Vessels

Context		
Support Vessel Operations – **Section 3.6**	Physical Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine discharge of deck and bilge water, grey water, sewage and putrescible wastes from the activity vessels to the marine environment.			X					A	F	N/A	L	LCS PJ	Broadly Acceptable	**EPO 4**

Description of Source of Impact

The activity vessels routinely generate/discharge the following:

- small volumes (up to 15 m^3 per vessel per day) of treated sewage and putrescible wastes to the marine environment (while vessel is moving)
- routine/periodic discharge of relatively small volumes of bilge water. Bilge tanks receive fluids from many parts of the vessel and can contain water, oil, detergents, solvents, chemicals, particles and other liquids, solids or chemicals (while vessel is moving)
- variable water discharge from activity vessel decks directly overboard or via deck drainage systems and may contain small quantities of oil, grease and detergents if present on deck. Water sources could include rainfall events and/or from deck activities such as cleaning/wash-down of equipment/decks
- cooling water from machinery engines on the activity vessels and brine water produced during the desalination process of reverse osmosis to produce potable water on board.

Environmental risk relating to the disposal/discharges above regulated levels or incorrect disposal/discharge of waste would be unplanned (non-routine/accidental) and are addressed in **Section 6.7.5**.

Impact Assessment
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 m^3 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). This assessment is considered to be conservative as the monitoring was undertaken for a stationary discharge while discharges of bilge and sewage will only occur while the vessels are moving. 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. 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 other receptors such as fish, reptiles, birds and cetaceans in significant numbers, and in close proximity to 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), rapidly dilute 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 nonroutine) 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 located more than 12 NM from land, which exceeds the exclusion zones required by Marine Order 96 (Marine pollution prevention – sewage) 2013 and Marine Order 95 (Marine pollution prevention – garbage) 2013. Vessel activity for the Petroleum Activities Program are intermittent and when within the Operational Area vessels are generally not in a single location for an extended period, and only discharge while moving. As a result, these 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 and short-term with no lasting effect. It is possible that protected marine fauna transiting the localised area may come into contact with these discharges (e.g. EIO pygmy blue whales, whale sharks and marine turtles) as they traverse the Operational Area during their seasonal migrations (**Section 4.6.1.5**). However, given the localised extent of cumulative impacts and rapid dilution from multiple vessel discharges within the Operational Area, significant impacts to marine fauna are not expected.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[14]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	Marine Orders required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class. Marine Orders 95 reduce the potential impact of discharges on water quality.	Controls based on legislative requirements – must be adopted.	Yes **C 4.1**
Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	Marine Orders required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class. Marine Orders 96 reduce the potential impact of discharges on water quality.	Controls based on legislative requirements – must be adopted.	Yes **C 4.2**
Marine Order 91 – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water prior to discharge.	F: Yes. CS: Minimal cost. Standard practice.	Marine Orders required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class. Marine Orders 91 reduce the potential impact of discharges on water quality.	Controls based on legislative requirements – must be adopted.	Yes **C 4.3**
Good Practice				
None Identified				
Professional Judgement – Eliminate				

[14] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[14]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Storage, transport and treatment/ disposal onshore treatment 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 implementing this control not feasible. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts of planned (routine and non-routine) discharges. As no reasonable additional /alternative controls were identified that would further reduce the impacts without disproportionate sacrifice, the impacts are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that, given the adopted controls, planned discharges (routine and non-routine) are unlikely to result in a potential impact greater than localised impacts not significant to environmental receptors, and no lasting effect. BIAs within the Operational Area include the pygmy blue whale migration, flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered standard industry practice, meet legislative requirements under Marine Orders 91, 95 and 96. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 4 Limit adverse water quality impacts to Localised (F) from routine and non-routine discharges during the Petroleum Activities Program.	**C 4.1** Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class).	**PS 4.1** Vessels compliant with Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class).	**MC 4.1.1** Records demonstrate vessels are compliant with Marine Order 95 – pollution prevention (as appropriate to vessel class).
	C 4.2 Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).	**PS 4.2** Vessels compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).	**MC 4.2.1** Records demonstrate vessels are compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).
	C 4.3 Marine Order 91 (Marine pollution prevention – oil) (as appropriate to vessel class).	**PS 4.3** Vessels compliant with Marine Order 91 – pollution prevention –oil (as appropriate to vessel class).	**MC 4.3.1** Records demonstrate vessels are compliant with Marine Order 91 – pollution prevention – oil (as appropriate to vessel class).

6.6.5 Routine and Non-Routine Discharges: Discharge of Chemicals and Hydrocarbons to the Marine Environment

Context	
Support Vessels Operations – **Section 3.6** Chemical Usage – **Section 3.8** Chemical Usage During IMMR Activities – **Section 3.9.5**	Biological Environment – **Section 4.6**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*: Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	*Evaluation*: Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
The discharge of chemicals and hydrocarbons to the subsea marine environment.		X	X		X			A	E	N/A	L	GP PJ	Broadly Acceptable	**EPO 5**

Description of Source of Impact

Release of chemicals and/or hydrocarbons to the marine environment as a result of planned routine and non-routine operations and activities, are describe below.

Discharges from IMMR activities

Chemicals (see **Section 3.9.5**) and hydrocarbons may be discharged intermittently and for short durations as a result of planned routine operations and IMMR activities (e.g. discharge of subsea control fluid (6 L per valve actuation) and non-routine operations and IMMR activities (e.g. acid cleaning). IMMR activities may result in:

- discharge from subsea cleaning activities such as acid marine growth removal, spool cleaning
- discharge of chemicals during IMMR activities
- discharge of residual control fluids and hydrocarbons remaining in subsea lines and equipment as a result of subsea intervention isolation works (e.g. hot or cold stab intervention)
- discharge from stabilising activities (e.g. residual cement from vessel based hose application).

Discharges range from up to 10 L of dye (during pressure leak testing) to about 280 L of MEG during spool and umbilical replacement and 400 L of acid during a SCM changeout (further details on discharges are provided in **Section 3.9.5**).

Discharges from Operations and JDP2 start-up

Subsea control fluid is used to control valves remotely from the Wheatstone Platform. Small amounts of subsea control fluid are discharged from valves on subsea infrastructure located at the wells and manifolds (**Figure 3-2**) when they are operated. Discharges range from about 0.5 to 6 L of control fluid per valve actuation. Other operational discharges may include:

- non-routine hydraulic fluid discharge associated with umbilical system losses/weeps
- minor fugitive hydrocarbon from wells and subsea equipment (e.g. weeps/seeps/bubbles).

Impact Assessment
As a result of planned routine and non-routine hydrocarbon and chemical discharges, there is potential for slight, short-term localised decrease in water and sediment quality at discharge locations and with potential impacts to benthic habitats / communities. ***Water Quality*** Subsea control fluids are discharged in relatively small volumes during valve operations at or near the seabed. Once released into a low-sensitivity receiving environment, subsea control fluids are expected to mix rapidly and dilute in the water column. Hydrocarbons, which may be released during operational and IMMR activities that break containment of isolated subsea infrastructure, are buoyant and float towards the surface. Given the water depth, pressure, and the small volumes released, these hydrocarbons are not expected to reach the sea surface. Rather, the release disperses and/or dissolves within the water column. Chemicals may be discharged intermittently and in small volumes. There is potential for slight, localised decrease in water quality at planned discharge locations and potential impacts on marine biota. Within the mixing zone impacts to pelagic fish are expected to be limited to avoidance of the localised area of the discharge and short-term, localised decline in planktonic organisms in the immediate vicinity of the discharge plume. ***Sediment Quality*** Accumulation of contaminants in sediments depends primarily on the volume/concentration of particulates in discharges or constituents that adsorb onto seawater particulates, the area over which those particulates could settle onto the seabed (dominated by current speeds and water depths), and the resuspension, bioturbation and microbial decay of those particulates in the water column and on the seabed. Valve actuation discharges are frequent but low in volume (typically <6 L). Given the frequency and volumes of hydrocarbon releases, accumulation in sediments is not considered likely. ***Ecosystem / Habitats*** Sediments in the Operational Area are expected to be broadly consistent with those in the NWS Province (as described in **Section 4.5.4),** with filter feeders such as sponges, ascidians, soft corals and gorgonians associated with areas of hard substrate. The only areas of hard substrate expected in the vicinity are artificial habitat associated with subsea infrastructure and the consolidated sediment and limestone ridge in proximity to the Wheatstone Platform which are not in the vicinity of any valves (**Figure 4-10**). Subsea control fluid does not contain any components that are both bioaccumulative and nonbiodegradable. Impacts to ecosystems are not expected due to the localised nature of discharges and lack of potential for sediment quality impacts. Given the nature and scale of planned discharges, potential impacts are considered to be slight and short term (expected to recover once routine discharges cease). ***Values and Sensitivities*** <u>KEFs</u> One KEF overlaps the Operational Area—Ancient Coastline at 125 m Depth Contour. No significant escarpments, species of conservation significance, emergent features or areas of high biological productivity characteristically associated with the Ancient Coastline KEF have been observed in the Operational Area (**Section 4.6.1.5**). Therefore, potential impacts to this regional-scale KEF are expected to be negligible. <u>AMPs</u> The Montebello AMP overlaps the Operational Area (see **Section 4.8**). No sensitive benthic habitats or invertebrate or vertebrate fauna were identified within the Operational Area in the portion which overlaps the AMP during dedicated survey (Advisian, 2019). Therefore, no impacts to the marine park sensitivities are anticipated as a result of these localised discharges

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified				
Good Practice				
Implement Woodside's Chemical Selection and Assessment Environment Guideline	F: Yes. Routinely implemented to the chemical selection process for Woodside facilities. CS: Minimal cost. Standard practice.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	Benefits outweigh cost/sacrifice.	Yes **C 5.1**
Flush subsea infrastructure where practicable to reduce volume/ concentration of hydrocarbons released to the environment.	F: Yes. The subsea infrastructure has been designed such that much of the hydrocarbon containing elements can be flushed back to Wheatstone. CS: Minor. Flushing may prolong the cessation of production required for subsea IMMR activities, leading to reduced production.	Flushing reduces the volumes/concentration of hydrocarbons release to the environment.	Benefit outweighs cost sacrifice.	Yes **C 5.2**
Implement Woodside *Engineering Operating Standard - Subsea Isolation*). Proven isolation in place for relevant IMMR activities.	F: Yes CS: Minimal cost. Standard practice.	Maintaining and testing the ability to isolate wells and pipelines will ensure barriers are in place and verified limiting the volume released	Benefits outweigh cost/sacrifice.	Yes **C 5.3**
Limit the volume of subsea control fluid discharged to the marine environment by monitoring and investigating material discrepancies.	F: Yes. The use of subsea control fluid is monitored to maintain adequate fluid in the system. CS: Minimal cost.	Limits the volumes of subsea control fluid discharge to the marine environment	Benefits outweigh cost/sacrifice.	Yes **C 5.4**
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Install closed-loop subsea control system.	F: Yes. Closed-loop valve control systems can be installed; however,	The potential consequences of the discharges are ranked as slight, based on the	When considering the slight short term effect from the release of control fluids, the risk	No

[15] Qualitative measure

	they may not perform as quickly/reliably as open-loop systems. CS: Significant. The design, procurement and retrofitting of a closed-loop system would result in considerable offshore logistics, exposure to safety hazards during installation, and significant financial burden through direct costs and lost production.	volume frequency, location, and types of fluid discharged in an open-ocean environment, and avoiding the discharges would provide little or no environmental benefit.	and costs of retrofitting a closed-loop subsea valve control system is considered to be grossly disproportionate to the environmental benefit.	

ALARP Statement

Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the potential impacts of planned routine and non-routine chemical and hydrocarbon discharges to be ALARP. As no reasonable additional alternative controls were identified that would further reduce the impacts without disproportionate sacrifice, the impacts are considered ALARP.

Demonstration of Acceptability

Acceptability Statement

The impact assessment has determined that, given the adopted controls, chemical discharge represents a slight short-term impact that is not anticipated to result in a potential impact greater than slight short-term effects on water quality, marine sediment or ecosystem habitat. The adopted controls are considered good practice. The potential impacts are considered broadly acceptable when the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of planned routine and non-routine chemical and hydrocarbon discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 5 Limit adverse water quality impacts to Slight (E) short-term effects from chemicals used in subsea activities during the Petroleum Activities Program.	**C 5.1** Chemical Selection and Assessment Environment Guideline.	**PS 5.1** All operational chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline. (described in Section 3.8.1) to ensure the impacts associated with use are ALARP and acceptable.	**MC 5.1.1** Records demonstrate the chemical selection, assessment and approval process for operational chemicals is followed.
	C 5.2 Subsea infrastructure flushed where practicable to reduce volume/concentration of hydrocarbons released to the environment.	**PS 5.2** Subsea infrastructure containing hydrocarbons will be flushed (where practicable) to the Wheatstone Platform or vessel to a hydrocarbon concentration where further dilution provides disproportionate cost to environmental benefit.	**MC 5.2.1** Records demonstrate subsea infrastructure flushing where practicable (to Wheatstone Platform or vessel)
	C 5.3 Engineering Operating Standard - Subsea Isolation.	**PS 5.3** Proven isolation in place in compliance with Woodside Engineering Operating Standard - Subsea Isolation.	**MC 5.3.1** Records demonstrate that there was a proven isolation in place as required.
	C 5.4 Limit the volume of subsea control fluid discharged to the marine environment by monitoring and investigating material discrepancies.	**PS 5.4** Subsea control fluid use monitored and, where losses are unexplained, potential integrity issues are investigated.	**MC 5.4.1** Records demonstrate routine monitoring of hydraulic control lines and discrepancies investigated.

6.6.6 Routine Atmospheric Emissions: Fuel combustion

Context	
Support Vessel Activity – **Section 3.6**	Physical Environment - **Section 4.5**

Impact Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Release of air pollutants and greenhouse gas (GHG) from activity vessels				x				A	F	N/A	L	LCS	Broadly Acceptable	**EPO 6**

Description of Source of Impact
Atmospheric emissions are be generated by the activity vessels (see **Section 3.6**) from internal combustion engines (including all equipment and generators) during the Petroleum Activities Program. These emissions occur when vessels are in transit and when stationary. Emissions include CO_2, N_2O, SO_2, NO_x, CO, particulate matter (PM) and non-methane volatile organic compounds.

Impact Assessment
Fuel combustion has the potential to result in localised, temporary reduction in air quality, generation of smoke and contribution to greenhouse gas emissions. Given the short duration and open ocean location of the activity vessels during the Petroleum Activities Program (which leads to the rapid dispersion of air pollutants), the potential impacts are expected to have no lasting effect, with no cumulative impacts when considered in the context of existing oil and gas operations in the region. Atmospheric emissions from activity vessels are not expected to contribute in a material way to air quality in the nearest mainland sensitive airshed (town of Dampier about 160 km away), as part of the combined air pollutant emissions from other Petroleum Activities Programs such as Pluto or Wheatstone and other marine users (commercial vessels).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[16]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 97 (Marine Pollution Prevention – Air Pollution) including the requirement for the use of low sulphur fuel.	F: Yes. CS: Minimal cost. Standard practice.	Marine Order 97 is required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class. Marine Order 97 reduces air pollution from vessels.	Control based on legislative requirements – must be adopted.	Yes **C 6.1**
Good Practice				
None Identified				
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls good practice, and appropriate to manage the impacts to air quality from the Petroleum Activities Program. 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 control below, fuel combustion is unlikely to result in a potential impact greater than a temporary decrease in local air quality, with no lasting effect. Further opportunities to reduce impacts have been investigated above. The controls adopted are considered good practice and meet the legislative requirements within Marine Order 97. The potential impacts are considered broadly acceptable if the adopted control is implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of the described emissions to a level that is broadly acceptable.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 6 Limit adverse air quality impacts to Localised (F) effects from vessel operations during the Petroleum Activities Program.	**C 6.1** Vessels complying with Marine Order 97 (Marine Pollution Prevention – Air Pollution).	**PS 6.1** Vessels compliant with Marine Order 97 as applicable to vessel size, type and class including the use of low sulphur fuel.	**MC 6.1.1** Records demonstrate vessels are compliant with Marine Order 97 – Marine Pollution Prevention – Air Pollution (as appropriate to vessel class).

[16] Qualitative measure

6.6.7 Routine Light Emissions: Activity Vessels

Context	
Support Vessels Operations – **Section 3.6** Subsea IMMR Activities – **Section 3.9**	Biological Environment– **Section 4.6**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*							*Evaluation*						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Light emissions from activity vessels, ROVs, inspection tools.						X		A	F	N/A	L	PJ	Broadly Acceptable	N/A

Description of Source of Impact
During IMMR activities, vessels generally move slowly over the subsea infrastructure and are in the Operational Area for short periods of time. Lighting on the vessel is used to allow safe operations, and to meet mandatory navigational requirements. During IMMR activities underwater lighting is generated for short periods while ROVs/AUVs are in use. Given the typical intensity of ROV/AUV lights and inspection tools and the attenuation of light in seawater, light from ROVs/AUVs and inspection tools will be localised to the vicinity of the ROV/AUV, operating in close proximity to subsea infrastructure. Lighting from vessels may appear from direct unshielded light sources or through skyglow. Where direct light falls upon the ocean, this area of light is referred to as light spill. Skyglow 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 skyglow may be visible from the source is dependent on the lighting on the vessel and environmental conditions. Receptors present within a 20 km buffer of the Operational Area were considered as having potential for interaction, based on recommendations of the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020). The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings (15 to 18 km) and fledgling seabirds grounded in response to artificial light 15 km away.

Impact Assessment

Light emissions have the potential to disrupt ecological processes that rely on natural light for visual cues. Light emissions can affect fauna in two main ways:

- **Behaviour** - many organisms are adapted to natural levels of lighting and the natural changes associated with the day and night cycle as well as the phase of the moon. Artificial lighting has the potential to create a constant level of light at night that can override these natural levels and cycles.
- **Orientation** - species such as marine turtles and birds may use lighting from natural sources to orient themselves in a certain direction at night. In instances where an artificial light source is brighter than a natural source, the artificial light may override natural cues, leading to disorientation.

Vessel operations will take place within the Operational Area located in an open water, offshore environment, about 46 km from the nearest emergent islands (Montebello Islands). A number of BIAs overlap the Operational Area and EPBC Act listed fauna may transit through the Operational Area (refer to **Section 4.6.1.5).**

Light pollution is identified as a key threat to species of marine turtles and seabirds identified as occurring within the Operational Area (**Table 4-6**). Relevant conservation actions outlined in recovery plans and Wildlife Conservation Management plans for these species are outlined in **Table 4-7.**   ***Marine Turtles***   The National Light Pollution Guidelines for Wildlife (Commonwealth of Australia, 2020) specify a 20 km buffer around vessel activities when considering the assessment of potential impacts to turtle behaviour from both direct light and sky glow. Although the Flatback turtle internesting BIA is within the Operational Area, given the distance of the nearest turtle nesting and internesting areas (habitat critical to survival to marine turtles) is the Montebello Islands, about 46 km from the Operational Area at the nearest point, there is no potential for lighting impacts. This is with specific reference to turtle hatchling emergence.   Although individuals undertaking migration and potential foraging at the nearest suitable habitat at Glomar Shoal (1 km distance at its closest point from the Operational Area), marine turtles do not use light cues to guide these behaviours. Further, there is no evidence, published or anecdotal, to suggest that foraging or migrating turtles are impacted by light from offshore vessels. As such, light emissions from the vessels are unlikely to result in displacement of, or behavioural changes to individuals in these life stages (PENV 2020b).   ***Sea birds***   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 but there is no emergent land that could be used for roosting or nesting habitat in the Operational Area. The nearest suitable habitat is the Montebello Islands, 46 km to the south-west. One BIA for wedge-tailed shearwater breeding overlaps with the Operational Area, with the breeding period occurring from August to April (**Section 4.6.2.6**). 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). 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 (Commonwealth of Australia, 2015c).   The risk associated with collision from seabirds or migratory shorebirds attracted to artificial lighting is considered to be low, impacts are expected to be limited to minor behavioural disturbance to isolated individuals, with no displacement from important habitat.   ***Fish (including sharks and rays)***   Lighting from the presence of a vessel may result in the localised aggregation of fish below the vessel. These aggregations of fish are considered localised and temporary and any long-term changes to fish species composition or abundance is considered highly unlikely. This localised increase in fish extends to those comprising the whale shark's diet. However, given that a large proportion of the diet comprises krill and other planktonic larvae, it is unlikely that a light source will lead to a significant increase in whale shark abundance in the vicinity of the vessels. Similarly, any localised impacts to marine fish is not expected to impact on any commercial fishers in the area.   No significant cumulative impacts over the life of the Petroleum Activities Program or in relation to other operations and activities in the region (e.g. Pluto, Balnaves or Wheatstone) are expected.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[17]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None Identified				
Good Practice				
None Identified				

[17] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[17]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
No use of lighting over the side during vessel activities.	F: Not feasible. Light management will be consistent with that required to provide a safe working environment for vessel personnel. CS: Inability to conduct the activity due to safety reasons.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Substitute				
Substituting external lighting with 'turtle friendly' light sources (reduced emissions in turtles' visible spectrum.	F: Yes. Replacement of external lighting with turtle-friendly lighting is technically feasible, although it is not considered practicable. CS: Significant cost sacrifice. Retrofitting all external lighting on the vessels would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory of the range of light types onboard the vessel. (Where available vessel meets the requirement, they will be utilised where practicable).	Given the potential impacts to turtles during this activity are insignificant, the short duration vessels will be in the Operational Area, the transient nature of the activities and the infrequency implementing this control would not reduce the consequence.	Grossly disproportionate. Implementing 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 turtle internesting periods (December to January) and night-time.	F: Not feasible. Timing of activities is linked to Risk-Based Inspection timeframes, due to vessel availability and operational requirements, undertaking activities during turtle nesting seasons and night-time may not be able to be avoided. CS: Not considered, control not feasible. Consideration should be given where practicable.	Not considered, control not feasible.	Not considered, control not feasible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[17]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Professional Judgement – Engineered Solution				
None Identified				
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the potential impacts from routine light emissions from the vessels to be ALARP. The potential impacts to marine fauna, such as turtles, fish or seabirds, from light emissions from the vessels is expected to be restricted to localised attraction (if any), and are considered to be localised, temporary and minor. As no reasonable additional/alternative controls were identified that would further reduce the impacts without a disproportionate sacrifice, the impacts are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that, in its current state, routine light emissions from the vessels represent a potential impact no greater than localised behavioural disturbance to fauna within the Operational Area, with no lasting effect. BIAs within the Operational Area include the pygmy blue whale migration, flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding and foraging 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 6.9**). Management of light emissions meets regulatory requirements pertaining to marine navigation and is consistent with industry standard practices. In conclusion, Woodside considers impacts associated with activity vessel routine light emissions to be acceptable.				

6.7 Unplanned Activities (Accidents, Incidents, Emergency Situations)

6.7.1 Quantitative Spill Risk Assessment Methodology

Quantitative hydrocarbon spill modelling was undertaken by RPS APASA, on behalf of Woodside, using a three-dimensional (3D) hydrocarbon spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program), which is designed to simulate the transport, spreading and weathering of specific hydrocarbon types under the influence of changing meteorological and oceanographic forces.

A stochastic modelling scheme was followed in this study, whereby SIMAP was applied to repeatedly simulate the defined credible spill scenarios using different samples of current and wind data. These data samples were selected randomly from an historic time-series of wind and current data representative of the study area. Results of the replicate simulations were then statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point.

The model simulates surface releases and uses the unique physical and chemical properties of a hydrocarbon type to calculate rates of evaporation and viscosity change, including the tendency to form oil in water emulsions. Moreover, the unique transport and dispersion of surface slicks and in-water components (entrained and dissolved) are modelled separately. Thus, the model can be used to understand the wider potential consequences of a spill, including direct contact of hydrocarbons due to surface slicks (floating hydrocarbon) and exposure of organisms to entrained and dissolved aromatic hydrocarbons in the water column.

During each simulation, the SIMAP model records the location (by latitude, longitude and depth) of each of the particles (representing a given mass of hydrocarbons) on or in the water column, at regular time steps. For any particles that contact a shoreline, the model records the accumulation of hydrocarbon mass that arrives on each section of shoreline over time, less any mass that is lost to evaporation and/or subsequent removal by current and wind forces.

The collective records from all simulations are then analysed by dividing the study region into a 3D grid. For surface hydrocarbons (floating oil), the sum of the mass in all hydrocarbon particles located within a grid cell, divided by the area of the cell, provides hydrocarbon concentration estimates in that grid cell at each model output time interval. For entrained and dissolved aromatic hydrocarbon particles, concentrations are calculated at each time step by summing the mass of particles within a grid cell and dividing by the volume of the grid cell. The process is also subject to the application of spreading filters that represent the expected mass distribution of each distinct particle. The concentrations of hydrocarbons calculated for each grid cell, at each time step, are then analysed to determine whether concentration estimates exceed defined threshold concentrations.

All hydrocarbon spill modelling assessments undertaken by RPS APASA undergo initial sensitivity modelling to determine appropriate time to add to the simulation after the cessation of the spill. The amount of time following the spill is based on the time required for the modelled concentrations to practically drop below threshold concentrations anywhere in the model domain in the test cases. This assessment is done by post-processing the sensitivity test results and analysing time-series of median and maximum concentrations in the water and on the surface.

6.7.1.1 Hydrocarbon Characteristics

Brunello condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In general, about 45.5% of the oil mass should evaporate within the first 12 hrs, a further 37.3% should evaporate within the first 24 hrs and a further 10.3% should evaporate over several days. About 6.9% of the oil is shown to be persistent (RPS APASA, 2020).

The whole oil has a low asphaltene content (about 0.5%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle.

Soluble, aromatic, hydrocarbons contribute about 11.2% by mass of the whole oil. About 6.9% by mass is highly soluble and highly volatile. The fate of this component, which include the benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, varies depending on the release conditions and subsequent setting. Subsea discharge favours the process of dissolution but if dissolved plume rises to the surface water, the compounds tend to evaporate from the water into the atmosphere. A further 2.4% by mass is contributed by moderately volatile and soluble di-aromatic hydrocarbons. These compounds dissolve more slowly but tend to persist in soluble form for longer.

The mass balance forecast for the constant-wind case for Brunello condensate (see **Figure 6-1**) shows that about 83% of the oil is predicted to evaporate within 24 hrs. Under calm conditions, the majority of the remaining oil on the water surface weathers at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds slows significantly, and they would then be subject to more gradual decay through biological and photochemical processes.

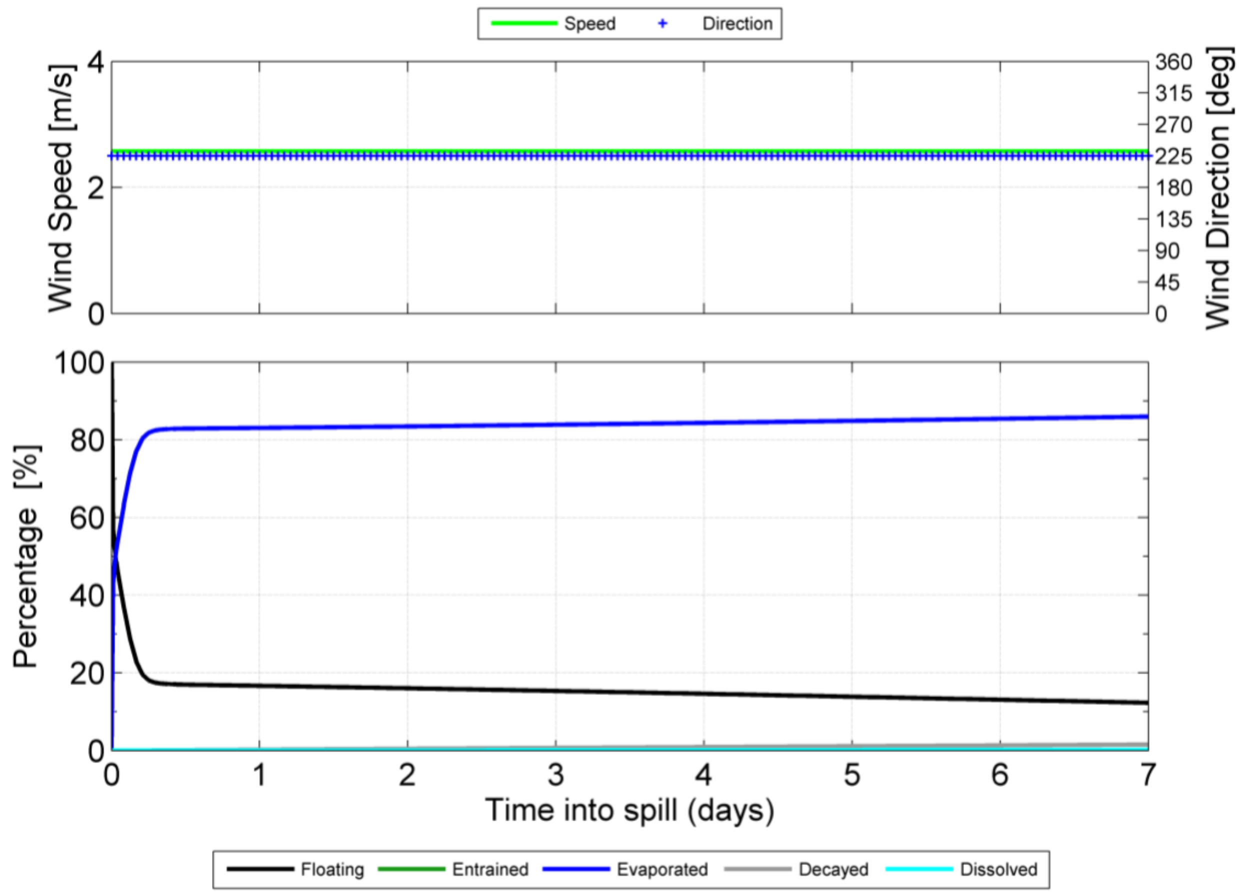


Figure 6-1: Proportional Mass Balance Plot Representing the Weathering of Brunello Condensate Spilled onto the Water Surface as a One-off Instantaneous Release and Subject to a Constant 5 kn (2.6 m/s) Wind at 27 °C Water Temperature and 25 °C Air Temperature.

Under the variable-wind case (see **Figure 6-2**), where the winds are of greater strength, entrainment of Brunello condensate into the water column is predicted to increase. About 24 hrs after the spill, around 16% of the oil mass is forecast to have entrained and a further 78% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<4%). The residual compounds tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s).

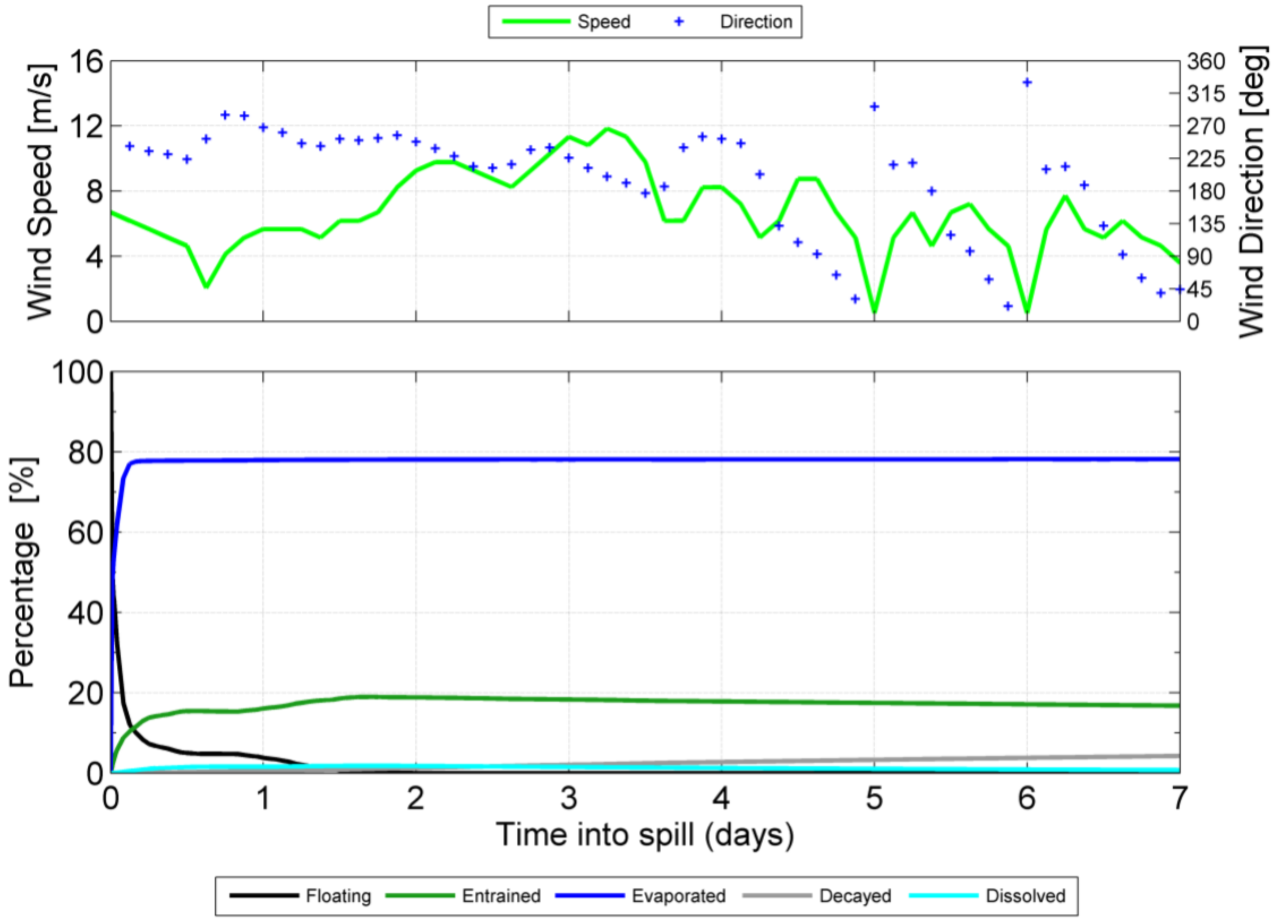


Figure 6-2: Proportional Mass Balance Plot Representing the Weathering of Brunello Condensate Spilled onto the Water Surface as a One-off Instantaneous Release and Subject to Variable Wind at 27 °C Water Temperature and 25 °C Air Temperature.

6.7.1.2 Environment that May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling are used to assess the environmental consequence by delineating which areas of the marine environment could be exposed to hydrocarbon levels exceeding selected hydrocarbon threshold concentrations if a credible hydrocarbon spill scenario occurred. The summary of the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the EMBA. 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 mechanism of transportation, a different EMBA is presented for each fate. Together, these EMBA have defined the spatial extent for the existing environment described in **Section 4**.

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 to selecting thresholds was taken by adopting the guideline impact thresholds (NOPSEMA, 2019) for floating, entrained, dissolved and accumulated hydrocarbons to define the EMBA for condensate spills from a loss of well control. An additional threshold has been included to define the boundary within which socio-cultural impacts may occur, based on visible surface oil (1 g/m^2) impacting on the visual amenity of the marine environment. These hydrocarbon thresholds are presented in **Table 6-3** and described in the subsections below.

The threshold concentration value for dissolved and entrained hydrocarbons for marine diesel has been established with reference to results from Woodside-commissioned ecotoxicity tests on Marine Diesel Oil (Ecotox Services Australia (ESA), 2013). The justification for the different thresholds for marine diesel is presented below.

Table 6-3: Summary of Thresholds Applied to the Quantitative Hydrocarbon Spill Risk Modelling Results

Hydrocarbon Type	Surface hydrocarbon (g/m^2)	Dissolved hydrocarbon (ppb)	Entrained hydrocarbon (ppb)	Accumulated hydrocarbon (g/m^2)
Condensate	10	50	100	100
Marine Diesel	10	500	500	100

Surface Hydrocarbon Threshold Concentrations

The spill modelling outputs defined the EMBA for surface hydrocarbon spills (contact on surface waters) using the ≥ 10 g/m^2 threshold (dull metallic colours) based on the relationship between film thickness and appearance (Bonn Agreement 2015) (**Table 6-4**). This threshold concentration, expressed in terms of g/m^2, is geared towards informing potential oiling impacts for wildlife groups and habitats that may break through the surface slick from the water or the air (e.g. emergent reefs, vegetation in the littoral zone and air breathing marine reptiles, cetaceans, seabirds and migratory shorebirds).

Thresholds for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10 to 25 g/m^2 (French *et al*. 1999, Koops *et al*. 2004, NOAA, 1997). Potential impacts of surface slick concentrations in this range for floating hydrocarbons may include harm to seabirds through ingestion from preening of contaminated feathers, or the loss of the thermal protection of their feathers. The 10 g/m^2 threshold is the reported level of oiling to instigate impacts to seabirds, and is also applied to other wildlife, though it is recognised that 'unfurred' animals where hydrocarbon adherence is less may be less vulnerable. 'Oiling' at this threshold is taken to be of a magnitude that can cause a response from the most vulnerable wildlife such as seabirds.

Due to weathering processes, surface hydrocarbons have a lower toxicity due to change in their composition over time. Potential impacts to shoreline sensitive receptors may be markedly reduced in instances where there is extended duration until contact.

Table 6-4: The Bonn Agreement Oil Appearance Code

Appearance (following Bonn visibility descriptions)	Mass per area (g/m^2)	Thickness (µm)	Volume per area (L/km^2)
Discontinuous true oil colours	50 to 200	50 to 200	50,000 to 200,000
Dull metallic colours	5 to 50	5 to 50	5000 to 50,000
Rainbow sheen	0.30 to 5.00	0.30 to 5.00	300 to 5000
Silver sheen	0.04 to 0.30	0.04 to 0.30	40 to 300

Dissolved Marine Diesel Hydrocarbon Threshold Concentration

Ecotoxicity tests were undertaken on a broad range of taxa of ecological relevance for which accepted standard test protocols are well established (**Table 6-5**). These ecotoxicology tests are focused on the early life stages of test organisms, when organisms are typically at their most sensitive. The eight ecotoxicology tests were conducted on seven mainly tropical-subtropical species representatives from six major taxonomic groups. The seven species were tested for chronic (function of life) effects of immobilisation, early life stage development/growth and acute toxicity (i.e. mortality).

The laboratory-based ecotoxicity tests used a range of water accommodated fraction (WAF) concentrations to expose the different test organisms. For each ecotoxicity test, samples of the WAF were analysed to determine the total petroleum hydrocarbons (TPH) concentration of the solution. The ecotoxicity testing focusses on the TPH concentration of the WAF of the hydrocarbon and includes the carbon chains C6 to C36. TPH concentration is representative of the sum of the hydrocarbons in each test solution for C6 to C36. Typically, C4 to C10 compounds are volatile (boiling point (BP) < 180°C), C11 to C15 compounds are semi-volatile (BP 180 to 265°C), C16 to C20 compounds have low volatility (265 to 380 °C) and C21 compounds and above are residual (BP > 380 °C).

Table 6-5 presents the results of the no-observed-effect concentrations (NOEC) for the marine diesel WAFs. The reported NOECs for organisms tested ranged from 520 ppb to 3500 ppb. For seven of the nine tests, no statistically significant effect on the test organisms was observed even at the highest WAF concentration used in the testing (denoted with the symbol '#').

Based on these ecotoxicology tests, a conservative threshold of 500 ppb has been adopted. This 500 ppb threshold is below the lowest NOEC for the most sensitive organism tested. These thresholds are calculated based on exposure of organisms to dissolved aromatic hydrocarbons for periods of 1 to 96 hrs and are, therefore, conservative when used for instantaneous contact.

Table 6-5: Summary of Total Petroleum Hydrocarbons (TPH) NOECs for Key Life Histories of Different Biota Based on Toxicity Tests for WAF of Marine Diesel (ESA, 2013)

Biota and life stage	Exposure Duration (hrs)	NOEC TPH (ppb)
Sea urchin fertilisation	1	3500#
Sea urchin larval development	72	3500#
Milky oyster larval development	48	3500#
Micro-algal growth test	72	520
Macro-algal (kelp) germination test	72	2530#
Rock oyster larval spat	48	3500#
Amphipod juvenile survival	96	520
Copepod juvenile survival	48	2530#
Larval fish imbalance test	96	2530#

 # Indicates lowest-observable-effect concentration (LOEC) was not reached during test.

Accumulated Hydrocarbons Threshold Concentration

Owens *et al*. (1994) define accumulated hydrocarbon < 100 g/m^2 to have an appearance of a stain on shorelines. French-McKay (2009) defines accumulated hydrocarbons ≥ 100 g/m^2 to be the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat; therefore, ≥ 100 g/m^2 has been adopted as the threshold for shoreline accumulation. An additional threshold has been included to define accumulated hydrocarbon on shorelines at < 10 g/m^2 within which socio-cultural impacts may occur, based on hydrocarbons impacting on the visual amenity of the shoreline.

Scientific Monitoring

A planning area for scientific monitoring is also described in Section 5.5 of the *Oil Spill Preparedness and Response Mitigation Assessment* (**Appendix D**). This planning area has been set with reference to the low exposure entrained value of 10 ppb detailed in the NOPSEMA (2019) bulletin *Oil Spill Modelling*.

A scientific monitoring program would be activated following a Level 2 or 3 unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire EMBA and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the worst-case credible spill scenario(s) or other identified unplanned hydrocarbon releases associated with the operational activities.

6.7.2 Unplanned Hydrocarbon Release: Vessel Collision

Context		
Support Vessels Operations – **Section 3.6**	Physical Environment – **Section 4.5** Biological Environment – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk 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/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of hydrocarbons to marine environment due to a vessel collision (e.g. support vessels or other marine users).			X		X	X	X	A	D	1	M	LCS GP PJ	Broadly Acceptable	**EPO 7**

Description of Source of Risk

Background

The temporary presence of the Petroleum Activities Program vessels in the Operational Area may result in a navigational hazard for commercial shipping within the immediate area (as discussed in **Section 6.6.1**). This navigational hazard could result in a third-party vessel colliding with an activity vessel resulting in release of hydrocarbons.

IMMR vessels have multiple isolatable diesel tanks typically located mid-ship and typically range in size from 22 to 250 m³.

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 (AusSAR).

From a review of the ATSB marine safety and investigation reports relevant to oil and gas industry vessels conducted for this EP (ATSB, 2020), 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 connecting with a vessel alongside a wharf, causing it to sink. No reported pollution resulted from the sunken vessel. These incidents demonstrate the likelihood of low volume hydrocarbon releases in the unlikely event of a vessel collision.

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 (ATSB, 2011). The majority of these related to the grounding instances.

Credible Scenario

The worst-case hydrocarbon spill scenario is defined as a maximum volume of 250 m³ of marine diesel resulting from a catastrophic rupture and loss of the largest single diesel tank inventory on an activity / support vessel.

For a vessel collision to result in this remote but credible scenario several factors must align, as follows:

- Vessel interaction must result in a collision.
- The force of the collision should be sufficient to breach the vessel hull.
- The tank breach must occur in the location of the fuel tank.
- The fuel tank must be full, or at least of volume which is higher than the point of penetration.

The probability of this chain of events is considered remote.

Quantitative Hydrocarbon Risk Assessment

Modelling of a 550 m^3 surface release of marine diesel was available for Woodside's Balnaves Development, conducted in 2016, about 1 km south east of the Operational Area. The modelled spill volume of 550 m^3 is greater than the release volume of 250 m^3 for the potential worst-case credible scenario, however the results of the modelling can be used to demonstrate that even a much larger marine diesel spill in the vicinity of the Operational Area has an EMBA that is not predicted to include any surface slicks above threshold volumes entering WA state waters, or any shoreline contact or accumulation. The EMBA for a 250 m^3 surface release of marine diesel within the Operational Area would be considerably smaller. Basing the impact assessment for a vessel collision scenario on this modelling is therefore considered highly conservative.

The modelling assessed the extent of a marine diesel spill volume of 550 m^3 for all seasons, using an historic sample of wind and current data for the region. A total of 50 simulations for each season were modelled (four seasons in total). The modelling was conducted by RPS using a three-dimensional hydrocarbon spill trajectory and weathering model (SIMAP, Spill Impact Mapping and Analysis Program) (RPS, 2016).

Hydrocarbon Characteristics

Marine diesel is a mixture of both volatile and persistent hydrocarbons. Predicted weathering of marine diesel, based on typical conditions in the region, indicates that about 35% by mass would be expected to evaporate over the first 24 hrs (**Figure 6-3**) (RPS, 2019). After this time the majority of the remaining hydrocarbon is entrained into the upper water column, leaving only a small proportion of the oil floating on the water surface (<1%). 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, thereby extending the area of potential effect.

Given the environmental conditions experienced in the Operational Area, marine diesel is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Marine diesel distillates tend not to form emulsions at the temperatures found in the region. The characteristics of the marine diesel are given in **Table 6-6.**

Table 6-6: Characteristics of the Relevant Marine Diesel (RPS APASA. 2016)

Hydrocarbon type	Initial density (g/cm3) at 25 ºC	Viscosity (cP @ 25 ºC)	Component BP (ºC) (% of total)			
			Volatiles %<180	Semi volatiles % 180–265	Low volatility (%) 265-380	Residual (%) >380
			Non-Persistent			Persistent
Marine Diesel	0.829	4.0	6	34.6	54.4	5

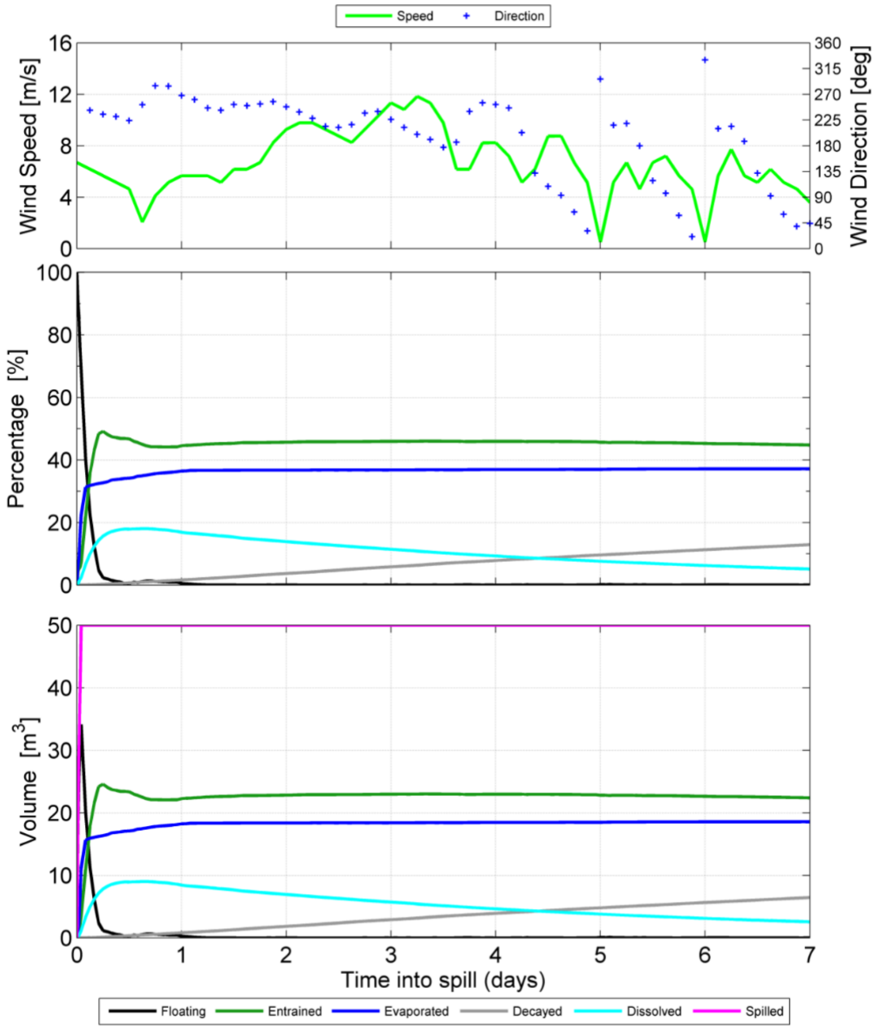


Figure 6-3: Proportional mass balance plot representing the weathering of 2000 m^3 surface spill of marine diesel a one-off release (at a rate of 50 m^3/hr) and subject to variable wind at 27 °C water temperature and 25 °C air temperature (RPS 2019)

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Environment that May Be Affected Surface Hydrocarbons: If this scenario occurred, a surface hydrocarbon slick would form down-current of the release location, with the trajectory dependent on prevailing wind and current conditions at the time. The modelling indicates that the EMBA would be confined to open water, with surface hydrocarbons extending up to about 85 km from the release location at or above the 10 g/m^2 impact threshold. The Montebello Marine Park, the Ancient Coastline at 125 m depth contour KEF and the Continental Slope Demersal Fish Communities KEF are the sensitive receptor habitats that are reached by the modelled scenario. Table 6-7 provides details of receptors potentially contacted by surface hydrocarbons at 10 g/m^2. A socio-cultural EMBA for surface hydrocarbons which includes the threshold for visible surface hydrocarbons of 1 g/m^2 may extend up to about 180 km from the release site. Entrained Hydrocarbons: If this vessel collision scenario occurred, a plume of entrained hydrocarbons would form down-current of the release location, with the trajectory dependent on prevailing current conditions at the time. The modelling indicates that locations exposed to entrained hydrocarbons at or above the threshold concentration of 500 ppb are restricted to offshore areas up to about 160 km from the release site. The Montebello Marine Park, the Ancient Coastline at 125 m

Impact Assessment
depth contour KEF and the Continental Slope Demersal Fish Communities KEF are the sensitive receptor habitats that are reached by the modelled scenario. Table 6-7 provides details of receptors potentially contacted by entrained hydrocarbons at 500 ppb. Dissolved Hydrocarbons: Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 500 ppb threshold are predicted to be limited to the immediate vicinity of the spill site. The Montebello Marine Park, the Ancient Coastline at 125 m depth contour KEF and the Continental Slope Demersal Fish Communities KEF are the sensitive receptor habitats that are reached by the modelled scenario. Table 6-7 provides details of receptors potentially contacted by dissolved hydrocarbons at 500 ppb. Accumulated Hydrocarbons: Accumulated hydrocarbons above threshold concentrations (≥100 g/m²) were not predicted by the modelling to occur at any shoreline locations. The results of the hydrocarbon spill modelling for a marine diesel spill indicate that the environment that may be affected (EMBA) will fall well within the EMBA of the condensate spill from MEE-01 a loss of well integrity, as outlined in **Section 6.8.2**

Table 6-7: Key Receptor Locations and Sensitivities Potentially Contacted Above Impact Thresholds by the Vessel Collision Scenario with Summary Hydrocarbon Spill Contact

Environmental setting	Location / name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure [WM0000PG10055394])																													Probability of hydrocarbon contact and fate (%)			
		Physical		Biological																						Socio-economic 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 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 (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (≥10 g/m²)	Entrained hydrocarbon (≥500 ppb)	Dissolved aromatic hydrocarbon (≥500 ppb)	Accumulated hydrocarbons (>100 g/m²)
Offshore[18]	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		9	2		
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		1		

[18] Note: hydrocarbons cannot accumulate on open ocean, submerged receptors, or receptors not fully emergent.

Summary of Potential Impacts to Environmental Values
Modelling of the credible worst-case hydrocarbon spill scenario that may arise from a vessel collision indicates that the spill will remain offshore. The biological consequences of such a spill on identified open water sensitive receptors relate to the potential for minor, short-term impacts to plankton and fish populations (surface and water column biota) and migratory megafauna (cetaceans, turtles and seabirds) within the spill affected area. 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.
Protected Species
Marine Mammals As identified in **Section 4.6**, protected species, including migrating EIO pygmy blue whale and humpback populations may be seasonally transiting offshore areas near to the Operational Area and, therefore; could be impacted if in close proximity to the marine diesel spill location (where the volatile, water soluble and most toxic components of the marine diesel may be present). However, the window for exposure to hydrocarbons with the potential for any toxicity effects in these waters would be limited to a few days following the spill. Potential impacts may include behavioural impacts (e.g. avoidance of impacted areas), sub-lethal biological effects (e.g. skin irritation, irritation from ingestion or inhalation, reproductive failure) and, in rare circumstances, organ or neurological damage leading to death. Given the absence of critical habitats or aggregation areas, cetaceans in the area are expected to occur transitionally and impacts are expected to be limited to individuals or small groups of animals (i.e. impacts on the overall population viability for cetacean species is not predicted). ***Marine Turtles*** The EMBA overlaps with habitat critical to the survival (internesting; Section 4.6.2.3) and BIAs (internesting; Section 4.6.2.4) for the flatback turtle. These habitats are associated with flatback turtle nesting at the Montebello Islands where peak nesting occurs in December and January. However, it is noted that the BIA and habitat critical to the survival of flatback turtles are considered very conservative as they are based on the maximum range of internesting females from nesting beaches, and many turtles are more likely to remain near their nesting beaches. The internesting BIAs for flatback turtles, for example, extends 80 km from known nesting locations. In the event of a worst-case vessel spill of marine diesel, there is a potential that surface and entrained hydrocarbons exceeding impact threshold concentrations (10 g/m2 and 500 ppb respectively) will be present in offshore waters extending up to 85 km and 160 km, respectively, from the modelled release site. Toxicity of hydrocarbons will be significantly reduced by weathering over such distances, with the volatile and water soluble (often the most toxic) components expected to have dissipated beyond the vicinity of the spill site. Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 500 ppb threshold are predicted to be limited to the immediate vicinity of the spill site. Low concentrations are only capable of causing sublethal impacts to the most sensitive marine organisms and no lethal or sub-lethal impacts to marine turtles are expected within relevant BIAs. The potential for lethal and sub-lethal impacts to marine turtles is limited to small numbers of transient individuals that may be present in offshore waters near the release location. Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (NOAA, 2010), therefore; contact with surface slicks or entrained hydrocarbon can result in hydrocarbons adhering to body surfaces (Gagnon and Rawson, 2010) causing irritation of mucous membranes in the nose, throat and eyes, leading to inflammation and infection (NOAA, 2010). Oiling can also irritate and injure skin, which is most evident on pliable areas such as the neck and flippers (Lutcavage *et al*., 1995). A stress response associated with this exposure includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of the salt gland (Lutcavage *et al*., 1995). Hydrocarbons in surface waters may also impact turtles when they surface to breathe as they may inhale toxic vapours. Their breathing pattern, involving large 'tidal' volumes and rapid inhalation before diving, results in direct exposure to petroleum vapours, which are the most toxic component of the hydrocarbon spill (Milton and Lutz, 2002). This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia, and neurological impairment (NOAA, 2010). Contact with entrained hydrocarbons can result in hydrocarbons adhering to body surfaces, causing irritation of mucous membranes in the nose, throat and eyes and leading to inflammation and infection (Gagnon and Rawson, 2010). ***Seabirds*** Seabirds may be exposed to marine diesel on the sea surface or upper water column if resting or foraging in waters near to the spill release area. A breeding BIA for wedge-tailed shearwaters overlaps the Operational Area and EMBA; and a foraging BIA overlaps the EMBA. Other EBPC listed species of seabird (**Section 4.6.2.1**) may also be present in low numbers. Impacts may include mortality due to oiling of feathers or the ingestion of hydrocarbons. However, due to the limited spatial extent of a marine diesel spill and limited window for exposure, population level impacts are not expected. Other EPBC Act listed species that may occasionally transit through the area and may potentially be exposed to a marine diesel spill, include shark and ray species such as whale sharks (fish species) and manta rays. The EMBA

overlaps the whale shark foraging BIA along the NWS but does not overlap the foraging (high density prey) BIA along the Ningaloo coast. Should sharks or rays be present in offshore waters near the EMBA during a spill, direct impacts may occur if foraging within surface slicks or in the upper 20 to 30 m of the water column containing entrained hydrocarbons and dissolved aromatics. Contamination and subsequent ingestion of prey may also result in long-term impacts as a result of bioaccumulation. Impacts are predicted to be limited to a small number of animals given the absence of key habitat and the low numbers of animals that may transit through the area during the short period when spilled hydrocarbons are present.
Other Habitats, Species and Communities
Within the EMBA for a marine diesel spill resulting from a vessel collision, there is the potential for plankton communities to be impacted where entrained hydrocarbon threshold concentrations are exceeded. A range of lethal and sub-lethal impacts may occur to plankton exposed to entrained or dissolved hydrocarbons within the EMBA. Communities are expected to recover quickly (e.g. within weeks/months) due to high population turnover (ITOPF, 2011). It is, therefore, considered that any potential impacts would be of low magnitude and temporary in nature. Pelagic fish populations in the open water offshore environment of the EMBA are highly mobile and have the ability to move away from a marine diesel spill. The spill-affected area would be confined to the surface layer and upper 20 to 30 m of the water column. It is, therefore, unlikely that fish populations would be exposed to widespread hydrocarbon contamination. Pelagic fish populations are also distributed over a wide geographical area so impacts at population or species level are considered to be negligible. These factors combined with the rapid dispersion of marine diesel result in potential impacts being considered minor. Other communities (e.g. demersal fish, benthic infauna and epifauna) and key sensitivities (e.g. KEFs identified in **Section 4.6.1.5**) occur within the EMBA, however are not directly exposed or impacted by a marine diesel spill as hydrocarbons are confined to the upper layers of the water column.
Protected Areas
The Montebello Marine Park overlaps a small portion of the Operational area and, therefore may be directly impacted by a marine diesel spill from a vessel collision. Surface and / or entrained hydrocarbons at or exceeding impact thresholds have a low probability of contacting the outer boundaries of the Montebello AMP and Gascoyne AMP. Surface and entrained hydrocarbons are only predicted within the deep open waters of these protected areas, with minimal overlap and no contact to seabed habitats or to shorelines. Potential impacts to water quality and the natural values (e.g. mobile protected species) in these areas would be temporary and localised in nature due to the rapid dispersion and weathering of the marine diesel. Dissolved hydrocarbons (at or exceeding 500 ppb) are not predicted to reach the Gascoyne AMP.
Offshore Oil and Gas Infrastructure
In the unlikely event of a major spill, surface hydrocarbons may affect production from existing petroleum facilities (platforms). 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 support vessel access. 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 on the operation of production facilities in the event of a spill would be based primarily on health and safety considerations. The closest production facility is the Chevron operated Wheatstone Platform (within the Operational Area), followed by the Woodside operated Pluto Platform. Operation of these facilities is likely to be affected in the event of a worst-case spill of marine diesel.
Socio-economic Receptors
A marine diesel spill is considered unlikely to cause significant direct impacts on the target species fished by Commonwealth and State fisheries (see **Section 4.7.2**) which overlap with the EMBA. The fisheries that operate within the EMBA predominantly target demersal fish species that inhabit waters in the range of more than 60 to 200 m water depth, or pelagic species which are highly mobile. Therefore, a marine diesel spill is expected to only result in negligible impacts, considering that hydrocarbons are confined to the upper layers of the water column. Visible surface hydrocarbons at or exceeding 1 g/m^2 may occur up to 180 km from the release site which may result in fouling of fishing gear and a perception of impacts to fish stocks by fisheries stakeholders and the public. There is the potential that a fishing exclusion zone would be applied in the area of the spill which would result in a temporary ban on fishing activities within that area, and therefore potentially lead to subsequent economic impacts on commercial fishing operators that would otherwise fish within this area. Such measures would likely be in place for less than a week and would not result in widespread or long-term impacts to fishing activities.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[19]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Vessels compliant with Marine Orders for safe vessel operations: • Marine Order 21 (Safety and emergency procedures) 2016 • Marine Order 27 (Safety of navigation and radio equipment) 2016 • Marine Orders 30 (Prevention of Collisions) 2016 Compliance with Marine Order 21, 27 and 30 reduces the likelihood of adverse interaction of vessels with other marine users.	F: Yes CS: Minimal cost. Standard practice.	Marine Orders 21, 27 and 30 are required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Control based on legislative requirement – must be adopted.	Yes **C 1.1**
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 7.1**
Good Practice				
Apply Woodside Marine Offshore Vessel Assurance Procedure.	F: Yes CS: Minimal cost. Standard Practice.	Assurance activities outlined in procedure will reduce the likelihood of a vessel collision.	Control based on internal company requirements – must be adopted.	Yes See **Section 7.6.2 (Implementation Strategy)**
Develop SIMOPS plan if more than one Woodside contracted vessel is operating in the Operational Area at any time.	F: Yes. CS: Minimal cost. Standard practice.	SIMOPS plans between Woodside contracted vessels in the Operational Area will reduce the likelihood of a collision occurring.	Benefits outweigh cost/sacrifice.	Yes **C 7.2**
Notify AHO of activities, where vessels will be in field >3 weeks, no less	F: Yes.	Notification to AHO will enable them to generate navigation	Benefits outweigh cost/sacrifice.	Yes **C 1.2**

[19] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[19]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
than four working weeks prior to scheduled activity commencement date.	CS: Minimal cost. Standard practice.	warnings (Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) (including AUSCOAST warnings where relevant)).	Control is also Standard Practice.	
Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities where vessels will be in the field >3 weeks 24 to 48 hrs before activities commence.	F: Yes. CS: Minimal cost. Standard practice.	Notification to AMSA JRCC aids in preparedness for any response required.	Benefits outweigh the cost/sacrifice. Control is also Standard Practice.	Yes **C 1.4**
Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	F: Yes. CS: Moderate costs associated with exercises. Standard practice.	No change to impact or risk however ensures OPEP can be implemented in the event of a hydrocarbon spill thereby potentially reducing the consequence.	Benefits outweigh the cost/sacrifice. Control is also Standard Practice.	Yes **C 7.3**
Mitigation – hydrocarbon spill response		Refer to **Appendix D** for discussion around the ALARP assessment of controls related to hydrocarbon spill response		
Professional Judgement – Eliminate				
Eliminate use of vessels	F: No. The use of vessels is required to conduct the Petroleum Activities Program. CS: Not considered- control not feasible	Not considered – Control not feasible	Not considered – control not feasible	No
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of an unplanned loss of hydrocarbon as a result of vessel collision. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that an unplanned loss of hydrocarbons as a result of a vessel collision represents a moderate current risk rating that is unlikely to result in potential impacts greater than localised, minor and temporary disruption to a small proportion of the population and have no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. 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 consistent with the most relevant regulatory guidelines, good oil-field practice/industry best practice and meet the legislative requirements of Marine Orders 21, 27 and 30. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of a loss of vessel structural integrity to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 7 Environment risk posed by loss of hydrocarbons to the marine environment due to vessel collision limited to Moderate during the Petroleum Activities Program.	**C 1.1** Refer to **Section 6.6.1**	**PS 1.1** Refer to **Section 6.6.1**	**MC 1.1** Refer to **Section 6.6.1**
	C 7.1 In the event of a spill emergency response activities implemented in accordance with the OPEP.	**PS 7.2** In the event of a spill the Julimar Operations OPEP requirements are implemented.	**MC 7.2.1** Completed incident documentation
	C 7.3 Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	**PS 7.3** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-7.**	**MC 7.3.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 7.3a Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the OPEP, are maintained.	**MC 7.3.2** Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available.
	C 7.2 SIMOPS will be developed if more than one Woodside contracted vessel is operating in the Operational Area at any one time.	**PS 7.2** SIMOPS outline operating procedures when more than one Woodside-contracted vessel is operating in the Operational Area.	**MC 7.2** Records demonstrate SIMOPS were developed for circumstances where more than one Woodside vessel was operating in the Operational Area.
	C 1.2 Refer to **Section 6.6.1**	**PS 1.2** Refer to **Section 6.6.1**	**MC 1.2.1** Refer to **Section 6.6.1**
	C 1.4 Refer to **Section 6.6.1**	**PS 1.4** Refer to **Section 6.6.1**	**MC 1.4.1** Refer to **Section 6.6.1**

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	Mitigation – hydrocarbon spill response.	Refer to **Appendix D** for discussion around the ALARP assessment of controls related to hydrocarbon spill response.	

6.7.3 Unplanned Hydrocarbon Release: Loss of Containment from Subsea Infrastructure

Context		
Field Inventory - **Section 3.5.1**	Physical Environment – **Section 4.5** Biological Environment – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary														
	Environmental Value Potentially Impacted							***Evaluation***						
Source of Risk	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of containment from subsea infrastructure.		X	X		X	X	X	A	D	1	M	LCS GP PJ	Broadly Acceptable	**EPO 8**

Description of Source of Risk

The Julimar Field Production System infrastructure, including location of Brunello and Julimar drill centres, is shown in **Figure 3-1** and includes three 22 km, 18” flowlines; one 4” MEG pipeline; three Production Manifolds; eight (up to 14) production wells; and other associated subsea infrastructure.

A loss of containment from a subsea production flowline could occur due to a variety of causes including:

- Internal corrosion
- External corrosion
- Overpressure
- Equipment fatigue (risers and structural supports)
- Pipeline stability and freespans
- Anchor impact / dragging
- Loss of control of suspended load from visiting vessel.

Extreme environmental conditions may also result in movement of an IMMR vessel and result in releases from subsea equipment (i.e. through unplanned movement during lowering activities dragging equipment over existing subsea infrastructure).

Subsea Equipment Loss of Containment – Credible Scenario

The worst-case credible scenario was assessed to be a short-term (5.2 hrs) subsea release of 1062 m^3 of Brunello Condensate from a full-bore rupture at the JDP2 flowline inlet, representing worst-case loss of containment when the isolation between the Brunello and Julimar Production Flowlines is open and the inventory from three separate flowlines is released at once.

Refer to **Section 6.7.1** for quantitative spill risk assessment methodology.

Table 6-8: Summary of Worst-case Subsea Loss of Containment Hydrocarbon Release Scenario

Scenario	Hydrocarbon	Duration (hrs)	Depth (m)	Latitude (WGS84)	Longitude (WGS84)	Total Oil Release Volume
Loss of containment when the isolation between the Brunello and Julimar Production Flowlines is open and the inventory from three separate flowlines is released at once.	Brunello Condensate	5.2	175	20°01' 49.1571" S	115°12' 05.6357" E	1062 m^3

Decision Type, Risk Analysis and ALARP Tools

Woodside has a good history of implementing industry standard practice in subsea system design and construction. In the company's recent history, it has not experienced any subsea integrity events that have resulted in significant environmental impacts. The Julimar Field Production System has never experienced a worst-case subsea loss of containment in its operational history.

Decision Type

A Decision Type A has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This scenario was considered to have a consequence rating of D - Minor, short-term impact (1 to 2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute.

Hydrocarbon Characteristics

Brunello condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In general, about 45.5% of the oil mass should evaporate within the first 12 hrs, a further 37.3% should evaporate within the first 24 hrs and a further 10.3% should evaporate over several days. About 83% of the oil is predicted to evaporate within 24 hrs with about 6.9% shown to be persistent (RPS APASA, 2020).

Consequence Assessment

Environment that May be Affected

The EMBA for the loss of containment from subsea infrastructure is based on stochastic modelling which compiles data from multiple hypothetical worst-case spill simulations under a variety of weather and metocean conditions (as described in **Section 6.7.1**). Therefore, the EMBA covers a larger area than that which would be affected during any single spill event and represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelled runs. The trajectory of a single spill would have a considerably smaller footprint.

This EMBA is significantly smaller than the overall EMBA for the Petroleum Activities Program which is based on the worst-case spill scenario (loss of well control), as detailed in **Section 6.8.3**. 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

The probability contour figures for floating oil indicate that concentrations equal to or greater than the 10 g/m2 impact threshold could potentially be found in the form of slicks up to 24 km from the spill site and at 1 g/m2 (socio-economic threshold) up to 70 km from the spill site. The Montebello Marine park is the only receptor with a probability (1.5%) of impact from floating oil concentrations greater than 10 g/m^2 as a result of the loss of subsea containment scenario.

Entrained and dissolved Hydrocarbons

Entrained oil concentrations equal to or greater than the 100 ppb impact threshold are predicted to be found up to 265 km from the spill site and dissolved aromatic hydrocarbon concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to 215 km from the spill site. Rankin Bank (5%) and the Montebello Marine Park (22 %) are the only receptors predicted to be impacted at the 100 ppb entrained Threshold and are also the only receptors with potential impact at the 50 ppb dissolved threshold (2.5 % and 11 % respectively).

Accumulated Hydrocarbons

No receptors are predicted to receive shoreline oil at impact (100 g/m^2) or socio-economic (10 g/m^2) thresholds.

Consequence Assessment Summary

Table 6-9 presents all receptors that may be impacted by the loss of containment from subsea infrastructure EMBA (i.e. the sensitive receptors and their locations that may be exposed to hydrocarbons (including surface, entrained, dissolved and accumulated hydrocarbon fates) at or above the adopted thresholds). These receptors are described in **Section 4**.

The potential biological and ecological impacts of an unplanned hydrocarbon release as a result of a loss of containment from subsea infrastructure during the Petroleum Activities Program to these receptors are considered in MEE-01 (**Section 6.8.2**)

Table 6-9: Key Receptor Locations and Sensitivities Potentially Contacted Above Impact Thresholds by the Loss of Well Containment Scenario with Summary Hydrocarbon Spill Contact

Environmental setting	Location / name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure [WM0000PG10055394])																												Probability of hydrocarbon contact and fate (%)			
		Physical		Biological																						Socio-economic 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 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 (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (≥10 g/m²)	Entrained hydrocarbon (≥100 ppb)	Dissolved aromatic hydrocarbon (≥50 ppb)	Accumulated hydrocarbons (>100 g/m²)
Offshore[20]	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1.5	22	11	
Submerged Shoals and Banks	Rankin Bank	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓				5	2.5	

[20] Note: hydrocarbons cannot accumulate on open ocean, submerged receptors, or receptors not fully emergent.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[21]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: requires a Safety Case for the Chevron Wheatstone Offshore Facilities	F: Yes. CS: Standard practice.	The Chevron Wheatstone Offshore Facilities Safety Case is in place and regulated to: • identify hazards that have the potential to cause an MAE • detail assessment of MAE risks • describe the physical barrier SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with a MAE to ALARP. This framework contributes to the management of associated potential environmental consequences of MAEs, and includes operation of third-party well and subsea systems (with regard to operating integrity envelopes, isolations, and emergency arrangements).	Control based on legislative requirements – must be adopted.	Yes **C 8.1**
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009: requires an Environment Plan for the Start Up and Operations of the Wheatstone Offshore Facilities (and associated subsea infrastructure)	F: Yes. CS: Standard practice.	The Start-Up and Operations Environment Plan: Wheatstone Project, is in place and regulated to meet legislative requirements. The Start-Up and Operations Environment Plan: Wheatstone Project, outlines the Operational Interface with Third-Party Assets (including	Control based on legislative requirements – must be adopted.	Yes, **C 8.2**

[21] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[21]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		Julimar-Brunello) and Chevron's contracted field operating services role in the safe operation, maintenance/testing and provision of emergency response arrangements for Julimar-Brunello subsea and wells systems.		
Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: requires an accepted Julimar/ Brunello Well Operations Management Plan (WOMP); which includes: • Julimar Subsea Inspection, Monitoring and Maintenance (IMM) Plan • Julimar Production Systems Operating Manual • Julimar - Subsea Operating Integrity Envelope - Subsea XTree Envelope	F: Yes. CS: Minimal cost. Standard practice.	The Julimar/ Brunello Well Operations Management Plan (WOMP) is in place to demonstrate that the risks to well integrity are managed in accordance with sound engineering principles, standards specifications, and good oilfield practice. It describes the systems that are in place to ensure well design and integrity is managed for the well lifecycle, thus contributing to management of associated potential environmental consequences of well integrity events.	Control based on legislative requirements –must be adopted.	Yes **C 8.3**
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 7.1**
Good Practice				
Incident reports are raised for unplanned releases within event reporting system.	F: Yes CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes **C 8.4**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[21]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
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.	Benefits outweigh the cost/sacrifice. Control is also Standard Practice.	Yes **C 7.3**
Mitigation: Oil spill response		Refer to Oil Spill Preparedness and Response Mitigation Assessment for the Julimar Operations (**Appendix D**)		
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
Only DP vessels used for subsea IMMR activities (Ref: Woodside Marine Offshore Vessel Assurance Procedure.	F: Yes CS: Minimal cost. Standard practice	The use of DP reduces the likelihood of a subsea infrastructure integrity event by eliminating the likelihood of anchor drag	Benefits outweigh cost/sacrifice	Yes **C 2.2**
Professional Judgement – Engineered Solution				
Maintaining subsea pipeline and hydrocarbon-containing infrastructure. Integrity managed in accordance with SCE Management Procedure (Section 7.1.5) and achieving SCE technical Performance Standards functional objectives for: • Wells (isolation barriers) (P10) • Pipeline systems (P09),	F: Yes CS: Minimal cost. Standard practice	Reduces the likelihood of subsea loss of containment and ensures barriers are in place and verified, thus reducing consequence and likelihood of the risk. Assurance programmes include a risk management approach in determining inspection, monitoring and maintenance requirements are undertaken (e.g. via the Julimar subsea IMM plan) to identify potential risk areas or anomalies which may require risk management actions or remediation.	Benefits outweigh cost/sacrifice	Yes **C 8.5**
Management System Specific Measures: Key Standards or Procedures				
Implementing management systems linked to: • MSPS-03 Maintenance and Inspection	F: Yes CS: Minimal cost. Standard practice	Key management systems act as barriers to ensure robust operational, maintenance and	Benefits outweigh cost/sacrifice	Yes See **Section 6.9 (Implemen**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[21]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• Contracting and Procurement Procedure • Marine Services Management Procedure • Marine Assurance Overview Procedure • Prevention / management of potential for human error • Prevention / management of potential for systemic / SCE failure.		inspection practices, contractual and quality requirements, and assurance structures. Reduces potential common failure causes due to human error and strengthens reliability of SCE integrity, reducing the likelihood of the risk.		**tation Strategy)**
Mitigation – hydrocarbon spill response	Refer to Oil Spill Preparedness and Response Mitigation Assessment for the Julimar Operations (**Appendix D)**			

ALARP Statement

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the Decision Type, Woodside considers the adopted controls appropriate to manage the impacts and risks of a low likelihood unplanned hydrocarbon release as a result of a loss of subsea containment.

The principle of inherent safety and environmental protection is based on the prevention of a loss of containment through design of subsea equipment integrity and ensuring the systems are operated within their design envelope through operating practices and assurance through maintenance and inspection. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The application of Woodside Risk Management Procedures, and Chevron implementation of the Wheatstone Offshore Facilities Safety Case and Environment Plan ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences, alongside procedural controls, it is considered that the risks associated with a subsea loss of containment are managed to ALARP.

Demonstration of Acceptability

Acceptability Statement

The impact assessment has determined that an unplanned loss of hydrocarbon from Subsea Infrastructure represents a moderate current risk rating that is unlikely to result in potential consequence greater than minor and short-term disruption to species or habitat but not affecting ecosystem function. 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.

Further opportunities to reduce the risks and consequences have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of the described emissions, to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 8 Subsea equipment loss of containment risks to the environment limited to Moderate during the Petroleum Activities Program.	**C 8.1** Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case in place for the Wheatstone Offshore Facilities. This framework, contributes to management of associated potential environmental consequences of MAE, and includes operation of third-party well and subsea systems (with regard to operating integrity envelopes, isolations, and emergency arrangements).	**PS 8.1** Woodside to ensure a field operating services contract in place with Chevron, with the accepted Wheatstone Offshore Facilities Safety Case in force in order to flow Julimar Brunello fluids to integrated field production system.	**MC 8.1.1** Field operating services contract and an accepted Wheatstone Offshore Facilities Safety Case in place.
	C 8.2 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009: Accepted Environment Plan for the Start Up and Operations of the Wheatstone Offshore Facilities (and associated subsea infrastructure). The EP outlines the Operational Interface with Third-Party Assets (including Julimar-Brunello) and Chevron's contracted field operating services role in the safe operation, maintenance/testing and provision of emergency response arrangements for Julimar-Brunello subsea and wells systems.	**PS 8.2** Woodside to ensure a field operating services contract in place with Chevron, with an accepted Wheatstone Operations Environment Plan in force in order to flow Julimar Brunello fluids to integrated field production system.	**MC 8.2.1** Field operating services contract and an accepted Environment Plan in-force.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	C 8.3 Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: Accepted WOMP to demonstrate that the risks to well integrity are managed in accordance with sound engineering principles, standards, specifications, and good oilfield practice. It describes the systems that are in place to ensure well design and integrity is managed for the well lifecycle, thus contributing to management of associated potential environmental consequences of well integrity events.	**C 8.3** An accepted WOMP is implemented, and well integrity notification and reporting is undertaken in accordance with the Regulations (as applicable).	**C 8.3.1** An accepted WOMP is implemented, and well integrity notification and reporting is undertaken in accordance with the Regulations (as applicable).
	C 7.1 In the event of a spill emergency response activities implemented in accordance with the OPEP.	**PS 7.2** In the event of a spill the Julimar Operations OPEP requirements are implemented.	**MC 7.2.1** Completed incident documentation
	C 8.4 Incident reports are raised for unplanned releases within event reporting system.	**PS 8.4** Incident reports raised for unplanned releases; and Recordable Incidents notified for unplanned liquid releases to sea, of; • 80 L or more of hydrocarbons; or • 1000 L or more of environmentally hazardous chemical[22] in any 48-hour period.	**MC 8.4.1** Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	C 7.3 Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	**PS 7.3** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-7.**	**MC 7.3.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 7.3a Woodside's procedure demonstrates a minimum level of	**MC 7.3.2** Emergency Management dashboard confirms that minimum level of

[22] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
		trained personnel, for core roles in the OPEP, are maintained.	personnel trained for core OPEP roles are available.
	C 2.2 Refer to **Section 6.6.2**	**PS 2.2** Refer to **Section 6.6.2**	**MC 2.2.2** Refer to **Section 6.6.2**
	C 8.5 Maintain subsea equipment environmental risk related integrity functional requirements associated with technical Performance Standards for: • Well barriers (P10) (includes reservoir isolation) • Pipeline systems (P09).	**PS 8.5** Integrity will be managed in accordance with SCE Management Procedure (Section 7.1.5) and SCE technical PSs to maintain environment risk-related functional objectives for • P10 – Wells (reservoir isolations) • P09 – Pipeline Systems to: – Maintain the minimum required mechanical and structural and containment integrity and prevent significant damage/degradation – Detect and respond to pre-defined initiating conditions to protect mechanical integrity and enact reservoir isolations.	**MC 8.5.1** Records demonstrate implementation of Performance Standard(s) and Safety Critical Element Management Procedure.
	Mitigation – hydrocarbon spill response	Refer to **Appendix D** for discussion around the ALARP assessment of controls related to hydrocarbon spill response.	

6.7.4 Unplanned Hydrocarbon or Chemical Release: Hydrocarbon or Chemical during Transfer, Storage or Use

Context	
Support Vessel Operations - **Section 3.6** Chemical Usage During IMMR Activities– **Section 3.9.5**	Biological Environment – **Section 4.6**

Risk 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/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental discharge of hydrocarbons or chemicals from vessel deck activities, and equipment used in subsea IMMR activities.			X		X	X		A	F	3	M	LCS GP, PJ	Broadly acceptable	**EPO 9**

Description of Source of Risk
Chemicals will be used during the Petroleum Activities Program for various purposes (refer to **Section 3.9.5**). Selection of chemicals is undertaken in accordance with the Woodside Chemical Selection and Assessment Environment Guideline. Spills of chemicals (including non-process hydrocarbons) can originate from equipment on the support vessel decks or subsea (refer to **Section 6.6.5** for an assessment of the impacts of planned chemical discharges). Due to the short duration of IMMR activities, significant chemical/fluid storage volumes are not anticipated. Storage areas are typically set up with effective primary and secondary bunding to contain deck spills. Releases from equipment are predominantly from the failure of hydraulic hoses, which can either be located within bunded areas or outside of bunded or deck areas (e.g. over water on cranes). Woodside's operational experience demonstrates that spills are most likely to originate from hydraulic hoses and have been less than 100 L, with an average volume of < 10 L. The accidental discharge of hydrocarbons and/or chemicals to the subsea marine environment can result from the failure of seals on the field production system; resulting in leaks of MEG, subsea hydraulic fluids, scale inhibitor (etc). A MEG line or umbilical release could result in loss of control fluids ranging from 1 to 25 m^3, based on the volumes contained in the flowlines. A valve loss of containment could result in control fluids leaking up to about 1 m^3 per day. The ROVs used in IMMR activities require hydraulic fluid to function. This is supplied through hoses containing about 100 L of fluid. On occasion hydraulic lines to the ROV arms and other tooling may become caught which may potentially result in minor leaks to the marine environment. Hydraulic lines may be isolated to prevent full loss of inventory, if a leak is detected.

Consequence Assessment
Deck Spills Accidental spills of hydrocarbons or chemicals from vessels and equipment decrease the water quality in the immediate area of a spill. However, the impacts are expected to be temporary and very localised as only small volumes of hydrocarbons or chemicals are likely to be used which disperse and dilute in the marine 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 to them.

Given the small area of the potential spill and the dilution and weathering of any spill, the likelihood of ecological impacts to marine fauna (including protected species) is likely to be negligible and restricted to individual animals.

No impacts on socio-economic receptors are expected due to the low levels of fishing activity in the Operational Area, the volumes of hydrocarbons/chemicals that could be accidentally spilled, and the localised and temporary nature of the impacts.

Subsea Loss

There is the potential for localised water column pollution (i.e. impacts to water quality) and adverse effects to marine fauna as a result of the unplanned discharge of hydrocarbons and chemicals within the subsea marine environment.

Protected Species, Fish and Plankton

The likelihood that fish, plankton or protected species will be exposed to lethal concentrations is negligible.

Plankton populations in the water column may be impacted within the immediate discharge area, however, given the fast population turn-over of open water plankton populations, the potential ecological impacts are considered to be very minor.

Potential impacts to mobile vertebrate marine fauna such as pelagic fish species and protected marine species are expected to be limited to localised avoidance of the discharges (i.e. behavioural changes).

Therefore, localised, short term and negligible impacts to these receptors are predicted.

Benthic Habitats and Communities

The benthic habitats within the Operational Area are representative of the NWMR and are primarily comprised of soft, sandy substrates with some smaller areas of hard outcropping and site attached species, as described in **Section 4.5.** Impacts to benthic communities as a result of discharges of hydrocarbons and/or chemicals at the volumes described above are predicted to be negligible, with no lethal stress impacts, due to the low abundance of benthic fauna typical of the Operational Area, short duration and small volumes of discharges that may be released. Motile benthic fauna may also be able to avoid potential impacts by moving away from the discharge.

Impacts specifically to those benthic habitats and communities located within the Montebello AMP are similarly unlikely, particularly as the length of infrastructure (flowlines with no valves) within the AMP is 0.4 km, the small volumes involved and the localised nature of the discharge. This applies also to the Ancient Coastline at the 125 m depth contour KEF (described in **Section 4.6.1.5**), particularly as no characteristics typical of this KEF have been identified during surveys of the relevant areas other than the outcroppings to the north-east. No impacts on the Continental slope demersal fish communities KEF are envisaged given the distance from the Operational Area to this KEF (1 km).

Given the adopted controls, it is considered that hydrocarbon/chemical subsea spills to the marine environment are unlikely to result in a potential impact to water quality greater than minor and/or temporary contamination above background levels, water quality standards or known effect concentrations. Minor volume subsea spills are unlikely to result in a potential impact greater than localised and temporary disruption to a small proportion of biological populations with no impact on critical habitat or activity.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[23]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Vessels comply with Marine Order 91 (Marine pollution prevention – oil) for safe vessel operations.	F: Y 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 **C4.1**
Good Practice				

[23] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[23]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Chemical Selection and Assessment Environment Guideline	F: Yes. Woodside routinely implements a chemical selection process based on OCNS CS: Minimal. The OCNS is widely used throughout the industry and chemical suppliers are aware of the requirements of the scheme.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	The Woodside chemical selection process will be used to ensure that fluids discharged meet Woodside's chemical environmental risk assessment standards while still providing the required technical capability.	Yes **C 5.1**
Implement *Woodside Engineering Operating Standard – Subsea Isolation.*	F: Yes CS: Minimal cost. Standard practice	Reduces the likelihood of contaminated discharge into the marine environment.	Benefits outweigh cost/sacrifice.	Yes **C 5.2**
Limit the volume of subsea control fluid discharged to the marine environment by monitoring use and investigating material discrepancies	F: Yes. The use of subsea control fluid is monitored to maintain adequate fluid in the system. CS: Minimal cost.	Limits the volumes of subsea control fluid discharge to the marine environment	Benefits outweigh cost/sacrifice.	Yes **C 5.4**
Chemicals will be stored safely to prevent the release to the marine environment.	F: Yes CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated discharge into the marine environment.	Controls based on legislative requirements – must be adopted.	Yes **C 9.1**
Spill response kits on vessels.	F: Yes CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged into the marine environment.	Benefit outweighs the sacrifice.	Yes **C 9.2**
Incident reports are raised for unplanned releases within event reporting system.	F: Yes CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes **C 8.4**
Opportunistic equipment inspection and monitoring of subsea infrastructure concurrent with SCE assurance and verification for:	F: Yes CS: Minimal cost. Standard practice.	Allows the identification, assessment and risk management of potential anomalies.	Benefits outweigh cost/sacrifice.	Yes **C 8.5**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[23]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• Wells (P10) • Pipeline systems (P09),				
Mitigation – hydrocarbon spill response	Refer to **Appendix D** for discussion around the ALARP assessment of controls related to hydrocarbon spill response			
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
A reduction in volumes of chemicals and hydrocarbons stored onboard the vessel.	F: Yes. Increases the risks associated with transportation and lifting operations. CS: Project delays if required chemicals not on board. Increases the risks associated with transportation and lifting operations.	No reduction in likelihood or consequence since cumulative volumes of chemicals will remain unchanged to enable activities to proceed and smaller stored volumes will be offset by increased logistical / bunkering requirements.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of an unplanned loss of hydrocarbon or chemical. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability			
Acceptability Statement The impact assessment has determined that an unplanned minor discharge of hydrocarbons or chemicals from deck or to subsea represents a low and medium current risk rating respectively that has the potential to result in temporary localised disruption to the marine environment or a small proportion of a protected species. Whilst BIAs within the Operational Area include the pygmy blue whale migration, flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding; these species are not expected to be impacted. The adopted controls are consistent with the most relevant regulatory guidelines and good practice. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of minor unplanned spills to a level that is broadly acceptable.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 Environment risk posed by accidental spills of non-process	**C 4.1** Refer to **Section 6.6.4**	**PS 4.1** Refer to **Section 6.6.4**	**MC 4.1.1** Refer to **Section 6.6.4**
	C 5.1	**PS 5.1**	**MC 5.1.1**

hydrocarbons or chemicals during storage and use limited to Moderate during the Petroleum Activities Program.	Refer to **Section 6.6.5**	Refer to **Section 6.6.5**	Refer to **Section 6.6.5**
	C 9.1 Chemicals will be stored safely to prevent the release to the marine environment.	**PS 9.1** Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily.	**MC 9.1.1** Marine verification records confirm all liquid chemicals and fuel are stored in bunded/ secondarily contained areas when not being handled/moved temporarily.
	C 9.2 Spill response kits on board vessels.	**PS 9.2** Spill response bins/kits are maintained and located in close proximity to hydrocarbon storage areas and vessel deck equipment for use to contain and recover deck spills.	**MC 9.2.1** Marine verification records demonstrate spill response bins/kits are appropriately located and stocked, and regularly maintained.
	C 5.2 Refer to **Section 6.6.5**	**PS 5.2** Refer to **Section 6.6.5**	**MC 5.2.1** Refer to **Section 6.6.5**
	C 5.4 Refer to **Section 6.6.5**	**PS 5.4** Refer to **Section 6.6.5**	**MC 5.4.1** Refer to **Section 6.6.5**
	C 8.5 Refer to **Section 6.7.3**	**PS 8.5** Refer to **Section 6.7.3**	**MC 8.5.1** Refer to **Section 6.7.3**
	C 8.4 Refer to **Section 6.7.3**	**PS 8.4** Refer to **Section 6.7.3**.	**MC 8.4.1** Refer to **Section 6.7.3**
	Mitigation – hydrocarbon spill response.	Refer to **Appendix D** for discussion around the ALARP assessment of controls related to hydrocarbon spill response.	

6.7.5 Unplanned Discharge: Loss of Hazardous or Non-Hazardous Waste

Context	
Support Vessels Operations - **Section 3.6**	Biological Environment – **Section 4.6**

Risk 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/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental loss of solid hazardous or non-hazardous waste to the marine environment.			X			X		A	F	2	L	LCS GP	Broadly acceptable	**EPO 10**

Description of Source of Risk

The activity vessels generate a variety of solid wastes, including packaging, domestic wastes and hazardous wastes such as oil rags, batteries and waste oil. Hence, there is the potential for solid and hazardous wastes to be lost overboard to the marine environment. Equipment that has been recorded as being lost on previous activities has primarily been windblown or dropped overboard; and has included items such as personal protective equipment and small tools or materials. These events have occurred during backloading activities, periods of adverse weather and/or as a result of incorrect waste storage.

Consequence Assessment

The potential impacts of solid and hazardous 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. The temporary or permanent loss of waste materials into the marine environment is not likely to have a significant environmental impact based on the location of the Operational Area; frequency of vessel activities; and the types, size and frequency of wastes that could occur and the species present.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[24]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Contract 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.	Implementation of Marine Order 94 and 95 reduces the likelihood of a harmful substance being released to the environment. Implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Controls based on legislative requirements – must be adopted.	Yes **C 10.1**
Good Practice				
Vessel waste arrangements which require: • dedicated lidded waste segregation bins • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard 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 10.2**
If safe and practicable to do so, vessel, ROV or crane will be used to attempt recovery of material[25] environmentally hazardous or non-hazardous solid object/waste 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	F: Yes CS: Minimal cost. Standard practice.	Potentially reduces consequence by recovering object/waste container from the environment.	Benefit outweighs cost sacrifice.	Yes **C 10.3**

[24] Qualitative measure

[25] For this control /performance standard, 'material' is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of >F

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[24]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• ability to recover the object (i.e. nature of object, lifting equipment, or, ROV availability and suitable weather). Material dropped objects / waste that remain in the title will undergo an impact assessment and be added to the inventory.				
Incident reports are raised for unplanned releases within event reporting system.	F: Yes CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes **C 8.4**
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				

ALARP Statement

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the risks and consequences of accidental discharges of waste. 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

The impact assessment has determined that, given the adopted controls, accidental discharge of solid waste represents a low current risk rating that is highly unlikely to result in a potential consequence of localised and temporary impacts on species, habitat (but not affecting ecosystems function), physical and biological attributes. Further opportunities to reduce the risks and consequences have been investigated above. The potential for solid and hazardous wastes to be lost overboard to the marine environment has considered the potential risks to threatened species. The residual risk is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements (Marine Orders 94 and 95). The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of these discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 10 Environment risk from hazardous or non-hazardous waste management limited to moderate during the Petroleum Activities Program	**C 10.1** Contract 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 10.1** Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class.	**MC 10.1.1** Marine verification records demonstrate compliance with standard maritime safety procedures (Marine Orders 94 and 95).
	C 10.2 Vessel waste management arrangements which require: • Dedicated lidded 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 10.2** Hazardous and non-hazardous waste will be managed in accordance with the vessel waste management arrangements.	**MC 10.2.1** Records demonstrate compliance against vessel waste management arrangements.
	C 10.3 If safe and practicable to do so, vessel, ROV, or crane will be used to attempt recovery of material[26] environmentally hazardous or non-hazardous solid	**PS 10.3a** Material environmentally hazardous, non-hazardous solid waste or object/container dropped to the marine environment will be recovered where safe and practicable to do so.	**MC 10.3.1** Records detail the recovery of material environmentally hazardous or non-hazardous solid waste object/container dropped to the marine environment.

[26] For this control /performance standard, 'material' is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of >F

	object/waste 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, or, ROV availability and suitable weather). Any material dropped objects / waste that remain in the title will undergo an impact assessment and be added to the inventory.	**PS 10.3b** Where retrieval is not practicable and / or safe, material items (property) that are dropped to the marine environment will undergo an impact assessment and will be added to the inventory for the title.	**MC 10.3.2** First Priority records demonstrate outcomes of the safe and practicable evaluation, including an impact assessment for the objects remaining.
	C 8.4 Refer to **Section 6.7.3**	**PS 8.4** Refer to **Section 6.7.3**.	**MC 8.4.1** Refer to **Section 6.7.3**

6.7.6 Physical Presence: Vessel Collision with Marine Fauna

Context	
Support Vessels Operations - **Section 3.6**	Biological Environment – **Section 4.6**

Risk 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/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental collision between activity vessels and threatened and migratory marine fauna.						X		A	E	1	L	LCS GP PJ	Broadly Acceptable	**EPO 11**

Description of Source of Risk

Activity vessels operating in the Operational Area may present a potential hazard to marine fauna, including protected cetaceans, whale sharks and/or marine turtles. Vessel movements can result in collisions between the vessel (e.g. hull and propellers) and marine fauna.

There are a number of factors that contribute to the frequency and severity of impacts due to collisions; these factors include vessel type, vessel operation (e.g. specific activity, speed), the physical environment (e.g. water depth) and the type of animal potentially present; coupled with the animal's behaviour.

Consequence Assessment

The likelihood of vessel–whale collision being lethal is influenced by vessel speed; the greater the speed at impact, the greater the risk of mortality (Jensen and Silber, 2003; Laist *et al*., 2001). Furthermore, Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale as a result of a vessel strike increases from about 20% at 8.6 knots (kn) to 80% at 15 kn. Vessels within the Operational Area are likely to be travelling less than 8 kn, therefore, the chance of a vessel collision with protected species resulting in a lethal outcome is reduced. No known key aggregation areas (resting, breeding or feeding) are located within or immediately adjacent to the Operational Area. However, the following BIAs overlap with the Operational Area (refer to **Section 4.6** for more detail of seasonal timings):

- A migration corridor for the EOI pygmy blue whale (northern migration occurring April to August; southern migration October to January) and a known distribution area.
- A foraging BIA for the whale shark extending from the Ningaloo Coast along the northern WA coastline, following the 200 m isobath. This is an important migration route, with migration occurring annually between July to November (peak season).
- An internesting BIA for flatback turtles associated with nesting at the Montebello Islands (Hermite Island, Northwest Island and Trimouille Island; nesting occurring between December to March), however, scientific evidence on the movement of internesting flatback turtles (does not support their presence in offshore waters to the west of the main nesting beaches of the Montebello Islands.

It is possible that these species may occur in the vicinity of the Operational Area at various times during the year, with increased numbers during peak periods (**Section 4.6**).

According to the data of Vanderlaan and Taggart (2007), it is estimated that the risk is less than 10% at a speed of 4 kn. Vessel–whale collisions at this speed are uncommon and, based on reported data contained in the US NOAA database (Jensen and Silber, 2004), there are only two known instances of collisions when the vessel was travelling at less than 6 kn. Both were from whale watching vessels that were deliberately placed amongst whales.

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 offshore NWS waters including the Operational Area during their migrations to and from Ningaloo Reef (the Operational Area overlaps with the foraging BIA for this species, as mentioned above).

Consequence Assessment
However, it is expected that whale shark presence within the Operational Area would not comprise significant numbers, given there is no main aggregation area within the vicinity of the Operational Area, hence their presence would be transitory and of a short duration. Marine mammals and fish are at risk of mortality through being caught in thrusters during station keeping operations (i.e. DP). The risk of marine life getting caught in operating thrusters is unlikely, given the low presence of individuals, combined with the avoidance behaviour commonly displayed during DP operations. Considering the absence of potential nesting or foraging habitat (i.e. no emergent islands, reef habitat or shallow shoals) and the water depth within the Operational Area, it is unlikely that the Operational Area represents important habitat for marine turtles, however, marine turtles may transit the area. It is acknowledged that there are significant nesting sites for marine turtles along the mainland coast and islands of the Pilbara region (e.g. Montebello Islands located 46 km south-east of the Operational Area). Summarily, it is unlikely that vessel movement associated with the Petroleum Activities Program will have a significant impact on marine fauna populations given (1) the low presence of transiting individuals (2) avoidance behaviour commonly displayed by whales and turtles and (3) low operating speed of the support vessels (generally less than 8 kn or stationary, unless operating in an emergency).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[27]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Implement EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans	F: Yes. CS: Minimal cost. Standard practice.	Implementing these controls will reduce the likelihood of a collision occurring between a cetacean. The consequence of a collision is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 11.1**
Good Practice				
Extend application of EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans to turtles and whale sharks.	F: Potentially, however turtles and whale sharks are hard to detect at sea (Operational Area water depth is about 71 to 177 m). Whale sharks and turtles may be more difficult to detect than whales, due to their size (turtles) and the absence of clearly visible surface behaviour (e.g. blows). Additionally, turtles typically dive in response to disturbance, therefore would not always be feasible to implement. CS: Minimal cost.	Given the expected low numbers of turtles and whale sharks within the Operational Area, interactions between vessels and turtles/whale sharks are considered to be highly unlikely, therefore adopting the control would provide low benefit.	Disproportionate. Interactions between vessels and turtles/whale sharks are considered to be highly unlikely, therefore adopting the control would provide low benefit given its low effectiveness.	No

[27] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[27]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Vary the timing of the Petroleum Activities Program to avoid whale migration and marine turtle breeding/nesting periods.	F: No. Timing of activities is linked to the IMMR schedule which are an operational requirement. The timing will, therefore, not be altered to consider seasonal timings of marine fauna. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Eliminate				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
The use of dedicated MFOs on support vessels for the duration of each activity to watch for whales and provide direction on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes, however vessel bridge crews already maintain a constant watch during operations, and crew complete specific cetacean observation training. CS: Additional cost of MFOs considered unnecessary.	Given support vessel bridge crews already maintain a constant watch during operations, a dedicated MFO would not significantly reduce the risk further.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted control appropriate to manage the impacts and risks of potential vessel collision with marine fauna. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, vessel collision with marine fauna represents a low current risk rating that is highly unlikely to result in a potential impact greater than slight, short term disruption to a small proportion of the population, and no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. Relevant BIAs within the Operational Area include the EOI pygmy blue whale migration BIA, flatback turtle internesting BIA and the whale shark foraging 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 good practice/industry best practice and meet the requirements of Part 8 (Division 8.1) of the EPBC Regulations 2000. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of vessel collision with marine fauna to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 11 No mortality of cetaceans resulting from interactions with activity vessels	**C 11.1** Implement EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans: • Vessels will not travel >6 knots within 300 m of a cetacean (caution zone) and not approach closer than 100 m from a whale. • Vessels will not approach closer than 100 m from a whale (with the exception of animals' bow riding). • If the cetacean shows signs of being disturbed, activity support vessels will immediately withdraw from the caution zone at a constant speed of <6 knots.	**PS 11.1** Woodside vessels will comply with: EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with Cetaceans to manage the risk to fauna collision.	**MC.11.1.1** Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans and Woodsides Marine Charterers Instructions **MC 11.1.2** Records demonstrate reporting cetacean ship strike incidents to the National Ship Strike Database.

6.7.7 Physical Presence: Introduced Marine Species

Context		
Support Vessels Operations - **Section 3.6**	Physical Environment – **Section 4.5** Biological Environment – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

	Environmental Value Potentially Impacted							*Evaluation*						
Source of Risk	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socio-economic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
IMS in vessel ballast tanks or on vessels/submersible equipment.					X	X	X	A	E	1	L	LCS GP PJ	Broadly Acceptable	**EPO 12**

Description of Source of Risk

During the Petroleum Activities Program, vessels and submersible equipment have the potential to introduce Invasive Marine Species (IMS) to the Operational Area which may then subsequently be translocated to the Wheatstone Platform through biofouling and ballast water exchange; as described below.

Vessels

During the Petroleum Activities Program vessels will transit to and from the Operational Area. Project vessels may be sourced from the local area (Dampier, Port Hedland, etc.) or from further afield (e.g. international waters), depending on the type of vessel required and the availability of vessels.

All vessels are subject to some level of marine fouling. Organisms may attach to the vessel hull, particularly in areas where organisms can find a good attachment surface (e.g. seams, strainers and unpainted surfaces), and/or in areas where turbulence is lowest (e.g. niches and sea chests). Commercial vessels maintain anti-fouling coatings to reduce the build-up of fouling organisms.

Organisms can also be drawn into ballast tanks during onboarding of ballast water as cargo is loaded or to balance vessels under load.

Submersible Equipment

Submersible equipment required for IMMR activities (e.g. ROV/AUV) is transported to and used within the Operational Area. There is the potential that this equipment may be used on other projects before being used on this activity. As a consequence, there is the potential for IMS translocation.

Consequence Assessment

Non-indigenous Marine Species (NIMS) are those species that have been introduced into a region beyond their natural biogeographic range and have the ability to survive, reproduce and establish founder populations. Not all NIMS introduced into an area will thrive or cause demonstrable impacts (i.e. become IMS). Indeed, the majority of NIMS around the world are relatively benign and few have spread widely beyond sheltered ports and harbours. Only a subset of NIMS that become abundant and impact on social/cultural, human health, economic and/or environmental values can be considered IMS.

Potential IMS have historically been introduced and translocated around Australia by various natural and human means including biofouling and ballast water (as mentioned above). 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.

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

Consequence Assessment
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. While the support vessels have the potential to introduce IMS into the Operational Area, the deep offshore open waters of the Operational Area (71 to 177 m) are not conducive to the settlement and establishment of IMS. Furthermore, the Operational Area is away from shorelines and/or critical habitat. The nearest sensitive receptor is the Montebello Marine Park a small portion of which is located within the Operational Area, however the water depths are greater than 50 m, with the shallower nearshore waters of the Montebello Islands about 46 km (25 nautical miles) from the Operational Area. It is therefore not expected that settlement and establishment of IMS within the Marine Park could occur as a result of the Petroleum Activities Program. The likelihood of IMS being introduced and establishing viable populations within the Operational Area or surrounds is not considered credible. The potential translocation from a vessel to the Wheatstone Platform could potentially impact the platform operationally through the fouling of intakes and require costly cleaning and treatment. Such an introduction would be expected to have a local impact to industry reputation. Given that interactions between the vessels and platform are limited to short infrequent periods and that there is no direct contact spread of marine pests via ballast water in the open ocean environment is also considered highly unlikely due to lack of suitable habitat for settlement and establishment. Most vessels used during the Petroleum Activities Program are typically sourced from Australia and are not considered high risk for IMS introduction. Given this, the likelihood of introducing/acquiring IMS during the Petroleum Activities Program and subsequently translocating to the Wheatstone platform is considered highly unlikely and considered manageable given the ballast water and biofouling controls that will be implemented.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[28]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
All 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 management option will reduce the likelihood of transfer of marine pests between vessels within the Operational Area and subsequently translocating to the Wheatstone platform. No change in consequence would occur.	Controls based on legislative requirements under the Commonwealth *Biosecurity Act 2015* – must be adopted.	Yes **C 12.1**
Good Practice				
Woodside's IMS risk assessment process will be applied to the project vessels and immersible equipment. Assessment will consider the following risk factors: For vessels: • vessel type	F: Yes. CS: Minimal cost. Good practice implemented across all Woodside operations.	Identifies potential risks and additional controls implemented accordingly. In doing so, the likelihood of transferring marine pests between platform and project vessels within the Operational Area is reduced. No change	Benefits outweigh cost/sacrifice.	Yes **C 12.2**

[28] Qualitative measure

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[28]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
• recent IMS inspection and cleaning history, including for internal niches • out-of-water period prior to 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 greater than seven 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 the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.		in consequence would occur.		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[28]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Source vessels based in Australia only.	F: Yes. Support vessels are routinely sourced from Australia. However, depending on the nature of subsea IMMR activities, there may not be a suitable subsea support vessel within Australian waters. CS: Significant cost and schedule impacts due to restrictions of vessel hire opportunities.	Reduction in the likelihood that a vessel will host IMS.	Disproportionate. The cost /sacrifice is grossly disproportionate to the benefit gained.	No
Inspect all vessels for IMS.	F: Yes. Approach to inspect vessels could be feasible. 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 marine pests through biofouling, while targeting its efforts and resources to areas of greatest concern.	Inspecting 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 to be implemented achieve an ALARP position.	No
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement Based on the environmental risk assessment objectives and use of the relevant tools appropriate to the Decision Type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of introducing IMS. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, translocation of IMS may result in slight impact, and the likelihood of introducing IMS to the Operational Area and then subsequently to the Wheatstone Platform is considered highly unlikely. BIAs within the Operational Area include the EIO pygmy blue whale migration BIA, flatback turtle internesting BIA, whale shark foraging BIA, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted by IMS. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good practice/industry best practice. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of IMS to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 12 No introduction and establishment of invasive marine species into the Operational Area as a result of the Petroleum Activities Program.	**C 12.1** Activity 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 12.1** Activity vessels manage ballast water in accordance with Australian Ballast Water Management Requirements	**MC 12.1.1** Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements.
	C 12.2 Woodside's IMS risk assessment process will be applied to activity vessels and immersible equipment. Assessment will consider the following risk factors: • For vessels • vessel type • recent IMS and cleaning history, including for internal niches • out of-water period prior to 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 greater than seven days • region of stationary or slow periods	**PS 12.2** Prior to entering the Operational Area activity vessels and relevant immersible equipment are determined to be low risk[29] of introducing IMS of concern	**MC 12.2.1** Records of IMS risk assessments maintained for all activity vessels and relevant immersible equipment entering the Operational Area to undertake the Petroleum Activities Program.

[29] 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***
	• 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 the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced		

6.8 Unplanned Activities (Accidents, Incidents, Emergency Situations) – Major Environmental Event

The risk considered in this section has been identified as a MEE due to the potential for significant consequence. These sources of risk are subject to additional consideration in accordance with the process described in **Section 2.7**.

The MEE presented is as a result of hydrocarbon loss of containment to the marine environment and atmosphere. The risk assessment has been informed using quantitative hydrocarbon spill modelling. An overview of the MEE is provided in **Section 6.8.1**.

6.8.1 MEE Overview

Section 2.7 outlines the process for additional analysis and evaluation of MEEs. **Section 6.8.2** presents the bowtie output for the MEE identified (**Table 6-10**).

Table 6-10: MEE Events for the Julimar Operations

No.	Hazard	Top Event
MEE-01	Unplanned Hydrocarbon Release	Loss of Well Containment

Section 6.8.2 summarises the hazard description, hazard management, emergency response, ALARP summary and a list of SCE barriers identified on the bowtie. Each group of SCEs is listed under Technical Performance Standards, with consistent naming conventions used across Woodside's process safety management processes (e.g. pipeline integrity SCEs are captured as P09 – Pipeline Systems).

Section 6.8.2 presents the bowtie that illustrate the causes, outcomes and controls/barriers in place to manage potential common cause event (CCE) failure mechanisms for MEE controls associated with generic SCE equipment failure and also human error. Human Error is managed via the WMS and the Generic Human Error is included in the MEE section for completeness.

ALARP is demonstrated through controls and barriers being analysed for selection based on their independence, prioritised in accordance with the Hierarchy of Controls where controls further up the hierarchy take precedence over controls further down, and further analysed to consider the type of effect the control provides. ALARP controls presented for MEE bowties are labelled in accordance with Type of Effect classifications presented in **Table 6-11**.

Woodside has developed a tailored ALARP position for hydrocarbon spill response, including EPOs, EPSs and MC for preparedness and response. The response arrangements are a mitigative control that applies to all MEEs where a hydrocarbon release may credibly occur. The hydrocarbon spill response arrangements are described in **Appendix D**.

Table 6-11: Barrier Hierarchy and Type of Effect

Type of Effect	Legend	Description
Elimination (Technical)		Elimination controls form the 'first line of defence'. They eliminate the underlying hazard and therefore are the most effective category of control measure. If practicable, they should be selected in preference to any other type, as their existence removes the need for any other controls (e.g. a corrosion-resistant metal could replace the original material of construction).
Elimination (Administration)		
Prevention (Technical)		Prevention controls are intended to remove certain causes of incidents or reduce their likelihood. The corresponding hazard remains, but the frequency of incidents involving the hazard is lowered (e.g. introduction of regular maintenance programs can prevent the development of events involving the hazard). Where hazards and causes could not be 'eliminated', controls are required to prevent them from leading to unwanted events and consequences.
Prevention (Administration)		
Detection (Technical)		Detection controls are those that identify a potentially hazardous scenario (e.g. a change in operating parameters), allowing initiation of procedures or systems to prevent the cause occurring. Controls that detect the occurrence of events are often critical to being able to respond with other control measures that reduce the propagation of the events. Detection controls themselves often provide no actual control other than the awareness of the need to respond.
Detection Administration)		
Reduction/Control (Technical)		Reduction controls are intended to limit the scale and consequence of incidents. They include systems that detect incidents and take some action (e.g. to reduce the rate of leakage of a toxic gas) and also aspects such as inter-unit separation that prevent escalation of fire and explosion incidents. As there is always potential for controls to fail, additional measures are required to limit the scale and severity of any unwanted event or outcome that may arise, by providing the ability to intervene and limit the propagation of the events.
Reduction/Control (Administration)		
Mitigation (Technical)		Mitigation controls take effect in response to an incident. They include controls that lessen the significance or damage caused by an unwanted event. Such controls only take effect after the hazardous event and outcomes occur. Mitigation controls are generally those designed to protect personnel against the consequences of a hazard or to aid in recovering from the effects of the hazard.
Mitigation (Administration)		

6.8.2 Unplanned Hydrocarbon Release: Loss of Well Containment (MEE-01)

Context		
Field Inventory - **Section 3.5.1**	Physical Environment – **Section 4.5** Biological Environment – **Section 4.6** Socio-economic and Cultural – **Section 4.7** Values and Sensitivities – **Section 4.8**	Stakeholder Consultation – **Section 5**

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	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of well containment of reservoir fluids from a Julimar or Brunello well (e.g. Xmas Tree, well production tubing etc.) resulting in loss of hydrocarbons to the environment.		X	X	X	X	X	X	B	B	1	M	LCS GP PJ RBA CV SV	Acceptable if ALARP	**EPO 13**

Description of Source of Risk

Background

A loss of well containment can lead to an uncontrolled release of reservoir hydrocarbons and associated fluids to the environment resulting in a well blowout. Woodside has identified a well blowout as the scenario with the worst-case credible environmental outcome as a result of this event. Due to the potential consequences, a loss of well containment is considered to be a MEE (MEE-01). A loss of well containment could occur due to a variety of causes, including:

- internal corrosion
- external corrosion
- erosion
- mechanical failure
- overpressure of the annuli in conjunction with failure of a primary containment measure
- loss of control of suspended load from vessel (operating near subsea wells).

A number of common failure causes due to human error and SCE failures are presented in the bowties in **Figure 6-4**, and **Figure 6-5**.

Loss of Well Containment – Credible Scenarios

The Petroleum Activities Program includes production from up to 14 subsea wells. One credible worst-case loss of well containment scenario was identified for the Petroleum Activities Program; Well blow-out at seabed – BRUA-2 well. The credible worst-case subsea release was based on a review of all the JDP2 wells and the existing Brunello wells, with BRUA-2 evaluated to be the worst-case scenario due to a higher condensate gas ratio as compared to the JDP2 wells.

The loss of well containment scenario was modelled to a duration of 75 days which is the estimated time required to successfully drill a relief well. The characteristics of Brunello Condensate was used as the basis in the modelling – refer to **Section 6.7.1** for additional information on modelling methods and environmental impact, thresholds and hydrocarbon characteristics justifications.

Table 6-12: Summary of Worst-case Loss of Well Containment Hydrocarbon Release Scenario

Scenario	Hydrocarbon	Average Rate (m^3/day	Duration (days)	Depth (m)	Latitude (WGS84)	Longitude (WGS84)	Release Volume (m^3)
Well blow-out at seabed – subsea well with highest condensate gas ratio	Brunello Condensate	741.9	75	149	20°01' 49.1571" S	115°12' 05.6357" E	55,647

Decision Type, Risk Analysis and ALARP Tools

Woodside has a good history of implementing industry standard practice in well design and construction. In the company's recent history, it has not experienced any well integrity events that have resulted in significant releases or significant environmental impacts. The Julimar subsea system has never experienced a worst-case loss of well containment in its operational history.

Decision Type

A Decision Type B has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this Decision Type, a further level of analysis has been applied using risk-based tools including the Bowtie Methodology (described in **Section 2.7.3**) and hydrocarbon spill trajectory modelling. Company and societal values were also considered in the demonstration of ALARP and acceptability, through peer review, benchmarking and stakeholder consultation.

The release of hydrocarbons as a result of well loss of containment is considered a MEE (MEE-01). The hazard associated with this MEE is hydrocarbons in subsea wells.

Quantitative Spill Risk Assessment

Spill modelling of the worst-case credible loss of well containment spill scenario was undertaken by RPS, on behalf of Woodside, over a 75-day simulation length to determine the fate of hydrocarbons released based on the assumptions in **Section 6.7.1**. Modelling was undertaken over all seasons to address year-round operations. This is considered to provide a conservative estimate of the EMBA and the potential impacts from the identified worst-case credible release volumes for all loss of well containment scenarios.

Likelihood

In accordance with the Woodside Risk Matrix, a worst-case loss of well containment has been defined as 1 (Highly Unlikely). Information to support this likelihood determination is outlined below.

Review of industry statistics indicates that the probability of a loss of well containment for production wells is low (10.6% of blowouts) relative to other activities in other hydrocarbon provinces (Gulf of Mexico and the North Sea), such as exploration drilling (31.5% of blowouts), development drilling (23.6% of blowouts) and well workovers (20.5% of blowouts) (SINTEF, 2017).

Separate analysis of blowout data collected between 1991 and 2010 in the North Sea and the US Gulf of Mexico shows that only ten blowouts occurred during the production phase at a frequency of 1.36×10^{-5} blowouts per well year, with all of these events occurring in the US Gulf of Mexico and none occurring in the North Sea (Scandpower, 2013). North Sea standards of well design and operation are considered to be aligned with those applied by Woodside, as outlined in the Julimar Well Operations Management Plan (WOMP). This data supports the likelihood ranking as described above.

When considering likelihood from an 'Experience' perspective and considering likelihood of the environmental consequence of the blowout event, historic blowouts from production wells that have had a catastrophic impact to the environment ('A' consequence rating) have not occurred in the industry. This also further supports the likelihood ranking of 'Highly Unlikely' for subsea wells.

Consequence

The spatial extent and fate (including weathering) of the spilled hydrocarbon were considered during the impact assessment for a worst-case loss of well containment (presented in the following section). In addition to condensate in the reservoir fluids, environmental impact assessment considerations included the mercury (Hg) content in some of the Brunello wells, which would see predominantly elemental Hg being released to the marine environment. A screening assessment was conducted to determine whether any of the hydrocarbon components or Hg will dominate the toxicity of the reservoir fluids. It was determined that although the 99% species protection criteria for Hg (0.1 ug/L) in comparison to the 100 ppb (100 ug/L) impact threshold for entrained hydrocarbons indicates Hg is a 1000 times more toxic to marine environment than hydrocarbons, the entrained hydrocarbon content exceeded the worst case Hg content in reservoir fluids by a factor of 40,000 indicating the overall toxicity of the released well fluids would be determined by the concentrations of hydrocarbons in the water column. Subsequent consequent modelling and risk assessment considered therefore the fate of hydrocarbons in the marine environment. These considerations were informed primarily by the outputs from the numerical modelling studies undertaken by RPS, available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill (**Section 44**) and relevant literature and studies considering the effects of hydrocarbon exposure. In accordance with the Woodside Risk Matrix, the unlikely event of a worst-case loss of well containment has been defined as having a ‘B’ consequence rating (Major, long-term impact).

Consequence Assessment

Environment that May be Affected

The overall EMBA for the Petroleum Activities Program is based on stochastic modelling which compiles data from multiple hypothetical worst-case spill simulations under a variety of weather and metocean conditions (as described in **Section 6.7.1**). The EMBA therefore covers a larger area than the area that would be affected during any 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.

<u>Surface Hydrocarbons</u>

Quantitative hydrocarbon spill modelling results for surface hydrocarbons are shown in **Table 6-13.** The modelled hydrocarbon slick is forecast to drift in all directions depending on the modelled parameters, reflecting the competing influence of both surface currents and winds across the wide area, and may extend up to 13 km south east from the release site at concentrations above the impact threshold (10 g/m^2). The Montebello Marine Park has a 4 % probability of impact by surface (floating) hydrocarbons with a minimum time to receptor of 60 hrs. This limited impact area is due to the rapid weathering (evaporation/entrainment) of the hydrocarbon. Surface hydrocarbons above the 1 g/m^2 socio-economic threshold are also predicted at the Montebello Islands Marine Park.

<u>Entrained Hydrocarbons</u>

Quantitative hydrocarbon spill modelling results for entrained hydrocarbons are shown in **Table 6-13**. The modelled entrained hydrocarbons are forecast to potentially drift in all directions, extending up to 338 km from the release site at or above the 100 ppb impact threshold level. Contact by entrained oil at concentrations equal to or greater than 100 ppb is predicted at the Montebello Marine Park (86% probability) and Montebello Islands State Marine Park (8%), Rankin Bank (44% probability), Ningaloo Coast (21% probability), Muiron Islands (18% probability) and Gascoyne Marine Park (17%), Barrow Island (8%) and Pilbara Islands (Southern Island group) (4%) (**Table 6-13**). The maximum entrained oil concentration forecast for any receptor is predicted at 1300 ppb within the Montebello Marine Park. **Table 6-13** indicates entrained threshold concentration contact locations for receptors as identified by the modelling.

<u>Dissolved Hydrocarbons</u>

Quantitative hydrocarbon spill modelling results for dissolved hydrocarbons are shown in **Table 6-13**. The modelled dissolved hydrocarbons are forecast to potentially drift in all directions, extending up to 223 km from the release site at the 50 ppb impact threshold level. Contact by dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb impact threshold is predicted to be greatest within Montebello Marine Park (76% probability) and at Rankin Bank (15%), with possible contact at several other receptors at probabilities of 1% (**Table 6-13).** The maximum dissolved aromatic hydrocarbon concentration forecast for any receptor is predicted as 400 ppb within the Montebello Marine Park.

<u>Accumulated Hydrocarbons</u>

Quantitative hydrocarbon spill modelling results for accumulated hydrocarbons are shown in **Table 6-13**. No shoreline accumulation in excess of the 100 g/m^2 ecological threshold is predicted. There is however a chance of accumulation of oil on shorelines above the 10 g/m^2 socio-economic thresholds, including Muiron Islands (9%), Barrow Island (1%), Montebello Islands (2%), Pilbara (3%) and Ningaloo Coast (4%), with a maximum accumulated volume of 3 m^3 and a maximum local accumulated concentration of 73 g/m^2 (Muiron Islands).

<u>Consequence Assessment Summary</u>

Table 6-13 presents the full extent of the EMBA; i.e. the sensitive receptors and their locations that may be exposed to hydrocarbons (surface, entrained, dissolved and accumulated) at or above the set impact threshold concentrations in the remote likelihood of a major hydrocarbon release from a loss of well control occurring during the Petroleum Activities Program. Details of these receptors are outlined in **Section 4**. The potential biological and ecological impacts of an unplanned hydrocarbon release as a result of a loss of well integrity during the Petroleum Activities Program are presented in the following sections.

Table 6-13: Key Receptor Locations and Sensitivities Potentially Contacted Above Impact Thresholds by the Loss of Well Containment Scenario with Summary Hydrocarbon Spill Contact (Table Cell Values Correspond to Probability of Contact [%])

Environmental setting	Location / name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure [WM0000PG10055394])																													Probability of hydrocarbon contact and fate (%)					
		Physical		Biological																						Socio-economic 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 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 (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas/Heritage – European and Indigenous/Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (≥1 to 10 g/m²)	Surface hydrocarbon (≥10 g/m²)	Entrained hydrocarbon (≥100 ppb)	Dissolved aromatic hydrocarbon (≥50 ppb)	Accumulated shoreline hydrocarbons (≥10 g/m²)	Accumulated hydrocarbons (>100 g/m²)
Offshore[30]	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		92	4	86	76		
	Ningaloo AMP	✓	✓					✓		✓					✓	✓			✓		✓	✓	✓	✓	✓	✓		✓	✓							
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			17			
Submerged Shoals and Banks	Rankin Bank	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓					44	15		
	Glomar Shoal	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓								
Islands	Montebello Islands (including State Marine Park)	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				8	1	2	
	Barrow Island (including State Nature Reserves, State Marine Park and Marine Management Area)	✓	✓	✓	✓		✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			8	1	1	
	Lowendal Islands (including State Nature Reserve)	✓	✓	✓	✓		✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			1			
	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserves)	✓	✓		✓	✓	✓		✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓				4		3	
	Pilbara Islands – Middle Island Group	✓	✓		✓	✓	✓		✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓							

[30] Note: hydrocarbons cannot accumulate on open ocean, submerged receptors, or receptors not fully emergent.

	Muiron Islands (WHA, State Marine Park)	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓				18		9	
Mainland (nearshore waters)	Ningaloo Coast (North/North West Cape, Middle and South) (WHA, and State Marine Park)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓				21	1	4	

Summary of Potential Impacts to Environmental Values
Modelling shows that about 78 to 83% of the hydrocarbon released is predicted to evaporate within 24 hrs depending on wind conditions, and a further 10% should evaporate over several days, with only about 7% shown to be persistent (RPS APASA, 2020). About 24 hrs after the spill, around 16% of the hydrocarbon mass is forecast to have entrained, leaving only a small proportion of the hydrocarbon floating on the water surface (<4%). Surface hydrocarbons are predicted to remain within 13 km of the release location travelling towards the southeast, potentially reaching the Montebello Marine Park. Entrained and dissolved hydrocarbons can travel much greater distance of up to 338 km and 223 km respectively, potentially reaching the Montebello Marine Park, Rankin Bank, Ningaloo Coast, Muiron Islands, Gascoyne Marine Park, Barrow Island and Pilbara Islands, however due to weathering entrained and dissolved hydrocarbons would be in a degraded state by the time most receptors are impacted. No shoreline accumulation above ecological impact thresholds is expected.
Openwater Environment (Near Spill Area)
Air Quality A hydrocarbon release resulting from a loss of well containment has the potential to result in short-term reduction in air quality and contribution of GHG (CH_4 and reservoir CO_2) to the atmosphere. GHG components contributes to the rise in the concentrations of these gases in the atmosphere, however it is the non-methane volatile organic compounds (VOCs) could potentially cause adverse effects on human health (e.g. vessel based oil response teams) and avifauna exposed to the VOC species in the plume. The ambient concentrations of VOCs released from diffuse sources is difficult to accurately quantify, although their behaviour and fate are predictable in open offshore environments, as emissions disperse rapidly under the forces of wind and ambient air temperature differences. As they disperse, VOCs react with photochemically active radicals in the atmosphere and participate in the formation of ozone, aerosols and contribute also to the increase of GHG concentrations in the atmosphere. Given the volatile and temporary nature of any VOC emissions (from either gas surfacing or weathering of liquid hydrocarbons from a loss of well containment), their dispersion and relatively high reactivity in the atmosphere, as well as the significant distance from the Operational Area to the nearest populated area (Barrow Island; about 72 km and the town of Dampier 160 km), a worst-case hydrocarbon spill scenario has the potential to result in minor and short-term impacts to air quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location in offshore waters.
Water Quality Water quality would be affected due to hydrocarbon contamination above impact thresholds. These are defined by the EMBA descriptions for each of the surface, entrained and dissolved hydrocarbon fates and their predicted extent. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in slight, short-term impacts to water quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location in offshore waters.
Marine Sediment Quality Marine sediment quality would be reduced as a consequence of hydrocarbon contamination for a relatively small area within the immediate release site medium to long term, as hydrocarbons in sediments typically undergo slower weathering and degradation (Diercks *et al*., 2010; Liu *et al*., 2012). There is the potential for floating and entrained hydrocarbons to sink following extensive weathering and adsorption of sediment particles, which may result in the deposition of hydrocarbons to the seabed in areas distant from the release location. Such hydrocarbons are expected to be less toxic due to the weathering process. Studies of hydrocarbon concentrations in deep-sea sediments in the vicinity of a catastrophic well blowout indicated hydrocarbons can be incorporated into sediments (Romero *et al.*, 2015). Proposed mechanisms for hydrocarbon contamination of sediments include sedimentation of hydrocarbons and direct contact between submerged plumes and the seabed (Romero *et al.*, 2015). In the event of a major hydrocarbon release at the seabed, modelling indicates that a pressurised release of hydrocarbons form droplets that would be transported into the water column to the surface (i.e. transported away from the seabed). Potential impacts predicted are most likely closest to the immediate release site due to direct seabed contact of released hydrocarbons though the main transport of hydrocarbons will be through the water column to surface waters and has the potential to result in medium to long term localised impacts to offshore seabed sediment quality at the release site and slight, short to medium term impacts to the seabed sediment quality within the wider EMBA.
Benthic Fauna Communities Benthic fauna (macrobenthos and epifauna) within the relatively small area of predicted impacts to seabed sediments in the immediate release site (as described above) would be highly likely to be impacted due to hydrocarbon exposure above ecological thresholds. However, in the event of a major release at the seabed, the stochastic spill model predicted the entrainment of hydrocarbon droplets and rapid transport to the sea surface limiting the exposure and potential ecological impact footprint to benthic communities. The low sensitivity, widespread benthic communities associated with the unconsolidated, soft sediment habitat and sparse, if any epifauna (see filter feeders, below) are not expected to have widespread exposure to released hydrocarbons.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to benthic communities (epifauna and infauna) within the EMBA, with potential impacts predicted to be greatest for habitats closest to the potential release location.

Filter Feeders

Hydrocarbon exposure may occur to offshore filter feeding communities (e.g. sponge and octocoral/soft coral communities present on exposed hard substrates within the EMBA associated with features such as Rankin Bank but not expected for deeper filter feeding benthic communities associated with the KEFs within the EMBA: the Ancient Coastline 125 m KEF, Canyons linking the Cuvier Abyssal Plain, the Cape Range Peninsula KEF, Continental Slope Demersal Fish Communities KEF, or other locations as identified in **Section 4.6.1.5**) based on the entrained/dissolved hydrocarbons subsea plumes being in the upper water column.

Exposure to entrained/dissolved aromatic hydrocarbons above thresholds has the potential to result in lethal or sublethal toxic effects. Sublethal impacts, including mucus production and polyp retraction, have been recorded for gorgonians (seawhip and seafan octocorals) exposed to hydrocarbons (White et al., 2012). Any impacts may result in localised long-term effects to community structure and habitat.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to filter feeders within the EMBA, with impacts predicted to be greatest for filter feeding benthic communities closest to the potential release location.

Productivity

Primary production by plankton (triggered by sporadic upwelling events in the offshore waters) is an important component of the primary marine food web. Planktonic communities are generally mixed, including phytoplankton (cyanobacteria and other microalgae), secondary consuming zooplankton (e.g. copepods), and the eggs and larvae of fish and invertebrates (meroplankton). Exposure to hydrocarbons in the upper 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 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 surface, 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).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to plankton populations within the EMBA, with impacts predicted to be greatest for plankton populations in the offshore waters closest to the potential release location.

Pelagic and Demersal Fish Populations

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 capable of eliminating the toxicants once placed in clean water, so individuals exposed to a hydrocarbon release 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 and the *Florida* in 1969) have occurred in sheltered bays.

Laboratory studies have shown that adult fish are able to detect hydrocarbons in water at very low concentrations, and large numbers of dead fish have rarely been reported after hydrocarbon spills (Hjermann *et al*., 2007). This suggests that juvenile and adult fish are capable of avoiding water contaminated with high concentrations of hydrocarbons. However, sublethal impacts to adult and juvenile fish may be possible, given long-term exposure (days to weeks) to polycyclic aromatic hydrocarbon (PAH) concentrations (Hjermann *et al*., 2007), which are typically the most toxic components of hydrocarbons. Light molecular weight aromatic hydrocarbons (i.e. one- and two-ring molecules) are generally soluble in water, which increases bioavailability to gill-breathing organisms such as fish.

The effects of exposure to hydrocarbons 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 help eliminate ingested oil from the fish (Cohen *et al*., 2005).

Fish are perhaps most susceptible to the effects of hydrocarbon spills in their early life stages, particularly during egg and planktonic larval stages, which can become entrained in spilled oil. Contact with oil droplets can 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 in early life stages to hydrocarbons include disruption to complex behaviours 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 (pre-settlement) 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 species are associated with the Ancient Coastline KEF, which overlaps the Operational Area. The Continental Slope Demersal Fish Communities KEF is 1 km west of Operational Area and has a highly diverse fish assemblage with a high degree of endemism (DoEE, 2019). Mortality and sublethal effects may impact populations located close to a loss of well control but within the wider EMBA entrained/dissolved aromatic hydrocarbons subsea plumes in the upper water column will reduce exposure and potential impacts. Additionally, if prey (infauna and epifauna) surrounding the well location and within the EMBA is contaminated, this can result in the absorption of toxic components of the hydrocarbons (PAHs), potentially impacting fish populations that feed on such prey.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to demersal fish assemblages, particularly, in the area surrounding the release site but slight impacts to pelagic fish species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' movements and distributions.

Protected Places

Potential Impacts to Australian Marine Parks (offshore waters)

Montebello Marine Park

The Montebello Marine Park comprises an area about 3,413 km², all of which is zoned as a Multiple Use Zone (IUCN VI). This AMP ranges in depth from less than 15 m up to 150 m.

The Montebello Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Province. It includes one key ecological feature: the ancient coastline at the 125-m depth contour, however impacts to this KEF and in particular its valued unique seafloor feature with ecological properties of regional significance, are expected to be limited to the immediate location of a potential release (see Benthic Communities and Filter Feeders above).

The Marine Park provides connectivity between deeper waters of the shelf and slope, and the adjacent Barrow Island and Montebello Islands State Marine Parks. A prominent seafloor feature in the Marine Park is Trial Rocks consisting of two close coral reefs. The reefs are emergent at low tide. There is potential for impacts to shallow coral reef communities, particularly those fringing the Montebello Islands due to its proximity to the potential release location, and these are considered in nearshore impacts description below.

<u>Natural values</u>

The bioregion includes diverse benthic and pelagic fish communities, and the ancient coastline is thought to be an important seafloor feature and migratory pathway for humpback whales. A key ecological feature of the Marine Park is the ancient coastline at the 125-m depth contour where rocky escarpments provide biologically important habitat in areas otherwise dominated by soft sediments. The Marine Park supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. Biologically important areas within the Marine Park include breeding habitat for seabirds, internesting, foraging, mating, and nesting habitat for marine turtles, a migratory pathway for humpback whales and foraging habitat for whale sharks.

The benthic habitat of the ancient coastline at the 125-m depth contour KEF is not expected to be impacted by a spill due to the buoyant nature of hydrocarbons, however the potential impacts to each of the other natural values are discussed throughout the sections below and range from moderate, medium term to major long-term potential impacts.

<u>Cultural values</u>

There is limited information about the cultural significance of this Marine Park, however it is noted that sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and managing their sea country for tens of thousands of years.

Potential impacts to cultural values of the Marine park will closely tie in with the impacts to the natural values of the Marine Park as addressed above and below range from moderate, medium term to major long term potential impacts.

<u>Heritage values</u>

There are no international, Commonwealth or national listings apply to the Marine Park. Two historic shipwrecks are located within the Marine Park. Shipwrecks occurring in the subtidal zone may be exposed to entrained/dissolved hydrocarbons, and marine life that shelter and take refuge in and around these wrecks may be affected by in-water toxicity of dispersed hydrocarbons. Potential impacts to each of these natural values are discussed throughout the sections below and range from moderate, medium term to major long term potential impacts.

<u>Social and economic values</u>

Tourism, commercial fishing, mining and recreation are important activities in the Marine Park. These activities contribute to the wellbeing of regional communities and the prosperity of the nation.

A hydrocarbon spill that results in visible slicks in coastal waters and on shorelines will disrupt recreational activities, particularly tourism, recreation and supporting services. In the event of a well blowout, surface hydrocarbons reach up to 13 km from the release location, which may enter the Montebello Marine Park. There is the potential for stakeholder perception that this environment would be contaminated over a large area and for the longer term, resulting in a prolonged period of tourism decline, however this is expected to be limited due the minor concentrations predicted.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term to major, long-term impacts to social and economic values within the Marine Park, with consequence severity dependent on the actual timing, duration and extent of a spill.

Key Ecological Features

Ancient coastline at 125 m depth contour

The KEF is primarily defined by seabed geomorphological features (ancient coastline), natural values associated with this KEF (see **Section 4.6.1.5**) include potential for increased biological productivity and, therefore, ecological significance.

The consequences of a hydrocarbon spill from a loss of well integrity event are predicted to result in moderate potential impacts that are associated with the immediate seabed area at the release site such as contamination of seabed sediments and ecological impacts to benthic fauna, associated impacts to demersal fish populations, and reduced biodiversity however, the KEF has a relatively broad-scale distribution which does overlap the wider EMBA is unlikely to be significantly impacted.

Continental slope demersal fish communities

Although the KEF is primarily defined by seabed geomorphological features, the distance from the potential release location and surface and upper water column fate and dispersion of fresh hydrocarbons indicates that the seabed features would not be impacted by a worst-case spill scenario. The KEF is also described for potential for increased biological productivity therefore ecological significance.

The consequences of a hydrocarbon spill from a loss of well integrity event are predicted to result in slight to moderate impacts with values of the KEF areas affected (for the values of each KEF see **Section 4.6.1.5**). Potential impacts include impacts to associated demersal fish populations, and reduced biodiversity as described above and below. The KEF has a relatively broad-scale distribution within the NWMR and is unlikely to be significantly impacted.

In addition to the two KEFs potentially impacted in the offshore waters near to the potential release location, four other KEFs overlap with the EMBA as detailed in Section 4.6.1.5, including Exmouth plateau; Canyons Linking the Cuvier Abyssal Plain with the Cape Range Peninsula; Commonwealth Waters Adjacent to Ningaloo Reef and Glomar Shoals KEF. It is noted that Glomar Shoal itself is not predicted to be exposed to hydrocarbon concentrations above ecological impact thresholds. These KEFs are primarily defined by seabed geomorphological features, however they can indicate a potential for increased biological productivity and, therefore, ecological significance.

The consequences of a hydrocarbon spill from a loss of well containment event are predicted to result in low/slight to moderate impacts to the values of these KEFs, with potential impacts such as impacts to demersal fish populations, and reduced biodiversity as described above. Impacts to sediments in these KEFs is not expected due to the entrained hydrocarbons being distributed in the upper layers of the water column. The KEFs within the EMBA have relatively broad-scale distributions and are unlikely to be significantly impacted.

Protected Species

Potential impacts to protected species (offshore environment)

Cetaceans

In the event of a loss of well containment, surface, entrained, and dissolved hydrocarbons exceeding environmental impact threshold concentrations may drift across open water habitat for cetacean species. Migratory routes and BIAs of cetaceans considered to be MNES may be affected. In particular, the pygmy blue whale Migration BIA boarders the north west corner of the Operational Area and the wider EMBA may affect migratory BIAs for the pygmy blue whales and humpback whales (**Section 4.6.2.9**). Surface spills are predicted up to 13 km from the release location, however it is noted that due to rapid evaporation and entrainment of the hydrocarbons, less only 7% of the spill will remain several days after the release event.

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 [DHNRDT] 2016). This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts, and organs. Other potential impacts include impairment of the immune system, neurological damage (Helm *et al*. 2015), reproductive failure, other adverse health effects (e.g. lung disease, poor body condition), and mortality (DHNRDT 2016). Physical contact with hydrocarbons is likely to have biological consequences for these species. Given cetaceans maintain thick skin and blubber, external exposure to hydrocarbons may result in irritation to skin and eyes. Hydrocarbons may also be ingested, particularly by baleen whales (e.g. pygmy blue whales), which feed by filtering large volumes of water.

In a review of the impacts of large-scale hydrocarbon spills on cetaceans, it was found that exposure to oil from the Deepwater Horizon resulted in increased mortality to cetaceans in the Gulf of Mexico (DHNRDT 2016), and long-term population level impacts to killer whales were linked to the Exxon Valdez tanker spill (Matkin *et al*. 2008). Given the

nature of the condensate and relatively small nature of the surface slick such exposure impacts to cetaceans may not eventuate. Cetacean populations may be susceptible to impacts from spilled hydrocarbons if they interact with an area affected by a spill. Fresh hydrocarbons (i.e. typically in the vicinity of the release location) may have a higher potential to cause toxic effects when ingested. The EMBA includes the migratory BIAs for pygmy blue whales and humpback whales and potential impacts would be highest during the peak periods of migration. May to June or November to December (north and south bound migrations) for the pygmy blue whales and June to July (primarily northbound migration) for the humpback whales. Whale migrations are protracted through time and space, and as such, a spill from the loss of well integrity is unlikely to affect an entire population (i.e. the whole population will not be within the vicinity of the release location). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to offshore cetacean species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.
Marine Turtles The EMBA overlaps a number of BIAs for turtles (**Table 4-10**). Impacts to marine turtles in the offshore environment is considered unlikely given the presence of turtles is generally isolated to transient individuals and, furthermore; the confirmed behaviour of internesting flatback turtles does not support the internesting buffer that extends into offshore waters from the Montebello Islands (**Section 4.6.2.9**).
Sea snakes In general, sea snakes frequent the waters of the continental shelf area around offshore islands and potentially submerged shoals. It is acknowledged that sea snakes may be present in the Operational Area and are present in the wider EMBA, in particular, sea snakes are likely to be present at submerged shoals such as Rankin Bank. Their abundance is not expected to be high in the deepwater and offshore environment. Impacts to sea snakes from direct contact with hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles. They 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. Sea snake species in Australia generally show strong habitat preferences (Heatwole and Cogger, 1993); species that have preferred habitats associated with submerged shoals and oceanic atolls may be disproportionately affected by a hydrocarbon spill affecting such habitat. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore sea snakes, with consequence severity dependent on the duration and extent of a spill in relation to the distribution of sea snakes. Potential impacts to inshore and offshore reef associated sea snakes are discussed in the Submerged Shoals and Banks and Mainland and Islands (nearshore) impacts discussion below.
Sharks, Sawfish and Rays Hydrocarbon contact may affect whale sharks through ingestion of entrained or dissolved hydrocarbons, particularly if feeding. Whale sharks may transit offshore open waters when migrating to and from Ningaloo Reef, where they aggregate for feeding (see Mainland and Islands (nearshore waters) below). Whale sharks may carry out opportunistic feeding in offshore waters including the Operational Area. The Operational Area overlaps the whale shark foraging (Northward from Ningaloo along 200 m Isobath) BIA (**Section 4.6.2.2** and **Section 4.6.2.9**) within which whale sharks are seasonally present between July and November. 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. Impacts to sharks and rays may occur through direct contact with hydrocarbons, or through contamination of the tissues and internal organs, either through direct contact or through 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 via coating of the gills inhibiting gas exchange. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore shark, sawfish and ray species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to inshore and offshore reef associated sharks, sawfish and rays are discussed in the Submerged Shoals and Banks and Mainland and Islands (nearshore) impacts discussion below.
Seabirds Offshore waters are potential foraging grounds for seabirds associated with the coastal roosting and nesting habitat (e.g. Ningaloo, Muiron Islands and the Barrow/Montebello/Lowendal Island Group).

There are confirmed foraging grounds in open waters off Ningaloo and the Barrow/Montebello/Lowendal Island Group. Foraging and breeding BIAs for a number of seabirds and migratory shorebirds overlap with the EMBA (**Table 6-13** and **Section 4.6.2.2**):

- the wedge-tailed shearwater (peak use August–April)
- the roseate tern
- the lesser crested tern
- the fairy tern.

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 to ingestion of hydrocarbons when preening to remove hydrocarbons; both impacts may result in mortality (Hassan and Javed, 2011).

Seabirds generally do not exhibit avoidance behaviour to floating hydrocarbons. Physical contact of seabirds with surface slicks is by several exposure pathways—primarily immersion, ingestion, and inhalation. Such contact with hydrocarbons may result in (AMSA, 2013; International Petroleum Industry Environmental Conservation Association (IPIECA), 2004):

- plumage fouling and hypothermia (loss of thermoregulation)
- decreased buoyancy and consequent increased potential to drown
- inability to fly or feed
- anaemia
- pneumonia
- and irritation of eyes, skin, nasal cavities and mouths.

Longer-term exposures may potentially impact seabird populations through loss of reproductive success, malformation of eggs or chicks (AMSA, 2013), or mortality of individuals from oiling of feathers or the ingestion of hydrocarbons.

A hydrocarbon spill may result in surface slicks disrupting a significant portion of the foraging habitat for seabirds, including foraging BIAs, which are generally associated with breeding habitats. Seabird distributions are typically concentrated around islands, so hydrocarbons near nesting/roosting areas may result in increased numbers of seabirds being impacted, with many species of seabirds, such as the wedge-tailed shearwater and the various species of tern, foraging relatively close to breeding islands/colonies.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to seabirds, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

Submerged Shoals and Banks (Rankin Bank)

The waters overlying the Rankin Bank have the potential to be exposed to entrained hydrocarbons above threshold concentrations (100 ppb) (**Table 6-13**). Rankin Bank comprises three main sedimentary banks rising steeply from between 80 and 120 m below sea level, reaching 20 to 40 m below the sea surface. Modelling predicts that Rankin Bank could be impacted by entrained hydrocarbon (44%) 126 hrs after a worst-case hydrocarbon spill scenario.

The submerged shoals are areas associated with sporadic upwelling and associated primary productivity events. Impacts to plankton communities from exposure to entrained hydrocarbons above threshold concentrations may result in short-term changes in plankton community composition but recovery would occur. Hydrocarbon contact during the spawning seasons for resident shoal community benthos and fish (meroplankton), particularly exposure to in water toxicity effects to biota, may result in the loss of a discrete cohort population but would not affect the longer-term viability of resident populations.

The modelling predicted that entrained and dissolved hydrocarbons are predicted to contact Rankin Bank and will impact corals, benthos or filter feeders.

Nearshore Waters (Mainland and Islands)

Marine Sediment Quality

Entrained and dissolved hydrocarbons (at or above the defined thresholds) are predicted to potentially contact shallow, nearshore waters of identified islands and mainland coastlines. Hydrocarbons may accumulate (at or above the ecological threshold) at a range of nearshore receptors (refer to **Table 6-13**). Such hydrocarbon contact may lead to reduced marine sediment quality by several processes, such as adherence to sediment in shallow waters and deposition on seabed habitat.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to sediment quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location.

Potential Impacts to State Marine Parks

The Barrow Island (BWI) Marine Management Area and State Marine Park; and Montebello Islands Marine Park are jointly managed due to their proximity and similar values and sensitivities. The marine and coastal environments of both the Montebello Islands and BWI comprise a complex seabed and island topography, featuring a unique combination of offshore islands, rocky shores, intertidal and subtidal coral reefs, mangroves, macroalgal and seagrass communities and sheltered lagoons, and are considered a distinct coastal type with very significant conservation values.

Key conservation and environmental values within these marine parks include complex and diverse marine and coastal habits, undisturbed intertidal and subtidal coral reefs and bommies with a high diversity of hard corals, important mangrove communities, particularly along the Montebello Islands; important habitat for EPBC Act listed species, including cetaceans, dugongs, marine turtles, seabirds and migratory shorebirds, an abundance of finfish, and pearling aquaculture.

In the highly unlikely event of a worst-case spill scenario reaching the BWI or Montebello Marine Parks and MMA, the entrained hydrocarbon may have ecological impacts to the above values where concentrations are above impact thresholds. The Montebello State Marine Park has an 8% probability of impact by entrained hydrocarbons above impact thresholds, 178 hrs after a worst-case spill scenario. The BWI MMA and State Marine Park are located further from the potential release location and has only a 1% probability of impact by entrained hydrocarbons 355 hrs after a worst-case spill scenario. Due to the time to impact, these weathered hydrocarbons are considered to be less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Impact on the protected areas is discussed in the sections below for ecological values and sensitivities, and socio-economic values. Additionally, such hydrocarbon contact may alter stakeholder understanding and/or perception of the protected marine environment, given these represent areas that are largely unaffected by anthropogenic influences and contain biologically diverse environments.

Potential Impacts to World Heritage areas

The Ningaloo Coast WHA lies about 187 km southeast of the Operational Area and was classified as an WHA as it contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; and contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation

In the highly unlikely event of a worst-case spill scenario reaching the WHA, the entrained hydrocarbon may have ecological impacts to the above values where concentrations are above impact thresholds. The WHA has a 21% probability of impact by entrained hydrocarbons above impact thresholds, 547 hrs after a worst-case spill scenario. Due to the time to impact, these weathered hydrocarbons are considered to be less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Impact on the protected areas is discussed in the sections below for ecological values and sensitivities, and socio-economic values. Additionally, such hydrocarbon contact may alter stakeholder understanding and/or perception of the protected marine environment, given these represent areas that are largely unaffected by anthropogenic influences and contain biologically diverse environments.

Potential Impacts to protected species (nearshore environment)

Cetaceans and Dugongs

In addition to a number of whale species that may occur in nearshore waters (refer to **Section 4.6.2.9**) or the full list of EPBC listed cetacean species identified by the PMST with potential to occur within the EMBA), coastal populations of small cetaceans and dugongs are known to reside or frequent nearshore waters, including the Ningaloo Coast, Muiron Islands, and Montebello/Barrow/Lowendal Islands Group (see **Table 6-13**) which may be potentially impacted by entrained and dissolved hydrocarbons exceeding threshold concentrations in the event of a loss of well containment. The predicted entrained EMBA extends past Exmouth Gulf, which is a known humpback whale aggregation area on the annual southern migration (September to December), therefore; humpbacks moving into the Gulf may be exposed to hydrocarbons above thresholds levels. However, hydrocarbons concentrations above thresholds are not expected within Exmouth Gulf itself. No hydrocarbon contact at or above threshold concentrations is expected for Camden Sound, an important calving area for humpback whales.

The potential impacts of exposure are as discussed previously in Offshore – Cetaceans. However, nearshore populations of cetaceans and 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 worst-affected areas, however dugongs are only expected in the nearshore areas around the Ningaloo coast which has a low probability of exceeding the impact thresholds due to its distance from the potential release location. Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to inshore cetacean species and dugongs, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

Marine Turtles

Several marine turtle species use nearshore waters and shorelines for foraging and breeding (including internesting), with significant nesting beaches along the mainland coast and islands in potentially impacted locations such as the Dampier Archipelago, Montebello/Barrow/Lowendal Islands Group, Pilbara Islands (Northern, Middle, and Southern Island Groups), and Ningaloo Reef. The nearshore waters of these turtle habitat areas may be exposed to surface, entrained or dissolved hydrocarbons exceeding threshold concentrations, and accumulated hydrocarbons above threshold concentrations.

A number of habitat critical to the survival nesting and interesting sites and BIAs have been identified for marine turtles within the EMBA, including foraging BIAs. In particular the internesting BIAs and habitat critical to the survival of a species for loggerhead and hawksbill turtles extend for ~20 km from known nesting locations, and for ~60 km for flatback turtles. A hydrocarbon spill above impact thresholds in these areas may result in impacts to biologically important behaviours. During the breeding season, turtle aggregations near nesting beaches within the EMBA are most vulnerable due to greater turtle densities, and potential impacts may occur at the population level for some marine turtle species. Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (NOAA 2010). Therefore, contact with surface slicks or entrained hydrocarbon can result in hydrocarbons adhering to body surfaces (Gagnon and Rawson 2010) causing irritation of mucous membranes in the nose, throat and eyes, leading to inflammation and infection (NOAA 2010). Oiling can also irritate and injure skin, which is most evident on pliable areas such as the neck and flippers (Lutcavage *et al*. 1995). A stress response associated with this exposure includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of the salt gland (Lutcavage *et al*. 1995).

Hydrocarbons in surface waters may also impact turtles when they surface to breathe as they may inhale toxic vapours. Their breathing pattern, involving large 'tidal' volumes and rapid inhalation before diving, results in direct exposure to petroleum vapours, which are the most toxic component of the hydrocarbon spill (Milton and Lutz 2002). This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia, and neurological impairment (NOAA 2010). Contact with entrained hydrocarbons can result in hydrocarbons adhering to body surfaces, causing irritation of mucous membranes in the nose, throat and eyes and leading to inflammation and infection (Gagnon and Rawson 2010).

In the nearshore environment, turtles can ingest hydrocarbons when feeding (e.g. on oiled seagrass stands/macroalgae) or can be indirectly affected by loss of food source (e.g. seagrass due to dieback from hydrocarbon exposure) (Gagnon and Rawson, 2010). In addition, hydrocarbon exposure can impact turtles during the breeding season at nesting beaches, however no hydrocarbons above thresholds are predicted to make shoreline contact, so impacts will be limited to individuals that may pass through the EMBA on the way to and from nesting beaches.

Results from studies of nesting beaches subject to extensive oil pollution from the Deepwater Horizon spill indicated a significant reduction (about 44%) in turtle nest density during the nesting season immediately following the spill (Lauritsen *et al*., 2017). Lauritsen *et al*. (2017) partially attributed this reduction to direct (e.g. direct mortality of adults due to oiling or toxicity) and indirect (e.g. shoreline disturbance from response activities) impacts from the spill. There was, however a significant increase in nesting density in the years following the spill year, with nesting density returning to levels comparable to pre-spill densities within two nesting seasons (Lauritsen *et al*., 2017). This indicates that adult female turtles that avoided mortality may have deferred nesting during the spill until subsequent years. The significant decline in nesting density observed following the Deepwater Horizon spill represents a decline of about 36% of reproductive output of the turtle population in the study area (Lauritsen *et al*., 2017); given turtles may take over a decade to reach sexual maturity, the effects of such a reduction in reproductive output may take over a decade to appear in nesting-related metrics (which are commonly used to monitor turtle populations).

Based on the modelling results and the potential for impact and recovery of turtles, a worst-case hydrocarbon spill from a loss of well containment may result in reduced turtle numbers and nesting density; however, it would not be expected to result in elimination of a population. To date, no oil spills have been demonstrated to have resulted in elimination of a turtle population at any scale (Yender and Mearns, 2010). Disastrous spills impacting important turtle habitat (including nesting areas) have not been shown to eliminate turtle populations, although direct and indirect impacts have been documented (e.g. Lauritsen *et al*., 2017; McDonald *et al*., 2017; Stacy *et al*., 2017; Vander Zanden *et al*., 2016). Turtle populations have been shown to be able to recover, even when populations have been reduced to small sizes after experiencing significant declines (Mazaris *et al*., 2017). As such, population-scale impacts to marine turtles from a worst-case loss of well containment would be expected to exhibit recovery, although may take several decades to reach pre-impact population levels due to the relatively long lifespan and late sexual maturity of marine turtle species.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to nesting marine turtles, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' mating and nesting seasons and overall distributions

Sea snakes

Impacts to sea snakes for the mainland and island nearshore waters from direct contact with hydrocarbons may occur and may include potential damage to the dermis and irritation to mucous membranes of the eyes, nose and throat (ITOPF, 2011). Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to sea snakes, with consequence severity dependent on the duration and extent of a spill in relation to the distribution of sea snakes.

Sharks, Sawfish and Rays

Whale sharks and manta rays are known to frequent the Ningaloo Reef system and the Muiron Islands (forming feeding aggregations in late summer/autumn). Both whale sharks and manta rays generally transit along the nearshore coastline and are vulnerable to surface, entrained and dissolved aromatic hydrocarbon spill impacts, with both taxa having similar modes of feeding.

Whale sharks are versatile feeders, filtering large amounts of water over their gills, catching planktonic and nektonic organisms (Jarman and Wilson, 2004). Whale sharks at Ningaloo Reef have been observed using two different feeding strategies, including passive subsurface ram-feeding and active surface feeding (Taylor, 2007). Passive feeding involves swimming slowly at the surface with the mouth wide open. During active feeding, sharks swim high in the water with the upper part of the body above the surface with the mouth partially open (Taylor, 2007). Individuals that are present in worst-affected spill areas would have the potential to ingest toxic amounts of entrained or dissolved aromatic hydrocarbons into their body. Large amounts of ingested hydrocarbons may affect endocrine and immune systems in the longer term. Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

The presence of hydrocarbons may displace whale sharks from the area where they normally feed and rest, and potentially disrupt migration and aggregations to these areas in subsequent seasons. Whale sharks may also be affected indirectly by surface, entrained or dissolved aromatic hydrocarbons through the contamination of their prey. The preferred food of whale sharks are fish eggs and phytoplankton, which are abundant in the coastal waters of Ningaloo Reef in late summer/autumn, driving the annual arrival and aggregation of whale sharks in this area. If the spill event occurred during the spawning season, this important food supply (in worst spill-affected areas of the reef) may be diminished or contaminated. The contamination of their food supply and the subsequent ingestion of this prey by the whale shark may also result in long-term impacts as a result of bioaccumulation.

There is the potential for other resident shark and ray (e.g. sawfish species identified in **Section 4.6.2.9**) populations to be impacted directly from hydrocarbon contact or indirectly through contaminated prey or loss of habitat. **Table 6-13** indicates the receptor locations predicted to be impacted from entrained and/or dissolved aromatic hydrocarbons to the benthic communities of nearshore, subtidal communities, and it is considered that there is the potential for habitat loss to occur. Therefore, the consequences to resident shark and ray populations (if present) from loss of habitat, may result in a disruption to a significant portion of the population; however, it is not expected to impact the overall viability of the population.

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to inshore associated shark, sawfish and ray species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

Seabirds and/or Migratory Shorebirds

In the event of a major spill, there is the potential for seabirds, and resident, non-breeding overwintering shorebirds that use the nearshore waters for foraging and resting, to be exposed to entrained and dissolved hydrocarbons. This could result in lethal or sublethal effects. Although breeding oceanic seabird species can travel long distances to forage in offshore waters, most breeding seabirds tend to forage in waters near their breeding colony. This results in relatively higher seabird densities in these areas during the breeding season, making these areas particularly sensitive in the event of a spill.

Pathways of biological exposure that can result in impact may occur through ingesting contaminated fish (nearshore waters) or invertebrates (intertidal foraging grounds such as reefs). Ingestion can also lead to internal injury to sensitive membranes and organs (IPIECA, 2004). Whether the toxicity of ingested hydrocarbons is lethal or sublethal will depend on the weathering stage and its inherent toxicity. Exposure to hydrocarbons may have longer-term effects, with impacts to population numbers due to decline in reproductive performance and malformed eggs and chicks affecting survivorship, and loss of adult birds.

Important areas for foraging seabirds and migratory shorebirds are identified in **Section 4.6.2.9.** Refer to **Table 6-13** for locations within the predicted extent of the EMBA that are identified as habitat for seabirds and migratory shorebirds. Suitable habitat for seabirds and shorebirds is broadly distributed along the mainland and nearshore island coasts within the EMBA. Important nesting and resting areas include:

- Muiron Islands
- Ningaloo Coast

- Montebello/Barrow/Lowendal Islands Group (including known nesting habitats on Boodie, Double and Middle Islands)
- Pilbara Islands North, Middle, and South Island Group (refer to **Section 4** for additional information, including BIAs within the EMBA).
- Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to inshore associated seabirds and migratory shorebirds, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements, breeding seasons and distributions

Other Receptors

Productivity

Nearshore waters and adjacent offshore waters surrounding the offshore islands (e.g. Montebello/ Barrow/Lowendal Islands Group) and to the west of the Ningaloo Reef system are known locations of seasonal upwelling events and productivity. The seasonal productivity events are critical to krill production, which supports megafauna aggregations such as whale sharks and manta rays in the region. This has the potential to result in lethal and sublethal impacts to a certain portion of plankton in affected areas, depending on concentration and duration of exposure and the inherent toxicity of the hydrocarbon. However, recovery would occur (see Offshore description above). Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to plankton populations within the EMBA.

Coral Reef

The quantitative spill risk assessment indicates there would be potential for coral reef habitat to be exposed to dissolved and entrained hydrocarbons at locations including the Montebello Islands and exposure to entrained hydrocarbons at Barrow Island, Lowendal Islands, discrete locations within the Pilbara Islands Southern Island Group, Muiron Islands and Ningaloo Coast (**Table 6-13**).

Exposure to entrained hydrocarbons/dissolved aromatic hydrocarbons above thresholds has the potential to result in lethal or sublethal toxic effects to corals and other sensitive sessile benthos within the upper water column, including upper reef slopes (subtidal corals), reef flat (intertidal corals) and lagoonal (back reef) coral communities. Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Mortality in a number of coral species is possible, and this would result in the reduction of coral cover and change in the composition of coral communities. Sublethal effects to corals may include polyp retraction, changes in feeding, bleaching (loss of zooxanthellae), increased mucous production resulting in reduced growth rates, and impaired reproduction (Negri and Heyward 2000). This could result in impacts to the shallow water fringing coral communities/reefs of the offshore islands (e.g. Barrow/Montebello/Lowendal Islands, Pilbara Southern and Northern Island Groups) and the mainland coast (e.g. Ningaloo Coast). With reference to Ningaloo Reef, wave-induced water circulation flushes the lagoon and may promote removal of entrained hydrocarbons from this particular reef habitat. Under typical conditions, breaking waves on the reef crest induce a rise in water level in the lagoon, creating a pressure gradient that drives water in a strong outward flow through channels. These channels are across as much as 15% of the length of Ningaloo Reef (Taylor and Pearce, 1999).

If a spill occurs at the time of coral spawning at potentially affected coral locations, or in the general peak period of biological productivity, there is the potential for a significant reduction in successful fertilisation and coral larval survival, due to the sensitivity of coral early life stages to hydrocarbons (Negri and Heyward, 2000). Such impacts are likely to result in the failure of recruitment and settlement of new population cohorts. In addition, some non-coral species may be affected via direct contact with entrained and dissolved aromatic hydrocarbons, resulting in sublethal impacts and in some cases mortality—particularly early life-stages of coral reef animals (reef-attached fishes and reef invertebrates), which can be relatively sensitive to hydrocarbon exposure. Coral reef fish are site-attached, have small home ranges, and as reef residents they are at higher risk from hydrocarbon exposure than non-resident, more wide-ranging fish species. The exact impact on resident coral communities (which may include fringing reefs of the offshore islands and/or the Ningaloo Reef system) will depend on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities.

Over the worst-affected sections of reef habitat, coral community live cover, structure and composition is predicted to reduce, manifested by loss of corals and associated sessile biota. Recovery of these impacted reef areas typically relies on coral larvae from neighbouring coral communities that have either not been affected or only partially impacted. For example, there is evidence that Ningaloo Reef corals and fish are partly self-seeding, with the supply of larvae from locations within Ningaloo Reef of critical importance to the healthy maintenance of the coral communities (Underwood, 2009). Recovery at other coral reef areas may not be aided by a large supply of larvae from other reefs, with levels of recruits after a disturbance event only returning to previous levels after the numbers of reproductive corals had also recovered (Gilmour *et al*., 2013).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in Major long-term impacts to coral populations within the EMBA, with consequence severity predicted to be greatest at reefs closest to the potential release location (e.g. Montebello Islands).

Non-biogenic Reefs

The reef communities fringing the Pilbara region (e.g. Pilbara islands) may be exposed to dissolved or entrained hydrocarbons (at or above threshold concentrations), and consequently exhibit lethal or sublethal impacts resulting in partial or total mortality of keystone sessile benthos, particularly hard corals; thus, potential community structural changes to these shallow, nearshore benthic communities may occur. If these reefs are exposed to entrained hydrocarbons, impacts may result in localised long-term effects. However, due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to non-biogenic reefs within the EMBA.

Filter Feeders

Hydrocarbon exposure to filter feeding communities (e.g. Montebello Islands) may occur, depending on the depth of the entrained and dissolved aromatic hydrocarbons. See discussion above on potential impacts.

Nearshore filter feeders that are present in shallower water <20 m may potentially be impacted by entrained hydrocarbon through lethal/sublethal effects (see discussion for Offshore Filter Feeders). However, due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location). Such impacts may result in localised, long-term effects to community structure and habitat.

Spawning/Nursery Areas

Fish (and other commercially targeted taxa) in their early life stages (eggs, larvae and juveniles) are at their most vulnerable to lethal and sublethal impacts from exposure to hydrocarbons, particularly if a spill coincides with spawning seasons or reaches nursery areas close to the shore (e.g. seagrass and mangroves) (ITOPF, 2011). Fish spawning (including for commercially targeted species such as snapper and mackerel) occurs in nearshore waters at certain times of the year, and nearshore waters are also inhabited by higher numbers of juvenile fishes than offshore waters.

Modelling indicated that, in the event of a major spill, there is potential for entrained or dissolved hydrocarbons to occur in nearshore waters, including Montebello Islands and entrained hydrocarbons at Barrow Island, Pilbara Islands Group, Ningaloo Coast, and the Muiron Islands. This has the potential to result in lethal and sublethal impacts to a portion of fish larvae in areas contaminated above impact thresholds, depending on concentration and duration of exposure and the inherent toxicity of the hydrocarbon. Although there is the potential for spawning/nursery habitat to be impacted (e.g. mangroves and seagrass beds, discussed above), losses of fish larvae in worst-affected areas are unlikely to be of major consequence to fish stocks compared with significantly larger losses through natural predation, and the likelihood that most nearshore areas would be exposed is low (i.e. not all areas in the region would be affected). This is supported by a recent study in the Gulf of Mexico, which used juvenile abundance data from shallow-water seagrass meadows as indices of the acute, population-level responses of young fishes to the Deepwater Horizon spill. Results indicated that there was no change to the juvenile cohorts following the Deepwater Horizon spill. Additionally, there were no significant post-spill shifts in community composition and structure, nor were there changes in biodiversity measures (Fodrie and Heck, 2011).

Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to spawning fish and/or nursery areas within the EMBA, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to key spawning periods and locations.

Seagrass Beds/Macroalgae and Mangroves

Spill modelling has predicted that entrained, dissolved, and accumulated hydrocarbons above threshold concentrations have the potential to contact a number of discrete shoreline sensitive receptors, such as those supporting biologically diverse, shallow subtidal and intertidal communities. The variety of habitat and community types, from the upper subtidal to the intertidal zones support a high diversity of marine life and are used as important foraging and nursery grounds by a range of invertebrate and vertebrate species. Depending on the trajectory of the entrained/dissolved plume, macroalgal/seagrass communities including the Barrow/Montebello/Lowendal Islands, the Pilbara Islands (documented as low and patchy cover), and the Ningaloo Coast (patchy and low cover associated with the shallow limestone lagoonal platforms), all have the potential to be exposed (see **Table 6-13** for a full list of receptors within the EMBA).

Seagrass in the intertidal zone is particularly vulnerable, as it may come into direct contact with accumulated hydrocarbons, as well as entrained components, which can smother and kill seagrasses if it coats their leaves and

stems (Taylor and Rasheed, 2011). This conclusion is supported by Howard *et al*. (1989) who noted that surface hydrocarbon spills that become stranded on the seagrass and smother it during the rise and fall of the tide can result in reduced growth rates, blackened leaves and mortality. Wilson and Ralph (2011) concluded that long-term impacts to seagrass are unlikely unless hydrocarbon are retained within the seagrass meadow for a sustained duration. Toxicity effects can also occur due to absorption of soluble fractions of hydrocarbons into tissues (Runcie *et al*., 2010). The potential for toxicity effects of entrained hydrocarbons may be reduced by weathering processes that should lower the content of soluble aromatic components before contact occurs. Exposure to entrained/dissolved aromatic hydrocarbons may result in mortality, depending on actual entrained/dissolved aromatic hydrocarbon concentration received and duration of exposure. Physical contact with entrained hydrocarbon droplets could cause sublethal stress, causing reduced growth rates and reduced tolerance to other stress factors (Zieman *et al*., 1984). Mangrove habitat and associated mudflats and salt marsh at Ningaloo Coast (small habitat areas), the Pilbara islands, and the Montebello Islands were identified within the EMBA (**Table 6-13**). Hydrocarbons coating prop roots of mangroves is not expected as no surface hydrocarbons are expected to reach land (i.e. no shoreline contact or accumulation above impact thresholds). Mangroves can be impacted by entrained/dissolved aromatic hydrocarbons that may adhere to the sediment particles. In low-energy environments such as in mangroves, deposited sediment-bound hydrocarbons are unlikely to be removed naturally by wave action and may be deposited in layers by successive tides (NOAA, 2014). The hydrocarbons comprise a proportion of persistent residual fractions. Therefore, deposited hydrocarbons are likely to persist in the shallow water sediment, potentially causing chronic sublethal toxicity impacts beyond immediate physical and acute effects, which may delay recovery in an affected area. Recovery of mangroves from oil spills can take 20–30 years (NOAA, 2014); although noting that there is no potential for surface spill contact, recovery from any impacts could still be long-term (>10 years). Entrained/dissolved hydrocarbon impacts may include sublethal stress and mortality to certain sensitive biota in these habitats, including infauna and epifauna. Larval and juvenile fish, and invertebrates that depend on these shallow subtidal and intertidal habitats as nursery areas, may be directly impacted due to the loss of habitats and/or lethal and sublethal in-water toxic effects. This may result in mortality or impairment of growth, survival and reproduction. In addition, there is the potential for secondary impacts on shorebirds, fish, sea turtles, rays and crustaceans that use these intertidal habitat areas for breeding, feeding and nursery habitat purposes. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to seagrass beds, macroalgae communities and mangroves within the EMBA, with consequence severity predicted to be greatest at receptors closest to the potential release location (e.g. Montebello Islands).
Sandy Shores/Estuaries/Tributaries/Creeks (including Mudflats)/Rocky Shores Spill modelling does no predict any surface hydrocarbons above 10 g/m^2 to reach shore nor does it predict any or accumulation of hydrocarbons above the 100 g/m^2 threshold. Shoreline accumulation is predicted at 10 g/m^2, however at this concentration is it not expected to have any biological impacts. Therefore, no impacts to Sandy Shores, Estuaries, Tributaries/Creeks (including Mudflats) and Rocky Shores is expected.

Summary of Potential Impacts to Socio-economic Values	
Setting	***Receptor Group***
Offshore	***Fisheries – Commercial*** A hydrocarbon release during a loss of well containment event has the potential to result in direct impacts to target species of Commonwealth and State fisheries within the defined EMBA (refer to **Section 4.7.2**). Lethal and sublethal effects may impact localised populations of targeted species within the EMBA for entrained/dissolved hydrocarbons above thresholds. However, entrained hydrocarbons are likely to be confined in the upper water column; therefore, demersal species are less likely to be exposed to hydrocarbons than pelagic species. A major loss of hydrocarbons from the Petroleum Activities Program may also lead to an exclusion of fishing from the spill-affected area for an extended period. 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 its efficacy 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 *et al*., 2002). Seafood safety is a major concern associated with spill incidents. Therefore, actual or potential seafood contamination can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (Yender *et al*., 2002). A major spill would result in the establishment of an exclusion zone around the spill-affected area. There would be a temporary prohibition on fishing activities for a period of time, and subsequent potential for minor economic impacts to affected commercial fishing operators. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major, long-term impacts to commercial fisheries within the EMBA, particularly for pelagic fisheries and fisheries with

<table>
<tr><th colspan="2">Summary of Potential Impacts to Socio-economic Values</th></tr>
<tr><td></td><td>most of their effort focused within the EMBA (e.g. Pilbara Demersal Scalefish Managed Fishery and Mackerel Managed Fishery). Potential impacts to inshore fisheries are discussed in the Mainland and Islands (nearshore) impacts discussion below, and the impact assessment relating to spawning is discussed above.</td></tr>
<tr><td></td><td>Tourism including Recreational Activities
Recreational fishers predominantly target large tropical species, such as emperor, snapper, grouper, mackerel, trevally and other game fish. Recreational angling activities include shore-based fishing, private boat and charter boat fishing, with peak activity between April and October (Smallwood et al. 2011) for the Exmouth region. Limited recreational fishing takes place in the offshore waters of the Operational Area. Impacts on species that are recreationally fished are described above under Summary of Potential Impacts to Other Species.
A major loss of hydrocarbons from the Petroleum Activities Program may lead to exclusion of marine nature-based tourist activities from the EMBA, resulting in a loss of revenue for operators. Tourism is a major industry for the region and visitor numbers would likely reduce if a hydrocarbon spill were to occur, based on the perception of hydrocarbon spills and associated impacts.
Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to tourism and recreation within the EMBA.</td></tr>
<tr><td></td><td>Offshore Oil and Gas Infrastructure
A hydrocarbon release during a loss of well containment event has the potential to result in disruptions to production at existing petroleum facilities (e.g. platforms and Floating Production Storage and Offloading (FPSO) facilities), as well as activities such as drilling and seismic exploration. For example, facility water intakes for cooling and fire hydrants could be shut off if contacted by floating hydrocarbons, which could in turn lead to the temporary cessation of production activities. Spill exclusion zones established to manage the spill could also prohibit access for activity support vessels as well as offtake tankers approaching facilities off the North West Cape.
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 on the operation of production facilities in the event of a spill would be based primarily on health and safety considerations. The closest production facilities are:
• Wheatstone (operated by Chevron): within the Operational Area
• Balnaves (operated by Woodside): 1 km from the Operational Area
• Pluto (operated by Woodside): 4 km from the Operational Area
• John Brookes Platform (operated by Santos): 32 km from the Operational Area.
Therefore, a worst-case hydrocarbon spill scenario has the potential to result in slight, short-term impacts to oil and gas industry within the EMBA.</td></tr>
<tr><td>Submerged Shoals</td><td>Tourism and Recreation
A hydrocarbon release during a loss of well containment event has the potential to result in a temporary prohibition on charter boat recreational fishing/diving and any other marine nature-based tourism trips to Rankin Bank. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to tourism and recreational activities within the EMBA.</td></tr>
<tr><td>Mainland and Islands (Nearshore Waters)</td><td>Fisheries – Commercial
<u>Nearshore Fisheries and Aquaculture</u>
In the event of a loss of well containment, there is the possibility that target species in some areas used by a number of state fisheries could be affected, including wild oysters in the Pearl Oyster Managed Fishery that are within the EMBA and several west coast fisheries (refer to Section 4.7.2 for fisheries within the wider EMBA). Targeted fish, prawn, mollusc and lobster species and pearl oysters could experience sublethal stress or, in some instances, mortality; depending on the concentration and duration of hydrocarbon exposure and its inherent toxicity.
<u>Prawn Managed Fisheries</u>
In the event of a major spill, the modelling indicated the entrained and dissolved EMBA may extend to nearshore waters, including the actively fished areas of the designated Onslow Prawn Managed Fishery, Exmouth Gulf Prawn Managed Fishery and the Nickol Bay Prawn Managed Fishery. Note: Most of the demarcated area for the prawn managed fishery in the Exmouth Gulf is outside the EMBA.
Prawn habitat usage differs between species in the post-larval, juvenile and adult stages (Dall et al., 1990) and direct impacts to benthic habitat due to a major spill have the potential to impact prawn stocks. For example, juvenile banana prawns are found almost exclusively in mangrove-lined creeks (Rönnbäck et al., 2002), whereas juvenile tiger prawns are most abundant in areas of seagrass (Masel</td></tr>
</table>

Summary of Potential Impacts to Socio-economic Values	
	and Smallwood, 2000). Adult prawns also inhabit coastline areas but tend to move to deeper waters to spawn. In the event of a major spill, a range of subtidal habitats that support juvenile prawns may be exposed to hydrocarbons above impact thresholds, including: • Montebello Islands • Barrow Island • Lowendal Islands • Pilbara Island Group • Ningaloo Coast. Localised loss of juvenile prawns in the worst spill-affected areas is possible. Whether lethal or sublethal effects occur will depend on duration of exposure, hydrocarbon concentration and weathering stage of the hydrocarbon, and its inherent toxicity. Furthermore, seafood consumption safety concerns and a temporary prohibition on fishing activities may lead to subsequent potential for economic impacts to affected commercial fishing operators. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major, long-term impacts to commercial fisheries within the EMBA.
	Tourism and Recreation In the event of a major spill, the nearshore waters of offshore islands and reefs as well as the Ningaloo coast could be reached by entrained hydrocarbons and dissolved hydrocarbons, depending on prevailing wind and current conditions. As these locations offer a number of amenities such as fishing, swimming and using beaches and surrounds, they have a recreational value for local residents and visitors. If a well blowout event resulted in hydrocarbon contact, there could be restricted access to beaches for a period of days to weeks, until natural weathering, tides, currents or oil spill response (e.g. shoreline clean-up if safe to do so) removes the hydrocarbons. In the event of a well blowout, tourists and recreational users may also avoid areas due to perceived impacts, including after the spill has dispersed. Typically, a hydrocarbon spill that results in visible slicks in coastal waters and on shorelines will disrupt recreational activities, particularly tourism and its supporting services. In the event of a well blowout, hydrocarbons may accumulate on shorelines, however, only at concentrations up to 10 g/m$^{2.}$ No shoreline accumulation is predicted at 100 g/m^2. As a result of potential accumulation on beaches, it is expected that there will be a temporary cessation of all marine-based tourism activities on the spill-affected coast and wider coastal area for a period of weeks or longer, until natural weathering or tides and currents remove the hydrocarbons. There is the potential for stakeholder perception that this environment will be contaminated over a large area and for the longer term, resulting in a prolonged period of tourism decline, however this is expected to be limited due the very minor concentrations predicted. Oxford Economics (2010) assessed the duration of hydrocarbon spill-related tourism impacts and found that, on average, it took 12 to 28 months to return to baseline visitor spending. There is likely to be significant impacts to the tourism industry, wider service industry (hotels, restaurants and their supply chain) and local communities in terms of economic loss as a result of spill impacts to tourism. Recovery and return of tourism to pre-spill levels will depend on the size of the spill and change in any public perceptions regarding the spill (Oxford Economics, 2010). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to tourism and recreational activities within the EMBA.
	Cultural Heritage A number of Underwater Cultural Heritage sites (including historic shipwrecks) have been identified in the within the EMBA. The spill modelling results do not predict surface slicks will contact any identified wrecks. However, shipwrecks occurring in the subtidal zone will be exposed to entrained/dissolved hydrocarbons, and marine life that shelter and take refuge in and around these wrecks may be affected by in-water toxicity of dispersed hydrocarbons. The consequences of such hydrocarbon exposure may include large fish species moving away, and/or resident fish species and sessile benthos such as hard corals exhibiting sublethal and lethal impacts (which may range from physiological issues to mortality). Artefacts, scatter and rock shelters are on land above the high-water mark on Barrow and Montebello islands, and there is no surface contact or accumulated hydrocarbons predicted as a result of the worst-case spill scenario. Therefore, there is no potential for impacts to heritage. Within the wider EMBA are several designated heritage places (**Section 4.7.1**). These places are also covered by other designations such as World Heritage Area. Potential impacts are discussed in the sections above.

MEE-01 Loss of Well Containment – Risk Analysis
Bowtie risk analysis was undertaken to assess MEE-01; refer to **Figure 6-4** and **Figure 6-5** for bowtie diagrams.

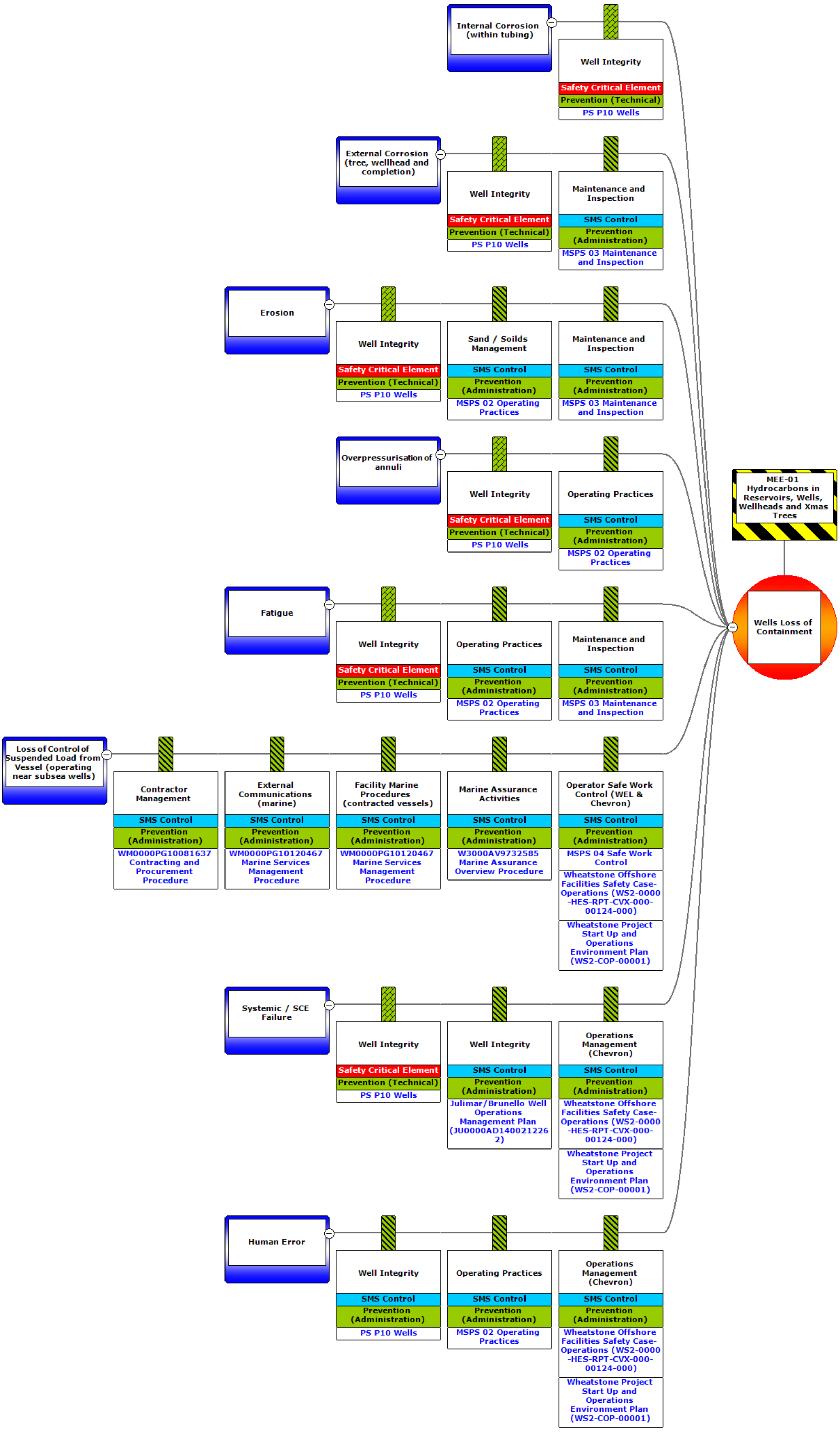

Figure 6-4: MEE-01 Wells Loss of Containment

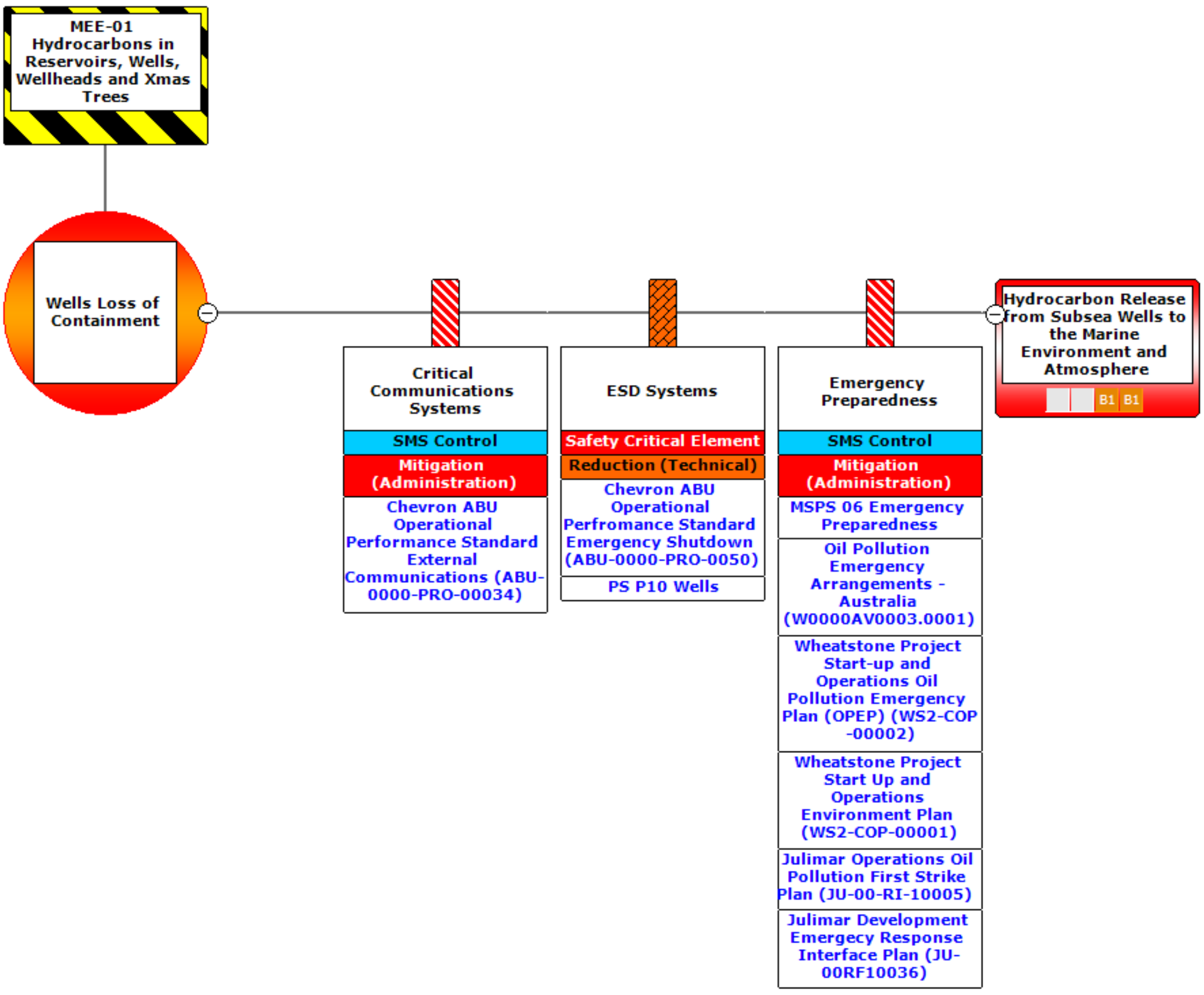

Figure 6-5: MEE-1 Well Loss of Containment (Outcomes)

MEE-01 Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Table 6-11)***	***Control Adopted***
Preventive Barriers – Safety and Environmental Critical Elements				
Elimination	N/A	No elimination or substitution controls were identified beyond those incorporated in design		
Substitution				
Engineering Controls	Maintain well mechanical integrity to contain reservoir fluids within well envelope at all times to prevent a MEE	PS P10 – Wells	Prevention (Technical)	Yes **C 13.1**
Mitigating Barrier – Safety and Environmental Critical Elements				
Engineering Controls	Maintain integrity of well system isolations as fail safe and available to safely isolate reservoir from subsea systems and the environment and prevent LOC event escalation to a MEE.	PS P10 – Wells Wheatstone Upstream Platform Operational Performance Standard Emergency Shutdown as referenced in Wheatstone Safety Case	Reduction (Technical)	Yes **C 13.2**
Legislation Codes and Standards				
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case • Accepted Safety Case for Wheatstone Offshore Facilities to: – identify hazards that have the potential to cause a MAE – detail assessment of MAE risks – describe the physical barriers SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with a MAE to ALARP. Thus, contributing to management of associated potential environmental consequences of MAEs	Wheatstone Offshore Facilities Safety Case – Operations	Prevention / Mitigation (Administration) Control based on legislative requirements – must be adopted)	Yes **C 8.1**
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: Accepted Well Operations Management Plan (WOMP) to demonstrate that the risks to well integrity are managed in accordance with sound engineering principles, standards, specifications, and good oilfield practice. It	Julimar/Brunello Well Operations Management Plan which includes: • Julimar Subsea Inspection, Monitoring and Maintenance Plan • Julimar Production Systems Operating Manual • Julimar - Subsea Operating Integrity	Prevention/ Mitigation (Administration) Control based on legislative requirements – must be adopted	Yes **C 8.3**

	describes the systems that are in place to ensure well design and integrity is managed for the well lifecycle, thus contributing to management of associated potential environmental consequences of well integrity events	Envelope - Subsea XTree Envelope		
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009: requires an Environment Plan for the Start Up and Operations of the Wheatstone Offshore Facilities (and associated subsea infrastructure)	The Wheatstone Environment Plan is in place and regulated to meet legislative requirements. The Wheatstone Start Up and Operations EP outlines the Operational Interface with Third-Party Assets (including Julimar-Brunello) and Chevron's contracted field operating services role in the safe operation, maintenance/testing and provision of emergency response arrangements for Julimar-Brunello subsea and wells systems.	Prevention/ Mitigation (Administration) Control based on legislative requirements – must be adopted	Yes **C 8.2**
Management System Specific Measures: Key Standards or Procedures				
Procedures and Administration	Implementing management systems linked to: MSPS-03 Maintenance and Inspection • MSPS 02 Operating Practices • MSPS-03 Maintenance and Inspection • MSPS 04 Safe Work Control • Contracting and Procurement Procedure • Marine Services Management Procedure • Marine Assurance Overview Procedure • Prevention / management of potential for human error • Prevention / management of potential for systemic / SCE failure.	MSPS-03 Maintenance and Inspection MSPS 02 Operating practices MSPS 04 Safe Work Control Contracting and Procurement Procedure Marine Services Management Procedure Marine Assurance Overview Procedure	Prevention (Administration)	Yes See **Section 6.9** (Implementation Strategy)
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure	Prevention / Mitigation (Administration) Control based on Woodside standard and regulatory requirements	Ys C 8.4
Procedures and Administration	Implement Chevron Operational Excellence Management System (OEMS) linked to:	Wheatstone Offshore Facilities Safety Case – Operations, and the	Prevention/ Mitigation (Administration)	Yes In place via Wheatstone Safety Case

	• Maintaining of well mechanical Integrity in operations • Maintain operations within the well integrity and safe operating envelope (e.g. erosion; fatigue) • Prevent/ manage potential for human error • Prevent/ manage potential for systemic/ SCE failure	following, as referenced in the Safety Case: • Chevron ABU Permit to Work Manual • Chevron, Wheatstone Operations Training Plan • Chevron ABU Operational Performance Standard Emergency Shutdown		**C 8.1**
Emergency Response and Contingency Planning	Implementing management systems linked to: • Emergency Response • Prevention of Escalation	MSPS-06 Emergency Preparedness Julimar Operations Oil Pollution First Strike Plan (Appendix H) Julimar Development Emergency Response Interface Plan Oil Pollution Emergency Arrangements - Australia	Mitigation (Administration)	Yes **C 7.1** **C 7.3** Refer to **Section 7** and **Appendix F** for a discussion around the ALARP assessment of controls related to hydrocarbon spill response
Emergency Response and Contingency Planning	Implement Chevron Operational Excellence (OE) Management System controls for Emergency Response	Wheatstone Offshore Facilities Safety Case – Operations which includes; Wheatstone Project Start-up and Operations Oil Pollution Emergency Plan Chevron ABU, Operational Performance Standard External Communications	Mitigation (Administration)	Yes In place via Wheatstone Safety Case **C 8.1,** and Environment Plan **C 8.2** Refer to **Section 7** and **Appendix F** for a discussion around the ALARP assessment of controls related to hydrocarbon spill response

Risk-based Analysis

Company Values

Corporate values require all personnel at Woodside to comply with appropriate policies, standards, procedures and processes while being accountable for their actions and holding others to account in line with the Woodside Compass. As detailed above, the Petroleum Activities Program will be undertaken in line with these policies, standards and procedures that include suitable controls to prevent loss of well containment, and response should a loss of well containment occur.

ALARP Statement

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the Decision Type, Woodside considers the adopted controls appropriate to manage the impacts and risks of a very low likelihood unplanned hydrocarbon release as a result of a loss of well containment.

The principle of inherent safety and environmental protection is based on the prevention of the MEE through design of well integrity and ensuring the wells are operated within their design envelope through operating practices and assurance through maintenance and inspection. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEE are specified and assured through implementing the Julimar WOMP, SCE management procedures including technical performance standards for SCEs and MSPS for

Safety Critical Procedures and ensuring the implementation of the Wheatstone Offshore Facilities Safety Case – Operations.

The application of Woodside Risk Management Procedures, and implementation of the WOMP ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability
- wells integrity codes and standards. Given the controls in place to prevent and control loss of containment events and mitigate their consequences, alongside procedural control of well intervention activities, it is considered that MEE risk associated with Wells Loss of Containment from Julimar subsea wells are managed to ALARP.

Demonstration of Acceptability

Acceptability Statement

Loss of well containment has been evaluated as having a 'Moderate' risk rating. As per **Section 2.6.3.1**, Woodside considers 'Moderate' risk ratings as acceptable if ALARP is demonstrated using good industry practice, consideration of company and societal values and risk based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained.

Acceptability is demonstrated with regard to the considerations below.

<u>Principles of Ecologically Sustainable Development</u>

Woodside is a proud Australian company that is here for the long-term. Woodside has a strong history of exploration and development of oil and gas reserves in the North West of WA with an excellent environmental record, while providing revenue to State and Commonwealth Governments, returns to shareholders, jobs and support to local communities. Titles for oil and gas exploration are released based on commitments to explore with the aim of uncovering and developing resources. It is under the lease agreement that Woodside has determined the potential to develop the hydrocarbon fields for which acceptance of this EP is sought under the Environment Regulations.

Woodside has established a number of research projects in order to understand the marine environments in which we operate, notably in the Exmouth Region and the Kimberley Region; including Rankin Bank, Glomar Shoal, Enfield Canyon and Scott Reef. Where scientific data do not exist, Woodside assumes that a pristine natural environment exists and therefore, implements all practicable steps to prevent damage. Woodside's corporate values require that we consider the environment and communities in which we operate when making decisions.

Woodside looks after the communities and environments in which we operate. Risks are inherent in petroleum activities; however, through sound management, systematic application of policies, standards, procedures and processes, Woodside considers that despite this risk, the extremely low likelihood of loss of well containment is acceptable.

<u>Internal Context</u>

The Petroleum Activities Program is consistent with Woodside corporate policies, standards, procedures, processes and training requirements as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including:

- Woodside Health, Safety, Environment and Quality Policy
- Woodside Risk Management Policy
- The SCE technical Performance Standards developed and implemented for the Julimar Field Production System

Hydrocarbon spill preparedness and response strategies are considered applicable to the nature and scale of the risk and associated impacts of the response are reduced to ALARP.

Woodside's corporate values include working sustainably, with respect to the environment and communities in which we operate, listening to internal and external stakeholders and considering Health, Safety and Environment (HSE) when making decisions. Stakeholder consultation, outlined below, has been undertaken prior to the Petroleum Activities Program.

<u>External Context – Societal Values</u>

Woodside recognises that our licence to operate from a regulator and societal perspective is based on historical performance, complying with appropriate policies, standards and procedures, and understanding the expectations of external stakeholders. External stakeholder consultation, outlined below, has been undertaken prior to the Petroleum Activities Program:

- Woodside has consulted with AMSA and WA DoT on spill response strategies. In accordance with the Memorandum of Understanding between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA and DoT.

Demonstration of Acceptability
• Consultation with other relevant stakeholders (**Section 5**) and incorporation of stakeholder feedback into this EP where appropriate. • By providing hydrocarbon spill response measures that are commensurate with the risk rating, location and sensitivity of the receiving environment (including social and aesthetic values), Woodside believes that this addresses societal concerns to an acceptable level. <u>Other Requirements (includes laws, policies, standards and conventions)</u> The Petroleum Activities Program is consistent with laws, policies, standards and conventions, including: • Accepted Safety Case (as per the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009. • Mutual aid memorandum of understanding for relief well drilling is in place. • Accepted Well Operations Management Plan (WOMP) as per the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011. • Notification of reportable and recordable incidents to NOPSEMA, if required, in accordance with **Section 6.9**. The EMBA overlaps a number of BIAs for threatened and migratory species. Relevant 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 (**Section 6.9**).

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 13 Well loss of containment risks to the environment limited to High through maintenance of prevention and mitigative barriers during the Petroleum Activities Program.	**C 13.1** Maintain well mechanical integrity to contain reservoir fluids within the well envelope to avoid a MEE.	**PS 13.1** Integrity will be managed in accordance with SCE Management Procedure (Section 7.1.5) and SCE technical PSs to maintain environment risk-related functional objectives for: • P10 – Wells to: – ensure that a well retains the mechanical integrity to contain reservoir fluids within the well envelope at all times to avoid a MEE. Including operate phase environmentally critical equipment for pressure containment, structures, monitoring and isolating the systems associated with the well.	**MC 13.1.1** Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.2 Maintain integrity of well system isolations as fail safe and available to safely isolate reservoir from subsea systems and the environment and prevent LOC event escalation to a MEE.	**PS 13.2** Integrity will be managed in accordance with SCE Management Procedure (Section 7.1.5) and SCE technical PSs to maintain environment risk-related functional objectives for: • P10 – Wells to: – detect and respond to predefined initiating conditions and/or initiate responses that put the equipment, and the wells in a safe condition so as to prevent or mitigate the effects of a MEE.	Refer to **MC 13.1.1**

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	*Controls*	*Standards*	*Measurement Criteria*
	C 8.1 Refer to **Section 6.7.3**	**PS 8.1** Refer to **Section 6.7.3**	**MC 8.1.1** Refer to **Section 6.7.3**
	C 8.2 Refer to **Section 6.7.3**	**C 8.2** Refer to **Section 6.7.3**	**C 8.2.1** Refer to **Section 6.7.3**
	C 8.4 Refer to **Section 6.7.3**	**PS 8.4** Refer to **Section 6.7.3**.	**MC 8.4.1** Refer to **Section 6.7.3**
	C 7.1 **Refer to Section 6.7.2**	**PS 7.1** **Refer to Section 6.7.2**	**MC 7.1.1** **Refer to Section 6.7.2**
	C 7.3 **Refer to Section 6.7.2**	**PS 7.3 a and b** **Refer to Section 6.7.2**	**MC 7.3.1** **Refer to Section 6.7.2**
			MC 7.3.2 **Refer to Section 6.7.2**
	Mitigation – hydrocarbon spill response	Refer to **Appendix F** for the discussion around the ALARP assessment of controls related to hydrocarbon spill response.	

6.9 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 1.10.2**, NOPSEMA will not accept an EP that is inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community. This section describes the assessment that Woodside has undertaken to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans. For the purposes of this assessment, the relevant Part 13 statutory instruments (recovery plans and threat abatement plans) are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (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 6-14 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 6-15** to

Table 6-18.

Table 6-14: 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			
B1. Determine trends in index beaches	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		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	*Titleholder*	*Petroleum Activities Program*
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			
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

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	**Titleholder**	**Petroleum Activities Program**
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
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		

EPBC Act Part 13 Statutory Instrument	**Applicable to:**		
	Government	***Titleholder***	***Petroleum Activities Program***
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	
3. Remove existing marine debris	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 6-15: 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 6.7.5** **Not inconsistent assessment**: The potential for solid and hazardous wastes to be lost overboard to the marine environment has considered the potential risks to marine turtles and they are of Low residual risk.	**EPO 11** **C 11.1-11.3, C 9.3** **PS 11.1-11.3, PS 9.3**
	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 6.6.5, 6.7 and 6.8** **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 6.6.5, 6.7 and 6.8** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**
	Action Area A8: Minimise light pollution	**Action**: Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats Priority actions at stock level: G-NWS – as above LH-WA – no relevant actions F-Pil – Manage artificial light from onshore and offshore sources to ensure biologically important behaviours of	Refer **Sections 6.6.7** **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. Based on the frequency and nature of IMMR activities, the impacts to adult turtles moving through the Operational Area from vessel lighting are expected to be localised and temporary with no lasting effect.	N/A

		nesting adults and emerging/dispersing hatchlings can continue		
	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[1].	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 North West Shelf stock to other stocks LH-WA – no relevant actions F-Pil – no relevant actions	Refer **Sections 6.6.3** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to marine turtles. IMMR related noise is not expected to result in behavioural response, injury or mortality of individuals, or any other lasting effect.	N/A

Assessment Summary

The Marine Turtle Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.

Table 6-16: 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[2], and is not displaced from a foraging area	Refer **Sections 6.6.3** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to pygmy blue whales. Acoustic emissions from project vessels (DP vessel and IMMR activities) will not cause injury to any pygmy blue whale.	**EPO 3** **C 3.1** **PS 3.1**
	Action Area A.4: Minimising vessel collisions	**Action 3**: Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented	Refer **Section 6.7.6** **Not inconsistent assessment**: The assessment of vessel collision with marine fauna has considered the potential risks to pygmy blue whales. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the low operating speed of support vessels.	**EPO 12** **C 12.1** **PS 12.1**
	Action Area B.3: Describing spatial and temporal distribution and defining biologically important habitat	**Action 2**: Identify migratory pathways between breeding and feeding grounds **Action 3**: Assess timing and residency within Biologically Important Areas	**Not inconsistent assessment**: Woodside contributes to Action Area B3 via its support of targeted research initiatives (e.g. satellite tracking of pygmy blue whale migratory movements[3]).	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.				

Table 6-17: Assessment against relevant actions of the Grey Nurse Shark Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Grey Nurse Shark Recovery Plan	**Objective 7**: Improve understanding of the threat of pollution and disease to the grey nurse shark	**Action 7.1**: Review and assess the potential threat of introduced species, pathogens and pollutants	Refer **Sections 6.6.5, 6.7 and 6.8** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to grey nurse sharks. Spill risk strategies and response program include management measures, as identified and required.	Refer **Sections 6.6.5, 6.7 and 6.8** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix F**
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 6-18: 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 6.6.5, 6.7 and 6.8** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to sawfish and river shark. Spill risk strategies and response program include management measures, as identified and required.	Refer **Sections 6.6.5, 6.7 and 6.8** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix F**
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.				

7 IMPLEMENTATION STRATEGY

Regulation 14 of the Environment Regulations requires an EP to contain an implementation strategy for the activity. The implementation strategy for the Petroleum Activities Program confirms fit-for-purpose systems, practices and procedures are in place to direct, review and manage the activities so that environmental risks and impacts are continually being reduced to ALARP and are acceptable, and that EPOs and EPSs outlined in this EP are achieved.

Woodside, as Operator, is responsible for ensuring that the Petroleum Activities Program is managed in accordance with this implementation strategy and the WMS (see **Section 1.9**).

7.1 Systems, Practice and Procedures

All operational activities are planned and carried out in accordance with relevant legislation and internal environment standards and procedures identified in this EP (**Section 6**).

Processes are implemented to verify controls to manage environmental impacts and risks to:

- a level that is ALARP and acceptable
- meet EPOs
- comply with EPSs defined in this EP.

The systems, practices and procedures that will be implemented are listed in the EPSs contained in this EP. Document names and reference numbers may be subject to change during the statutory duration of this EP; this is managed through a change register and management of change process (**Section 7.1.3**). Further information regarding some of the key systems, practices and procedures relevant to implementation of this EP is provided below.

7.1.1 WMS Operate Processes

Under the WMS Operate Activity (see **Section 1.9** for an overview of the WMS), there are four overarching processes; those directly relevant to the implementation of this EP and environmental management during the Petroleum Activities Program are described below (Operate Plant Process and the Maintain Assets Process).

7.1.1.1 Operate Plant

The Operating Practice MSPS (M02) is in place to assure operating practices are in place, such that:

- integrity-critical operating procedures are available, accurate, up to date, understood and used
- safe operating and technical integrity limits are defined, understood and the process is managed within these limits.

The Julimar Field Production Systems Operating Manual describes what is undertaken and “how” Chevron must “operate” the wells that are under its control. This key document is developed and maintained by Woodside and the requirements executed by Chevron. It describes the requirements for operating the Julimar-Brunello field including reference to relevant operating and maintenance procedures. It also defines the relevant emergency response bridging documents and communication arrangements.

Permit to Work

The *Wheatstone Platform Permit to Work Manual* process outlines the key systems and practices required to achieve effective management of permit-controlled work. The PTW system is a key element in ensuring that all necessary steps are taken to manage the safety of personnel, protection of the environment and technical integrity of the facility and the Julimar Field Production System.

Vessels liaise with the Wheatstone Platform to obtain a PTW prior to working on subsea infrastructure and JDP2 start-up.

The PTW system takes a risk-based approach to all activities with tasks with higher levels of risk subjected to greater scrutiny and control. The PTW system also allows for low risk routine tasks to be carried out with minimal but adequate administration. The primary objective of PTW is to ensure that work meets regulatory requirements, as well as internal requirements for how to safely manage the execution of work. Specifically, that activities are properly planned, risk assessed, controlled, co-ordinated, and safely executed. It provides a methodical approach to identify hazards, assess risks, create and support permits to work and associated certificates.

In keeping with ALARP principles, this system is critical to ensuring the appropriate level of hazard identification and risk assessment is carried out for activities performed on the Julimar Field Production System.

In addition, the Safe Work Control MSPS (M04) is in place to assure effective safe work control, permit to work and task risk management arrangements are in place and followed to control the risks arising from work activities.

7.1.1.2 Maintain Assets

The Maintain Assets Process aims to improve the reliability and availability of plant and equipment (which includes that required for safe operation) through well managed and planned execution of maintenance that promotes a proactive maintenance culture.

Maintenance, inspection and testing systems and procedures are in place to safeguard the integrity of the Julimar Field Production System. The maintenance strategy for the Julimar Field Production System is based on optimising safety, minimising environmental impact and maximising production. Maintenance practices used to establish well managed maintenances strategies, planned execution and improvement are described in the Maintenance of Assets Procedure.

A risk-based approach is used as the basis for establishing and prioritising inspection, maintenance and testing requirements at the Julimar Field Production System. Equipment is assessed to establish equipment criticality with respect to the consequences and likelihood of equipment failure. This informs determination of appropriate maintenance and inspection activities. Maintenance activities are allocated risk rankings according to the criticality of equipment, to ensure high risk maintenance work orders are completed as a priority.

A computerised maintenance management system (CMMS) provides a database called SAP-PM that contains Julimar Field Production System registers, equipment details, spare parts data and associated planned maintenance tasks. This system is used to plan, monitor and record maintenance activities. The system provides a variety of reports that enable monitoring and assessment of maintenance activities.

SCE Technical Performance Standards identify SCEs and associated assurance activities. These activities are identified in the CMMS and given the appropriate priority (Technical Integrity status). Refer to **Section 2.7.5** and **Section 7.1.5** for more detail on SCE Technical Performance Standards and how they differ from EPSs required by the Environment Regulations. SCE Technical Performance Standards form a key component in the processes and systems implemented by Woodside to maintain safety and environment critical plant and equipment.

In addition, the Maintenance and Inspection MSPS (M03) is in place to assure that the necessary inspection and maintenance requirements are identified and carried out to maintain the integrity of SCEs and SCCs.

7.1.2 Process Safety Management

To ensure that Woodside protects the safety, security and health of its employees, contractors, the environment and assets, Woodside has adopted the Energy Institute's Process Safety Management

(PSM) framework within its Process Safety Management Procedure which sets out a disciplined framework for managing the integrity of systems and processes that handle hazardous substances over the production (and exploration) lifecycle. It deals with the prevention and control of events that have potential to release hazardous materials and energy.

PSM consists of four main focus areas. Each focus area contains a number of PSM requirements that define key aspects required to ensure that PSM is integrated through the organisation. There are twenty PSM requirements. The focus areas and requirements are shown in **Figure 7-1**. Chevron process safety management framework is outlined in the Wheatstone Facility Safety Case (including Julimar-Brunello pipelines) with the interface documents outlined in the Julimar field production Systems Operating Manual.

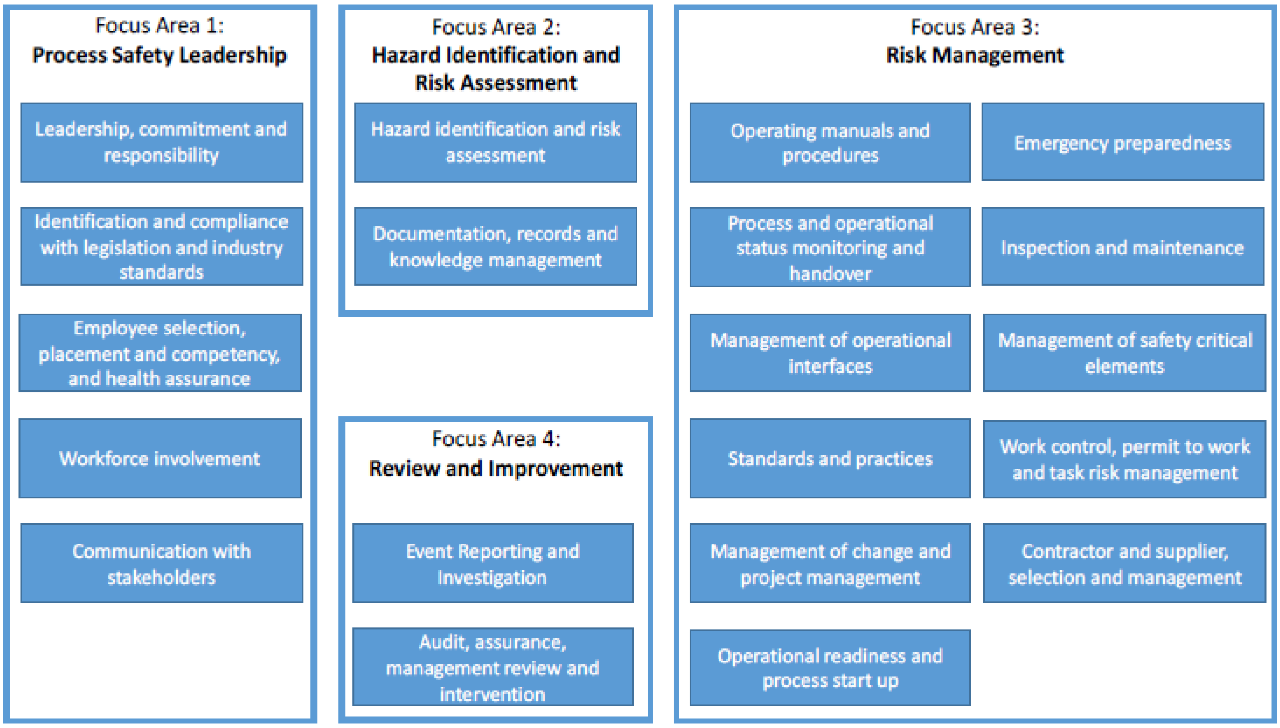

Figure 7-1: Process Safety Management Focus Areas

7.1.2.1 Woodside Safety Culture Framework

Woodside's 'Our Safety Culture' framework (shown in **Figure 7-2**) promotes a strong HSE culture and is a key enabler for effective process safety management. This framework outlines the expected behaviours for everyone including supervisors and managers/executives, and is openly discussed as part of inductions, training and development. Chevron safety culture framework is outlined in the Wheatstone Facility Safety Case (including Julimar-Brunello pipelines).

Theme	Everyone	Supervisors	Managers/Executives
Standards	Follow rules	Ensure compliance	Set high standards
Communication	Speak up	Encourage the team	Communicate openly
Risk management	Be mindful	Promote risk awareness	Confront risk
Involvement	Get involved	Involve the team	Involve the workforce

Figure 7-2: Woodside 'Our Safety Culture' Framework

7.1.3 Risk Management

Risk management processes and practices are applied on an ongoing basis to design, production and maintenance activities for Julimar operations to manage risks to personnel, assets and the environment.

Potential environmental consequences and impacts from the Julimar operations are risk assessed and controlled in accordance with the Woodside risk management processes described in **Section 2.2** of this EP (Environmental Risk Management Methodology).

The results of the Julimar operations ENVID are described in **Section 6** and in the Julimar Field Production System Environmental Impacts and Risk Register. This register, in conjunction with the EP, provides a demonstration that environmental risks have been identified, and that appropriate controls are in place to manage those risks to a level that is acceptable and ALARP throughout the life of the Julimar Field Production System.

A number of other risk management tools and techniques are used by Julimar operations to manage environmental and other risks on a routine basis during operational, maintenance and inspection tasks. Examples include:

- the processes outlined in **Section 2**
- risk management tools (e.g. Hazard Identification and Risk Assessments, Operational Risk Assessments, the technical Management of Change (MoC) system (**Section 7.1.4**), and Step back 5 x 5)
- integrity review studies, HAZIDs and Hazard Operability studies.

These tools, risk and integrity management practices are described further in the Wheatstone Facility Safety Case (including Julimar-Brunello pipelines), WOMP, and the Control of Operational Risk Procedure.

In addition, other risk sub-processes and practices are also applied within Woodside on an ongoing basis to manage different types of risk. A summary of those relevant to the Petroleum Activities Program is provided below. Woodside's risk management processes (refer to **Section 2.2.1**), along with the supporting risk sub-processes and practices discussed in this section, ensure the environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP.

7.1.3.1 Management of Risks – Contracting and Procurement

Suppliers and contractors play a significant role in meeting the resource needs of Woodside's operations, including the Julimar Field Production System operations. Effective management of environmental risks in contracts is achieved by setting clear expectations and managing environmental risks throughout the duration of the contract. Environmental risks in contracts are managed under the Contracting and Procurement Procedure supported by the Health, Safety and Environment in Contracting Guideline. The guideline provides a risk-based approach to contractor selection and management and is aligned with 'HSE Management – Guidelines for Working Together in a Contract Environment' International Association of Oil and Gas Producers, Report No. 423.

The Engineering Standard Quality Requirements for Supply of Products and Services defines specific quality requirements for engineering contracts and purchase orders. The specified quality control requirements in the Standard are required to be complied with as applicable to the scope of supply.

7.1.3.2 Management of Risks – Subsea Activities

Subsea activities are managed in line with the Subsea and Pipelines Integrity Management Procedure which defines the practices and technical requirements that must be applied to deliver and safeguard integrity of the subsea equipment and pipelines during the Julimar Field Production System lifecycle. It provides the relationship between the PSM Framework (including management of change) and Subsea and Pipelines Group services processes.

IMMR activities are managed under the Manage IMMR Work Procedure. Risk assessments are conducted as required under this procedure.

These requirements are supported by implementation of the Subsea Construction and Inspection, Maintenance and Repair Environment Screening Questionnaire tool. The screening questionnaire is used to understand the scope of the activity, potential environmental impact and if additional regulatory approvals are required. To achieve this, the questionnaire captures key project information such as seabed disturbance, chemical usage and waste. This information is used by an environment focal point to determine if further assessment is required. For scopes that have the potential for environmental impact, an assessment is undertaken against this EP and other Woodside environmental requirements. If determined by the Subsea and Pipeline Environment Screening Questionnaire process, an EP MoC review (as per **Section 7.1.4**) may be undertaken to confirm if the level of environmental risk warrants revision and resubmission of an EP. Environmental questionnaires are maintained in the Subsea and Pipeline (SSPL) Environment Project Register.

Key environmental requirements and regulatory commitments are communicated to project teams and incorporated into key project documentation where applicable and required (i.e. not addressed via existing Woodside practices).

7.1.3.3 Management of Risks – Major Projects

Major projects are required to follow the Appraise and Develop Management Procedure and the Opportunity Management Framework. This procedure defines the requirements to deliver a commercially valuable production facility or modify to an existing facility. The process workflow requires integration of work from various functions utilising their people and processes, including Environment, for example HSE philosophy and regulatory approval requirements.

These requirements are supported by implementation of the Brownfields Environment Screening Questionnaire tool. The screening tool is used to determine if a project has the potential for environmental impact or requires additional regulatory approvals. For projects that have the potential for environmental impact, an environmental focal point is assigned, and the risks and impacts assessed against this EP and other Woodside environmental requirements.

Key environmental requirements and regulatory commitments are communicated to project teams and incorporated into key project documentation where applicable and required (i.e. not addressed via existing Woodside practices).Where it is identified that the project scope has the potential to result in significant modification or change to the Julimar Field Production System description provided in the EP, or where potential significant new environmental risks or impacts or significant increases in an existing environmental risk or impact are identified, an EP MoC review (as per **Section 7.1.4**) may be undertaken to confirm if the level of environmental risk warrants revision and resubmission of an EP.

7.1.3.4 Management of Risks – Well Integrity

Wells are managed throughout their lifecycle in line with the Well Lifecycle Management Procedure. This procedure provides the basis for ensuring well integrity in accordance with the Process Safety Management Procedure.

In addition, wells are required to have a regulator-accepted Well Operations Management Plan to demonstrate that well integrity risks are managed to ALARP levels. Wells associated with the Julimar Field Production System are managed under a WOMP.

7.1.3.5 Management of Risks – Marine Services

Woodside's Marine Services Function provides a platform for the conduct of safe and efficient Marine Operations across Woodside through the Marine Services Management. A set of procedures that support vessel assurance and management (including HSE and quality management) are in place to ensure marine operations are conducted in a safe and efficient manner, and in accordance with regulatory requirements. Management of subsea activities on subsea support vessels is managed by the SSPL Function.

7.1.3.6 Management of Human Factor Related Risks

The term 'human factors' is used to describe the consideration of people as part of complex systems. Woodside defines 'human factors' as follows: 'human factors uses what we know about people, organisation and work design to influence performance'.

As outlined in **Section 6.8.2**, human factors can contribute to MEEs, or result in failure or degradation of the controls in place to protect against MEEs. The WMS includes a number of procedures designed to manage human factors related risks and prevent incident causation.

7.1.4 Change Management

Woodside's Change Management Procedure describes requirements for change management at owned or controlled operations/sites.

Change management is used where there is no existing approved business baseline, such as a process, procedure or accepted practice, or where conformance with an approved baseline is not possible or intended; for example, due to equipment fault or failure or a recently discovered issue which will take time to rectify. Change management is also used when the baseline is changed (e.g. the process is modified). It applies to management of temporary, permanent, planned or unplanned change encompassing one or more of the following:

- plant (equipment, plant, technology, facilities, operations or materials)
- projects (budget, schedule)
- people (organisation structure, performance, roles)
- process (WMS content, processes, procedures, standards, legislation, information).

Woodside's change management process hierarchy is depicted in **Figure 7-3**. The hierarchy has been developed with sub-processes to address the different types of change performed at Woodside.

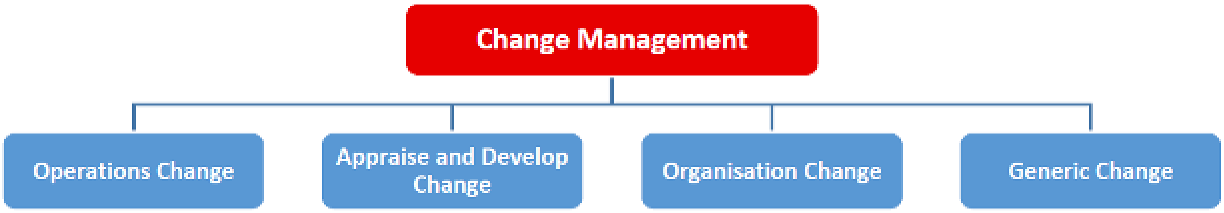

Figure 7-3: Change Management Hierarchy

To help manage the day to day operation of the Julimar Field Production System, Woodside has developed a Golden Safety Rules Booklet, which provides a summary of mandatory requirements for safety in the workplace and includes guidance for managing changes that have a Health, Safety, Integrity and/or Environment impact.

7.1.4.1 Technical Change Management

Technical changes within the Operations Division are managed using the Management of Change – Assets Procedure. The objective of the procedure is to ensure HSE risks associated with both realised and potential changes, including any failure to meet the Julimar Field Production System Performance Standards, are identified, assessed and reduced to ALARP (**Section 7.1.5** provides further information on management of Performance Standards).

Assessed changes must be recommended, agreed and decided upon based on the assessed current level of risk, as defined by Woodside's Technical Decision Authority matrices.

The management of change requirements contained in the Process Safety Management Procedure and Management System Performance Standard M05 Management of Change are considered when conducting any changes with the potential to impact process safety.

The Engineering Management Procedure specifies key requirements of engineering related changes, and requires that engineering Technical Decisions are agreed, recommended and decided at the appropriate engineering authority level according to the risk. Change management and risk assessment include consideration of applicable legislation/regulation.

Change is also managed under management system requirements set out as part of major projects (Brownfields), wells integrity, subsea and pipelines integrity management and marine management system. Change management includes consideration of regulatory requirements, managed in accordance with the Regulatory Compliance Management Procedure.

In addition, the Management of Change MSPS (M05) is in place to assure process safety risks arising from change (temporary and permanent) are systematically identified, assessed and managed.

The Julimar Field Production System is managed under Chevron's Operations Safety Case for the Julimar-Brunello Pipeline therefore management of change (MoC) will comply with the requirements of the Chevron Operations Excellence Management System (OEMS). Woodside implements a MoC interface process that complies with both the Chevron OEMS and the Woodside Change Management Operating Standard, the interface process describes how change will be managed for the following scenarios:

1. Change to the Julimar Field Production System instigated by Woodside
2. Change to the Julimar Field Production System or systems that can impact the Julimar Field Production System instigated by Chevron

The MoC interface process ensures that the relevant Woodside stakeholder/s including relevant Integrity Authorities (as defined in *Engineering Management Procedure*) are consulted during the change assessment. The interface process shall also ensure that the consultation occurs during the initial assessment phase of the proposed change and the relevant Woodside stakeholder endorses the change prior to implementation.

7.1.4.2 EP Management of Change and Revision

Woodside's Environmental Approval Requirements Australia Commonwealth Guideline provides guidance on the Environment Regulations that may trigger a revision and resubmission of the EP to NOPSEMA. The document also provides guidance on what may constitute as new source-based or receptor-based impacts and risks, or a significant increase in an existing source of environmental risk (to provide context in determining if EP resubmission is required under Regulations 8 and 17 of the Environment Regulations).

Minor EP changes, where a review of the activity and the environmental risks and impacts of the activity shows the changes do not trigger regulatory requirements to resubmit the EP, are considered a 'minor revision'.

Changes with potential to influence minor or technical changes to the EP text are tracked in management of change records, project records, or the Production EP Updates Register, and incorporated during internal updates of the EP or the five-yearly revision.

In accordance with the requirements of Regulation 19 of the Environment Regulations, Woodside will also submit to NOPSEMA a proposed revision to this EP at least 14-days before the end of each period of five years, commencing on the day on which the original and subsequent revisions of the EP are accepted under Regulation 11 of the Environment Regulations.

7.1.4.3 OPEP Management of Change

Relevant documents from the OPEP (**Section 7.9**; **Table 7-5**) 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 7.1.4.2**).

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.

7.1.4.4 Change of Titleholder's Nominated Liaison Person

In the event of a change to Woodside's nominated liaison person, or a change to the contact details for the titleholder or the nominated liaison person, Woodside will notify NOPSEMA of the change in writing as soon as practicable.

7.1.5 Management of SCE Technical Performance Standards and Management System Performance Standards

7.1.5.1 Management System Performance Standards

Woodside ensures safety critical management processes function as required through the application of Management System Performance Standards (MSPS). MSPS are developed and owned at non-facility specific level (i.e. pan Woodside) and include assurance checks for the key requirements of the applicable management system.

Individual facilities demonstrate conformance against the MSPS through the conduct of reviews. Non-conformances against an MSPS are internally managed in accordance with the Woodside Management System.

7.1.5.2 SCE Technical Performance Standards

An SCE is defined by Woodside as a hardware barrier, the failure of which could cause or contribute substantially to, or the purpose of which is to prevent or limit the effect of a MAE/MEE, or Process Safety Event.

Woodside identifies/develops, implements, monitors/assures and verifies/optimises SCEs by applying SCE technical Performance Standards as described in the Safety and Environment Critical Element (SCE) Management Procedure. Key elements of the procedure are summarised in **Table 7-1**.

Table 7-1: Safety and Environment Critical Element Management Procedure Summary

Identify/Develop	**Identify SCE –** SCEs must be identified from the facilities PSRAs (e.g. Formal Safety Assessments) (**Section 2.2**). The identification of SCEs for which Performance Standards are required are part of the formal safety and environmental risk assessment processes. Woodside's Global Performance Standards (based on industry and Woodside Standards) should be used for preliminary selection of SCEs. **Complete Engineering Design Studies –** Engineering design studies must be completed to demonstrate that SCE Performance Criteria specified in the global Performance Standard and/or determined by PSRA will be met by the facility design, allowing for normal SCE degradation in operation. The studies must establish the testing and inspection tasks required to assess performance against the criteria. The scope and frequency of SCE Assurance Tasks are guided by the SCE Global Performance Standard and may require designated Engineering Design Studies. Studies could include Reliability Centred Maintenance, Risk Based Inspection and LOPA (Layers of Protection) studies to determine the Assurance Task scope and frequencies, RBI plans, and classification and implementation requirements for instrumented safeguarding. **Develop Performance Standards –** Facilities must develop Performance Standards for all applicable SCEs by: • selecting the relevant Global Performance Standard (including Assurance Tasks) • considering facility specific requirements and applicable regulatory requirements • adding the specific data from the facility Engineering Design Studies and PSRA to compile scope and frequency of SCE assurance activities.
Implement	Identify SCE in Asset Register – SCEs must be uniquely identified on the asset register and assigned Performance Standard flags. Develop Testing, Inspection and Maintenance Programs – SCE assurance tasks are developed into maintenance procedures. Implement Testing, Inspection and Maintenance Programs – SCE testing, inspection and maintenance requirements must be implemented in the CMMS (Section 7.1.1.2).
Maintain/Assure	**Execute Testing, Inspection and Maintenance Programs** – On completion of SCC and SCE assurance tasks, results must be recorded with all relevant detail, assessed for conformance with the Performance Criteria and any follow-on correction work identified. **Conduct Fitness for Service (FFS) Assessment –** In some instances, an engineering FFS assessment may be required to determine whether equipment has failed its performance standard requirements, e.g. assessment of corrosion defects following inspection of piping. Detailed results of FFS assessment may be recorded out of CMMS. **Response to SCC/SCE events** – Events where the SCC/SCE have not met their specified performance criteria must be managed in accordance with a structured review process. This process may require the application of the facility Manual of Permitted Operation (MOPO) which provides prescriptive guidelines to be followed in the event of a reduction in the performance of an SCE, or managed in accordance with the Management of Change – Assets Procedure (**Section 7.1.4**). **Internal Reporting** – Internal notification of SCC failures must be made in accordance with maintenance management workflows. SCC failures that cause failures to meet a Facility Performance Standard and SCE demands must be reported in accordance with the Health Safety and Environment Event Reporting and Investigation Procedure (**Section 7.8.3**). The Facility Performance Standard is not met when the SCE fails to achieve the given functional objectives (i.e. it does not meet its goal statement or applicable key requirements). **External Reporting** – External notification obligations for SCE events must be understood (i.e. based on local regulatory requirements). External communications must be in accordance with the health safety and environment event reporting and investigation procedure (**Section 7.8.3**). **Manage and Analyse Results** – The results from assurance tasks must be accurately recorded to support data analysis. Analysis will enable appropriate action to be taken to minimise future failure recurrences and enable assessment of overall system performance and reliability to verify SCE effectiveness in revealing failures and to allow predictive maintenance.
Verify/ Optimise	**Review SCE Performance –** SCE performance reviews must be conducted to ensure requirements for maintaining SCE performance are being met. **Manage Change –** Any change to the Performance Standards must be conducted in accordance with the Change Management Procedure (**Section 7.1.4**).

SCE Facility Performance Standards are a statement of the performance required of an SCE (e.g. functionality, availability, reliability, survivability), which is used as the basis for establishing agreed assurance tasks and managing the hazard. An assurance task is an activity carried out to confirm that the SCE meets, or will meet, its SCE Performance Standard. Examples of assurance tasks include inspection routines, maintenance activities, test routines, and reliability monitoring.

These assurance tasks are identified in the CMMS, flagged against their associated Performance Standard, and given the appropriate priority (defined as Technical Integrity). Management systems are in place to manage the completion of maintenance including that required for Technical Integrity assurance.

Events where the SCC/SCE have not met their specified performance criteria must be managed in accordance with a structured review process. This process may require the application of the facility Manual of Permitted Operation (MOPO) which provides prescriptive guidelines to be followed in the event of a reduction in the performance of an SCE in specific defined circumstances; or, if the MOPO does not cover the event, according to procedures for the assessment and management of operational risk.

Internal notification of SCC failures must be made in accordance with maintenance management workflows. Failures to meet a Facility Performance Standard occur where SCC events lead to the functional objectives (goal and/or applicable key requirement statements) of the facility Performance Standard for the SCE not being met (i.e. lost or unavailable), taking into account any redundancy inherent within the SCE. These events are reported in the Event Reporting Database as potential SCE Failure to Meet Facility Performance Standard Events.

These are internally reported as Hazard Events. Where ‘Failure to meet a Facility Performance Standard’ leads to a loss of hydrocarbon containment, or a release of energy, it is internally reported (and externally where relevant) as a Loss of Primary Containment or Environmental Spill event, depending on the nature of the release.

Additionally, confirmed ‘Failure to meet a Facility Performance Standard’ events for the SCEs identified in the MEE bowties may equate to a breach of EPOs and/or EPSs. The review to identify such events for external reporting considers whether the hazard event is relevant to environmental SCE functional objectives (goal and/or applicable key requirements) of the SCE Facility Performance Standard and whether the event poses a risk to achieving EPOs and EPSs. The WMS Regulator Event Reporting Guideline provides additional information regarding external SCE related reporting obligations.

There may also be planned changes/deviations from SCE Technical Performance Standards, these are managed via procedures for the assessment and management of operational risk, and endorsed in accordance with the engineering management procedures (described further within **Section 7.1.4**). This management process ensures risks (including environment) are managed so that the planned change/deviation does not result in unacceptable impact or risk, remains ALARP and regulatory requirements are met.

7.2 Organisation Structure

The following Woodside organisational structure provides leadership and direction for operation of the Julimar operations and environmental performance:

- The Senior Vice President Operations reports to the Chief Executive Officer (CEO);
- The Vice President FPSO’s and Wheatstone report to the Senior Vice President Operations;
- The Production Environment Manager reports to the General Manager Environment;
- The Asset Manager and support teams report to the Vice President FPSO’s and Wheatstone;
- All facilities are supported by a team of environmental professionals who report to the Production Environment Manager; and

- All facilities are supported functionally by a number of multi-discipline teams including engineering, project development, marine assurance, human resources, subsea, drilling and completions, corporate etc.
- all facilities are supported by other Woodside functional teams including:
  - **Engineering** – supports operating assets in terms of engineering standards/guidelines and governance processes, systems, applications and specialist personnel to support these standards/guidelines
  - **HSE Support** – provides specific guidance and access to specialist HSE resources including assistance for governance and training, as well as guidance on Woodside HSE standards
  - **Subsea** – responsible for the installation and IMMR activities on subsea infrastructure including Julimar Field Production System structures, flowlines, manifolds and subsea isolation valves to ensure integrity
  - **Drilling and Completions** – ensures the safe planning and execution of drilling (note drilling is excluded from the scope of this EP), completion and work over operations
  - **Brownfields** – responsible for the engineering, construction and execution of small projects on operational facilities to ensure ongoing integrity and safe operation
  - **Marine Group** – responsible for chartering vessels to support Woodside's offshore production facilities including vessels to aid emergency response
  - **Aviation Group** – provides personnel transport, material transport, emergency evacuation and search and rescue capabilities.

A simplified chart of the structural organisation of the Julimar operations is shown in **Figure 7-4**.

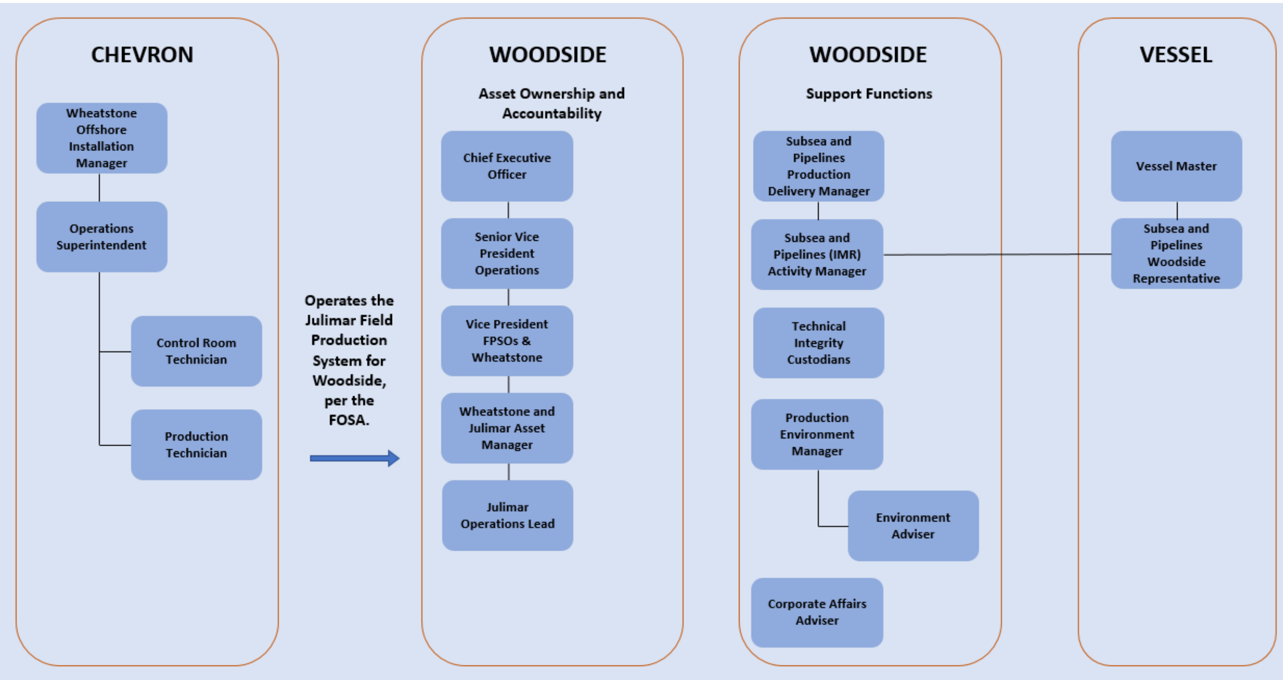

Figure 7-4: Julimar & Wheatstone Operations Organisation Structure

7.3 Roles and Responsibilities

As required by Regulation 14(4), this section of the implementation strategy establishes a clear chain of command that sets out the roles and responsibilities of personnel in relation to the implementation, management and review of the EP, ranging from senior management to operational personnel on the vessels.

Key roles and responsibilities for Woodside and Contractor personnel in relation to the implementation, management and review of this EP are described below in **Table 7-2**. Roles and responsibilities for hydrocarbon spill preparation and response are outlined in **Table 7-2** and the Woodside Oil Pollution Emergency Arrangements (Australia) (OPEA (Australia)). Roles and responsibilities for Julimar Field Production System emergency response are outlined in the Wheatstone Facility Safety Case (including Julimar-Brunello pipelines) and are consistent with the Julimar Emergency Response Plan.

It is the responsibility of all Woodside employees and contractors to apply the Woodside Corporate Health, Safety, Environment and Quality Policy (**Appendix A**) in their areas of responsibility.

Table 7-2: Roles and Responsibilities

Title (Role)	Environmental Responsibilities
Onshore Based Personnel	
Asset Manager	***Systems, Practices and Procedures*** • As per the requirements of the Wheatstone Platform Safety Case and the FOSA, provides operational direction and oversight to ensure that the Julimar Field Production System is operated in accordance with approved Operating Procedures. • Manages the ongoing integrity of Julimar Field Production System in accordance with the approved procedures and plans. • Accountable for ensuring all necessary regulatory approvals are in place to operate. • Accountable for the implementation and compliance of the EP. • Accountable for safe, efficient and environmentally sound operation of the field production system in accordance with the EP, legislative requirements and HSE policies and standards. • Custodian of communication with all regulatory agencies required to operate the wells and subsea infrastructure. • Accountable and responsible for environmental performance and continuous improvement. • Accountable for the implementation of stakeholder consultation as per the description in this EP and in compliance with regulations. • Accountable for aspects of integrity management of the field production system including the evaluation and reporting of conditions against the integrity envelope. ***Resourcing, Training and Competencies*** • Puts in place adequate resource (technical, environmental, engineering, information, financial) to implement and me*et* the requirements of this EP. • Establishes and maintains a workforce with the necessary knowledge, skills and competencies to oversee and maintain the subsea system in accordance with the requirements of the EP. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Accountable for monitoring performance against the EP. • Accountable for implementing agreed assurance activities and monitoring close out of actions. • Accountable for incident notification, reporting and investigation in line with Woodside and EP requirements.
Subsea and Pipelines Production Delivery Manager	***Systems, Practices and Procedures*** • Responsible for overall engineering compliance with legislative requirements. • Accountable for ensuring that the management of change and maintenance workflow systems and processes are adhered to. • Accountable for compliance with all engineering elements of business processes within the defined area/asset including the management of change and maintenance workflow. • Accountable for achievement of all engineering KPIs and maintenance execution and technical integrity KPIs, and risk assessment and mitigation.

Title (Role)	Environmental Responsibilities
Technical Integrity Custodians	***Systems, Practices and Procedures*** • Maintaining and approving deviations and changes to technical integrity and engineering standards of which they are custodian. • Owning and maintaining Performance Standards and reliability specifications. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Distributing technical learning from incidents to relevant technical integrity custodians to share learnings.
Julimar Operations Lead /Focal Point	• Provides Julimar Field Production System operational guidance and oversight. • Accountable for maintenance of Field Operating Guidelines, Operating Procedures and Field Production System Operating Manual. • Provides an ongoing interface between Chevron Operations and the Woodside functional support groups.
Environment Manager	***Systems, Practices and Procedures*** • Overall coordination of environmental management across the Division to ensure the performance objectives, standards and measurement criteria of the EPs is met. • Ensuring the Division understands and adheres to legislative and regulatory requirements, EPs and the WMS. • Guiding and driving the direction of environmental management across the Division, maintaining alignment with the Corporate Environment functional direction. • Facilitating environmental approval documentation for the Division and its timely submission in accordance with regulatory requirements and Woodside standards. • Providing governance on environmental standards and EP compliance. • Monitoring and communicating to internal stakeholders any relevant changes to legislation, policies, regulator organisation that may impact the EP or business. • Developing environmental improvement plans, targets and KPIs with divisional management, as relevant. ***Resourcing, Training and Competencies*** • Supporting the Divisional environmental performance through implementation of effective environmental training programs. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Monitor and review environmental performance and continuous improvement.
Corporate Affairs Adviser	***Systems, Practices and Procedures*** • Preparing Stakeholder Consultation Plan. • Facilitating implementation of the Stakeholder Consultation Plan. • Reporting of stakeholder consultation.
Subsea and Pipelines (IMR) Activity Manager	***Systems, Practices and Procedures***

Title (Role)	Environmental Responsibilities
or Contract Sponsor	• Ensuring the activity is undertaken as per the management measures of the EP (including actions required prior to the commencement of the activity). • Ensuring implementation of this EP for the scope of work. • Managing change requests for the activity and notifying the Environmental Adviser of any scope changes in a timely manner. ***Resourcing, Training and Competencies*** • Ensuring sufficient resources to implement the management measures of the EP. • Ensuring vessel crew complete an environmental induction. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Ensuring environmental incident reporting meets regulatory requirements (as outlined in the EP) and Woodside's Event Reporting and Investigation Operating Standard. • Reviewing environmental performance. • Monitoring and closing out corrective actions raised from environmental inspections/audits or incidents.
Environment Adviser	***Systems, Practices and Procedures*** • Ensuring the key Woodside, contractor and activity vessel personnel have copies of the EP and understand the management measures and their environmental responsibilities for the activity. • Ensuring understanding of legislative and regulatory requirements, EPs and the WMS. • Developing, review and control revisions of the EP and maintaining in accordance with EP commitments. • Ensuring appropriate personnel have access to the EP and understand the objectives, standards and measurement criteria and their environmental responsibilities for the activity. • Liaising with applicable regulatory authorities and stakeholders as required. ***Resourcing, Training and Competencies*** • Developing and maintaining environmental training for deployment to relevant personnel. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Coordinating environmental reporting requirements from the EP including environmental performance and compliance reporting. • Assisting with review, investigation and reporting of environmental incidents.
Offshore Personnel (Chevron)	
Wheatstone Offshore Installation Manager (Chevron)	• Ensures operational obligations on Wheatstone are satisfied under the Julimar Brunello Field Operating Services Agreement: • Comply with relevant platform and subsea commitments of this EP. • Ensures compliance with applicable legislation, guidelines, company policies and procedures. • Ensures Chevron's Permit to Work process is appropriately applied to relevant Julimar and Brunello work scopes.

Title (Role)	Environmental Responsibilities
	• Ensure compliance to relevant platform and subsea commitments of the *Start-Up and Operations Environment Plan: Wheatstone Project* (Chevron Doc. WS2-COP-00001), including that Wheatstone platform personnel have relevant training to meet the requirements of the document.
Operations Superintendent (Chevron)	• Ensures Wheatstone platform persons are competent and compliant with all aspects of their tasks. • Complies with operational obligations on Wheatstone are satisfied under the Julimar Brunello Field Operating Services Agreement. • Complies with and ensures the compliance of others with HSE policies and procedures pertaining to accessing, working on and operating the Julimar Field Production System.
Control Room Technician (Chevron)	• Operate the Wheatstone Platform following standard operating procedures to meet Operational Excellence Management System commitment to Environment and within compliance of all associated procedures and standards. • Respond to emergency incidents as per the Wheatstone Platform Emergency Response Plan. • Act upon any SIMOPs activities or safety systems that may be compromised.
Production Technician (Chevron)	• Complies with HSE policies and procedures pertaining to accessing and working on and operating the Julimar Field Production System. • Respond to emergency incidents as per the WP Emergency Response Plan.
Vessel Based Personnel	
Vessel Master	***Systems, Practices and Procedures*** • Understanding and managing health, safety and environmental aspects of the vessel in relation to the EP and legislative requirements. • Communicating with Woodside Representative and SSPL Environment Adviser as required regarding potential environmental risks applicable to vessel activities. • Implementing relevant controls under Chevron's permit to work process including working within petroleum safety zones • Ensuring vessel meets relevant quarantine and IMS requirements. • Notifying AMSA and other authorities as per maritime requirements. • Implementing HSE policies and procedures. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Participating in environmental audits and inspections on request. • Providing, as requested by Woodside, copies of documents, records, reports and certifications (i.e. fuel use, ballast exchanges, waste logs etc.) in a timely manner to assist in compliance reporting. • Ensuring the vessel's Emergency Response Team have sufficient training to implement the vessel's SOPEP. • Ensuring all emergency drills are conducted. • Ensuring that vessel procedures are followed in the event of an emergency or spill. • Immediately notifying the Woodside Representative of any reportable and recordable incidents.

Title (Role)	Environmental Responsibilities
Subsea and Pipelines Woodside Representative	***Systems, Practices and Procedures*** • Ensuring the management measures in this EP are implemented on the IMMR vessel. ***Monitoring, Auditing, Non-conformance and Emergency Response*** • Ensuring environmental incidents or breaches of objectives, standards or measurement criteria, are reported in accordance with Woodside and regulatory requirements. • Ensuring periodic environmental inspections are completed.
Title (role)	**Responsibilities Related to Environment Plan**
All Personnel	
All relevant Wheatstone Platform and onshore support personnel	• understand the Woodside standards and procedures that apply to their area of work. • understand the environmental risks and control measures that apply to their area of work. • carry out assigned activities in accordance with approved procedures and the EP. • follow instructions from relevant supervisor with respect to environmental protection. • cease operations which are deemed to present an unacceptable risk to the environment. • participate in environmental assurance activities and inspections as required. • prompt reporting of environmental hazards/incidents to their supervisor and assist in event investigation.

7.4 Communication Strategy

7.4.1 Subsea Operating Procedures

Julimar Subsea Operating procedures define the limits of the Julimar Field Production System boundaries. The procedures cover the following operating scenarios and are integrated into the relevant Chevron topside operating procedures:

- Start-up and Shutdown
- Routine Operations
- MEG Flushing
- Valve integrity Operations
- Hydrate localisation and remediation.

Updates to procedures is outlined in the Woodside Information Management Plan and undertaken in accordance with Chevron MOC requirements (**Section 7.1.4.1**).

7.4.2 Information Management

The Woodside Information Management Plan addresses document management and communication of changes between Woodside and Chevron.

A Computerised Maintenance Management System (CMMS) interface enables oversight of critical maintenance activities on the Julimar Field Production System. The system provides Woodside with oversight of critical tasks in accordance with relevant technical integrity standards, using monitoring techniques and alarms that replicate those established for other Woodside facilities. Non-compliance with any critical maintenance activities performed on the Wheatstone Platform will result in relevant notification and close out as provided for in the operating contract.

7.4.3 Onshore

Woodside interface closely with Chevron to ensure Julimar Field Production System deliverables are aligned with the relevant Chevron deliverables to provide a consistent approach to Operational documentation.

Regular interface meetings are held. Meetings include representatives from Chevron and Woodside Operations teams and interface coordinators.

7.4.4 Offshore

Chevron's permit to work system (Wheatstone Platform Permit to Work Manual (Chevron Doc ABU-COP-0011) for the Julimar Field Production System is authorised by appropriate personnel on the Wheatstone Platform.

Recordable incidents from the Wheatstone Platform or contracted vessels under the Julimar Operations Environment Plan will be reported to Woodside within 72 hrs of occurrence and recorded in event reporting software and investigated appropriately, in accordance with Woodside *Event Reporting and Investigation Procedure* (WM1040PF7386000) (refer also **Section 7.8.4**).

7.5 Training and Competency

As required by Regulation 14(5), this section of the implementation strategy includes measures that ensure all personnel associated with operating the Julimar operations are aware of their EP related responsibilities, and that all relevant personnel have appropriate competencies and training.

Environmental training is undertaken to ensure employees and contractors whose work may impact on the environment have the necessary awareness, knowledge and competence appropriate for their role.

Different levels of training are undertaken in relation to managing environmental risks and impacts for the Julimar operations and associated Subsea Support Vessel based IMMR activities

Competence of operations personnel can be reviewed via online dashboards.

7.5.1 Operations Personnel

Training and competency for personnel on the Wheatstone Platform is managed in accordance with commitments in the *Start-Up and Operations Environment Plan: Wheatstone Project* (Chevron Doc WS2-COP-00001). As part of that training process Woodside provides training to relevant Wheatstone Platform maintenance personnel for the Julimar Field Production System.

Training requirements for Julimar Field Production System have been incorporated into the overall Wheatstone Platform Competency Management System (CMS), which includes maintaining competency. The CMS is managed in accordance with the Wheatstone Operations Training Plan. Chevron report on competency compliance to Woodside. Training for Julimar includes web-based training modules, operator training simulator and vendor training. Competency assessment is managed in accordance with Chevron Wheatstone Operations Training Plan.

7.5.2 Vessel Inductions

At the beginning of, and during a new activity / Subsea IMMR activity, the Vessel crew including contractor crew, Woodside representatives and other relevant personnel are required to undertake a vessel induction before commencing work. This induction covers HSE requirements for the vessel and IMMR activities, and as required environmental information specific to the activity location. The induction may cover the following environmental information:

- adherence to standards and procedures, and the use of Job Safety Analysis and permit to work hazard identification and management process
- spill management including prevention, response and clean-up, location of spill kits and reporting requirements
- waste management requirements and location of bins
- reporting of marine fauna, location of forms and charts
- chemical management requirements.

All personnel who undertake the induction are required to sign an attendance sheet which is maintained in an Induction Attendance Register. For vessels on long-term hire, and working in other areas of Chevron or Woodside, induction may be limited to campaign-specific environmental awareness (below).

Personnel involved in activities on the Wheatstone Platform, or on IMMR activity vessels provided by Chevron operating on the Julimar Field Production System undertake a HES induction and other relevant training as described in the *Start-Up and Operations Environment Plan: Wheatstone Project* (Chevron Doc. WS2-COP-00001).

7.5.2.1 Campaign-Specific Environmental Awareness

Prior to the commencement of IMMR activities, Woodside representatives hold a pre-start meeting with all vessel and contractor crew. Pre-start meetings provide an opportunity to address any specific environmental sensitivities or management measures associated with the IMMR activity, as required.

Regular HS&E meetings are held on the vessel and this covers all crews. During these meetings, environmental incidents are reviewed and awareness material presented on a regular basis. All personnel are required to attend the HS&E meetings and attendance sheets are retained by the vessel Safety and Training Co-ordinator.

7.5.2.2 Environmental Leadership Training

Woodside personnel in leadership roles working on the Julimar Field Production System, for more than three months will undertake Environmental Leadership training. The training covers Woodside's policies and standards, environmental legislative requirements, the EP, key environmental risks and impacts, hazard and incident reporting, environmental management tools and accountabilities.

7.5.3 Permit to Work System Training

The *Wheatstone Platform Permit to Work* system (see **Section 7.1.1**) is a key element in ensuring that all necessary steps are taken to ensure the safety of personnel, protection of the environment and technical integrity of the facility and the Julimar Field Production System. The system takes a risk-based approach to all activities, thus tasks with higher levels of risk are subjected to greater scrutiny and control.

All members of the workforce that are required to work with the system (**Section 7.1.1**) receive training commensurate with the level of authority and responsibility they hold.

7.5.4 Emergency and Hydrocarbon Spill Response Training

All operations personnel involved in crisis and emergency management are required to commit to ongoing training, process improvement and participation in emergency and crisis response (both real and simulated), including emergency drills specific to potential incidents at the Julimar operations. Training includes task specific training and role-based training and 'on the job' experience (i.e. participation in crisis or emergency management exercises). Roles based training is further described in **Section 7.9**.

An overview of Woodside's hydrocarbon spill response training and competency requirements are provided in dashboards for key responder roles. The roles are consistent with Woodside's crisis and emergency management incident control structure.

Woodside Hydrocarbon Spill Preparedness Advisor(s) are responsible for maintaining hydrocarbon spill preparedness competency. This includes the identification and development of approved competency and non-competency based courses, identification of relevant personnel required to undertake training and ensuring training records are maintained. Minimum Woodside capabilities continue to be identified and documented.

7.6 Monitoring, Auditing, Management of Non-conformance and Review

Regulation 14(6) states that the implementation strategy is to provide for the monitoring, audit, management of non-conformance and review of operator's environmental performance and the implementation strategy itself.

This section of the EP outlines the measures undertaken by Woodside to regularly monitor the management of environmental risks and impacts of the Julimar operations against the EPOs, EPSs and MCs, with a view to continuous improvement of environmental performance. The effectiveness of the implementation strategy is also reviewed periodically as part of the monitoring and assurance process.

7.6.1 Monitoring

Woodside and its Contractors undertake a program of periodic monitoring during the Petroleum Activities Program. This information is collected using the tools and systems outlined below based on the EPOs, controls, EPSs and MCs in this EP. Environmental aspects are integrated into Woodside-wide functional and asset review and assurance processes, which deliver effective governance. This integration of environmental controls into appropriate parent systems and processes includes process safety management (**Section 7.1.2**), contractor management (**Section 7.1.3**), marine assurance (**Section 7.6.2.2**),

The tools and systems collect, as a minimum, the evidence referred to in the MCs in **Sections 6.6, 6.7** and **6.8.** The collection of this evidence forms part of the record of compliance maintained by Woodside and forms the basis for demonstrating that the EPOs and EPSs are met. Compliance is summarised in a series of routine reporting documents (refer to **Section 7.8.2**).

The following tools and systems to monitor environmental performance, (including collection of evidence of compliance with controls), where relevant, include:

- environmental emissions/discharge reporting systems that record volumes of unplanned and planned discharges to ocean – a summary discharge monitoring that will be undertaken during the Petroleum Activities Program is provided within **Table 7-3**
- routine internal reporting (as described in **Section 7.8.1**) and routine external annual compliance reporting (as described in **Section 7.8.2**)
- internal auditing and assurance program (as described in **Section 7.6.2**).

Collectively, these systems/tools involve collection of evidence of compliance with controls. Throughout the Petroleum Activities Program, Woodside will continue to identify any new source-based risks and impacts through the Monitoring and Auditing systems and tools described above and within **Section 7.6**.

Other examples of assurance tasks implemented through the EP include (as an example);

- permit to work hazard, risk management check list, area sign-on, and permit audits (**Section 7.1.1.1**)
- technical integrity SCE performance reviews (daily, weekly, monthly) (**Section 2.7.5**)
- ongoing maintenance performance assurance (e.g. conformance dashboard)
- management system performance audits reviews (e.g. MSPSs) (**Section 7.6.2**)
- data gathering and governance dashboard presentations (e.g. Woodside Integrated Risk and Compliance System).

7.6.1.1 Management of Knowledge

Review of knowledge relevant to the existing environment is undertaken in order to identify changes relating to the understanding of the environment or legislation that supports the risk and impact assessments for EPs (in-force and in-preparation). Relevant knowledge is defined as:

- Environmental science supporting the description of the existing environment
- Socio-economic environment and stakeholder information
- Environmental legislation.

The frequency and documentation of reviews, communication of relevant new knowledge and consideration of management of change are documented in the WMS Environment Plan Guideline.

Under the Oil Spill Scientific Monitoring Program preparedness, an annual review and update to the environmental baseline studies database is completed and documented. Periodic location-focused environmental studies and baseline data gap analyses are completed and documented. Any subsequent studies scoped and executed as a result of such gap analysis are managed by the Environment Science Team and tracked via the Corporate Environment Baseline Database

7.6.1.2 Management of Newly Identified Impacts and Risks

New sources of receptor based impacts and risks identified through monitoring and auditing systems and tools and the Woodside Environment Knowledge Management System are assessed using the Change Management Process (**Section 7.1.4**).

Table 7-3: Summary of Emissions and Discharges Monitoring for the Petroleum Activities Program

Category	Parameter to be Monitored/Reported	Monitoring Frequency	Monitoring Equipment/Methodology	EP Reference
Planned Discharges				
Discharge of subsea control fluids during well actuations	Subsea control fluid consumption	Normally continuous process indication/monthly review	Subsea control fluid consumption surveillance. Process indication for gross leaks/ruptures	**Section 6.6.5**
Discharge of hydrocarbons and chemicals during subsea IMMR activities	Volumes of hydrocarbons and chemicals released subsea	As required, during IMMR activities (activity specific)	Estimates based on known volumes pumped and ROV observation	**Section 6.6.5**
Waste recycling and disposal	Quantities of solid and liquid wastes disposed of onshore	Ongoing	Vessel waste log	**Section 6.6.4**
Unplanned Emissions and Discharges				
Unplanned emissions and discharges	Nature of release	As required	HSEQ Event Reporting System (First Priority)	**Sections 6.7.2 to 6.8.2**

7.6.2 Auditing

7.6.2.1 Operations Assurance

To provide confidence, based on evidence commensurate with risk, that business objectives are met, business activities are performed and risks are managed, assurance is performed as described in the Provide Assurance Procedure and the Provide Assurance Guideline. The Guideline aims to explain how the Operations Division Assurance Team implement WMS Assurance requirements, while concurrently satisfying the Operations Division's specific objectives.

Environmental assurance activities are conducted on a regular basis to help:

- verify environmental risks and potential impacts are being managed in accordance with the EPOs and EPSs detailed in this EP
- monitor, review and evaluate the effectiveness of the performance outcomes and standards detailed in this EP
- verify effectiveness of the EP implementation strategy
- identify potential non-conformances.

The outputs of the assurance process are corrective actions that feed the improvement process. Therefore, assurance is a key driver of continuous improvement.

Under the Field Operating Services Agreement (FOSA) Chevron is required to act in accordance with the direction provided by Woodside and the guidelines and procedures contained in the Field Production System Operating Manual provided by Woodside (**Section 1.8**).

Under the FOSA, Woodside has the means to monitor the performance of Chevron, including access to real-time data and reporting, and has access rights to all facilities under the Joint Operating Agreement.

7.6.2.2 Marine Assurance

Marine assurance is undertaken in accordance with Woodside marine assurance procedures which defines the marine assurance activity practices for the different types of vessels either chartered directly by or on behalf of Woodside (including support vessels). The marine assurance process is managed by the Marine Assurance Team of the Marine Services Group.

The processes and procedures used are based on industry standards and consideration of guidelines and recommendations from recognised industry organisations such as Oil Companies International Marine Forum (OCIMF) and International Maritime Contractors Association.

Support Vessel Assurance

Under the Offshore Vessel Suitability Procedure and the Offshore Vessel Assurance Procedure support vessels (subsea) are subject to a pre-charter vessel suitability and marine assurance process. Intent of the offshore vessel suitability process is to ensure any offshore vessel (i.e. support vessel) is capable of the defined work scope. Intent of the offshore vessel marine assurance process is to ensure all marine contractors and associated suitable vessels are compliant with regard to all legislative and statutory requirements, are well managed and well maintained in addition to meeting any specific requirements held by Woodside. Vessels sourced by Chevron to undertake IMMR activities on the Julimar field production system will meet Woodside minimum marine standards.

Under the offshore vessel assurance procedures, regular Woodside, or third-party inspections are usually required for support vessels. Support vessel inspections are not always required and may be replaced by a risk assessment. Woodside uses the OCIMF Offshore Vessel Inspection Database (OVID) inspection as its primary means for inspecting vessels. These inspections assess compliance with laws of the international shipping industry, including safety management requirements and maritime legislation including International Convention of the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL) and other International Maritime Organisation Standards. Environmental inspections will be conducted on long hire vessels or for high risk activities.

7.6.3 Management of Non-conformance (Internal)

Woodside employees and Contractors are required to internally report all environmental incidents and hazards, including potential non-conformances with EPOs and EPSs in this EP.

The Health, Safety and Environment Event Reporting and Investigation Procedure defines how incidents and hazards are internally reported. Key requirements are set out through the use of an Event Report Form, which includes details of the event, immediate action taken to control the situation, and corrective actions to prevent reoccurrence. An internal online database called First Priority is used for the recording and reporting of these events. Corrective actions are monitored using First Priority and closed out in a timely manner.

Detailed investigations are completed for all incidents with an actual impact of A, B or C, and high potential environmental incidents and hazards. The classification, reporting, investigation and actioning of environmental incidents and hazards is undertaken in accordance with the Health, Safety and Environment Event Reporting and Investigation Procedure supported by the HSE Event Reporting Guideline. Event bulletins may be used for communication of learnings from significant events.

Non-conformances with EPOs and EPSs are also internally reported and investigated in accordance with Regulatory Compliance Management Procedure, supported by the Regulatory Compliance Management Guideline.

External regulatory reporting requirements for this activity are outlined in **Section 7.8** of this EP.

7.6.4 Review

7.6.4.1 Environmental Risk Review

Woodside risk management processes include risk review. Woodside's risk management processes are described in **Sections 2.2.1** and **7.1.3** and are applied on a day-to-day basis. The Julimar Field Production System Environmental Impacts and Risk Register must be reviewed and updated every five years.

Monitoring (**Section 7.6.1**) and assurance (**Section 7.6.2**) and review (**Section 7.6.4**) are also used to identify potential new information that may arise during the activity and ensure that performance outcomes and standards are being met and EP environmental control measures are effective. Whilst conducting these activities, qualified, experienced environment advisors, in consultation with experienced Operational and/or Engineering personnel use their professional judgement, to identify potential new control measures that have potential to improve environmental outcomes or reduce risk. As various monitoring/assurance/review processes are used there is not an overarching procedure/checklist that is suitable to contain a prompt for consideration of new environmental controls.

In addition, Woodside's risk management practices and processes are systematically applied on an ongoing basis to activities provided for within the EP (as summarised within **Section 7.1.3**). Via these processes and practices, new risk controls for individual planned and unplanned events may be selected and implemented (proportional to risk levels). When such risk controls are identified by environmental advisors as being relevant to the overarching EP sources of risk, these may also be added as new EP control measures. Any new or improved EP environmental controls or specific measures (that have the potential to improve environmental outcomes or reduce risk), can be tracked within the production EP updates register for incorporation into the EP at its next revision. The EP may be internally revised to reflect these changes without resubmission.

Where review processes identify new or improved controls relevant to environmental risks identified in this EP (that have the potential to improve environmental outcomes or reduce risk), the EP may be internally revised to reflect these changes without resubmission.

7.6.4.2 Continuous Improvement

Continuous Improvement (CI) Projects to improve production or environmental performance that involve modification or major maintenance on the Julimar Field Production System are typically managed by Brownfields Engineering and required to follow appraise and develop management procedures. Currently, the Procedure requires that all projects be managed in accordance with the Opportunity Management Framework which supports the progressive maturation of an opportunity through value creation in the Assess and Select Phases and the maintenance of value in the Develop and Execute phases.

To support the accountable executive to make a decision on whether a CI Project should proceed to the next phase in the Opportunity Management Framework, it is sometimes necessary to conduct a trial of the modification to determine the outcomes that can be expected if the modification is implemented. Due to prioritisation of resources, the phased progress of opportunities, competition between different solutions and long-term strategic and financial considerations, it is not possible to set quantitative success criteria to determine whether a modification will be implemented based on the results of trials. Instead, the results of a trial are used to inform a decision on whether to progress the CI Project to the next phase in the Opportunity Management Framework. Decisions are typically made with two key considerations; whether the business is ready to proceed which has a technical/functional focus and whether there is a business case for progressing to the next phase. The business case may consider the ALARP position for the CI Project, if relevant.

7.7 Record Keeping

Compliance records (outlined in MCs in **Section 6**) will be maintained. Record keeping will be in accordance with Regulation 14(7) that addresses maintaining records of evidence such that the records can be used to assess whether EPOs and EPSs are being met (refer to **Section 7.6.1** for a summary of records that will be retained).

7.8 Reporting

7.8.1 Routine Reporting (Internal)

7.8.1.1 Daily Reports

The following daily reports, containing environmental performance information are issued:

- Pan-Woodside Daily Production Report – The report includes Julimar Field Production System performance information on production.
- Subsea support vessel Daily Progress Report(s) – During subsea IMMR activities, daily reports are issued by the Woodside Site Representative. The reports provide performance information on HSE events, diesel use, together with equipment information, current and planned work activities.

7.8.1.2 Performance Reporting

A number of routine performance reports are developed in support of the Julimar Field Production System operational activities. These reports cover HSE, production and process safety performance. Information included in these reports, relevant to the EP, includes:

- summary of environment incidents
- current and planned work activities, significant events (e.g. shutdowns, failures)
- integrity status and process safety metrics
- status of subsea IMMR activities.

7.8.2 Routine Reporting (External)

7.8.2.1 Environmental Performance Review and Reporting

In accordance with applicable environmental legislation for the activity, Woodside is required to report information on environmental performance to the appropriate regulator.

Routine regulatory reporting requirements are summarised in **Table 7-4**. The requirements include that Woodside will develop and submit an annual Environmental Performance Report to NOPSEMA, with the first report submitted within 12 months of the commencement of activities covered by this EP (as per the requirements of Regulation 14(2)(b); i.e. by 30 April the following year).

Table 7-4: Routine External Reporting Requirements

Report	Recipient	Frequency	Content
Monthly Recordable Incident Report	NOPSEMA	Monthly, by 15 of each month	As required by Regulation 26B, details of recordable incidents that have occurred under the EP for the previous month. Refer to **Section 7.8.4** for more detail.
Annual Environment Plan Performance Report	NOPSEMA	Annual, by 30 April of the year following reporting period	As required by Regulation 14 (2) and 26C the report will report compliance with the EPOs and EPSs outlined in **Section 6** of this EP. The reporting period is 1 January to 31 December each year.

7.8.2.2 End of the Petroleum Activities Program Notification

In accordance with Regulation 29, Woodside will notify NOPSEMA[31] within ten days after the completion of the Petroleum Activities Program. The Petroleum Activities Program is not expected to end within the five-year life of this EP.

7.8.2.3 End of the Environment Plan

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended, 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. As noted above, the Petroleum Activities Program is not expected to end within the five-year life of this EP.

7.8.3 Incident Reporting (Internal)

All Woodside employees and contractors are required to report environmental incidents and non-conformances with this EP. Incidents are reported using an Event Report Form which includes details of the event, immediate action taken to control the situation, and corrective actions to prevent reoccurrence (for further details refer to **Section 7.6.3**).

7.8.4 Incident Reporting (External) – Reportable and Recordable

Woodside's regulatory reporting requirements are outlined within the Regulator Event Reporting Procedure supported by the Regulator Event Reporting Guideline.

[31] NOPSEMA has already been notified of commencement of operations of the Julimar Field Production System.

7.8.4.1 Reportable Incidents

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 **Section 2.6**).
- 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 **Section 2.6**).

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 ocean resulting from:

- loss of well containment (MEE-01)

Any such incidents represent potential events which would be reportable incidents. Reporting of incidents is undertaken 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:

- orally notify NOPSEMA of all reportable incidents to the regulator as soon as practicable, but within 2 hrs 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 (Department of Mines, Industry Regulation and Safety [DMIRS]) as soon as practicable after the oral notification of the incident
- complete a written report for all reportable incidents using a format consistent with the NOPSEMA Form FM0929 – Reportable Environment Incident which must be submitted to NOPSEMA as soon as practicable, but within three days of the incident or of its detection by Woodside
- provide a copy of the written report to NOPTA and DMIRS, within seven days of the written report being provided to NOPSEMA.

7.8.4.2 Recordable Incidents

A recordable incident is defined under Regulation 4 of the Environment Regulations as a ‘breach of an EPO or EPS, in the EP that applies to the activity, that is not a reportable incident’.

Any breach of the EPOs or EPSs (as presented within **Section 6**) will be raised as a recordable incident and managed as per the notification and reporting requirements outlined below and internal requirements outlined in **Section 7.8**.

Notification

NOPSEMA will be notified of all recordable incidents, according to the requirements of Regulation 26B (4). Woodside will:

- provide a written record not later than 15 days after the end of the calendar month using a format consistent with the NOPSEMA Form – Recordable Environmental Incident Monthly Summary Report (Appendix E).

7.8.4.3 Other External Reporting Requirements and Notifications

In addition to the notification and reporting of environmental incidents defined under the Environment Regulations and Woodside requirements, the following incident reporting requirements also apply in the Operational Area if the spill originates from a vessel:

- Any oil pollution incidents in Commonwealth Waters will be reported (by the vessel master) to AMSA Rescue Coordination Centre (RCC) as per Article 8 and Protocol I of MARPOL within 2 hrs via the national emergency 24-hour notification contacts, and a written report within 24 hrs of the request by AMSA. (This requirement is included in the Julimar Operations Oil Pollution First Strike Plan).

  If the ship is at sea, reports are to be made to:

  Free call: 1800 641 792

  Phone: 08 9430 2100 (Fremantle).

- Any spills greater than ten tonnes in Commonwealth Waters must be reported (by the vessel master) to AMSA within one hour (this requirement is detailed in the Julimar Oil Pollution First Strike Plan). Reports are to be made via the national 24-hour emergency notification contacts (AusSAR: RCC):

  Rescue Coordination Centre Australia (RCC Australia)

  Phone: 02 6230 6811

  Facsimile: 02 6230 6868

  Telex: 62349

  Free call: 1800 641 792

  AFTN: YSARYCYX.

- A hydrocarbon spill incident with potential to significantly impact MNES must be reported to DAWE.

- If the activity described within this EP results in the unintentional death of or injury to a fauna that constitute MNES (i.e. species listed as Threatened or Migratory under the EPBC Act), and the activity was not authorised by a permit, the Secretary of the DAWE should be notified within seven days of becoming aware of the results of the activity:

  The Secretary

  DAWE

  Hotline: 1800 803 772

  Email: protected.species@environment.gov.au.

For hydrocarbon spill incidents, other agencies and organisations[32] 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 Julimar Oil Pollution First Strike Plan, including but not limited to:

[32] The Director of National Parks will be notified if Woodside becomes aware of a hydrocarbon spill occurring within, or potentially impacting upon the values of, a Commonwealth Marine Park.

- A hydrocarbon spill incident with the potential to significantly impact MNES must be reported to DAWE.
- A hydrocarbon spill incident occurring within a marine park, or with the potential to impact a marine park must be reported to DNP as soon as possible. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include:
  - titleholder details
  - time and location of the incident (including name of marine park likely to be affected)
  - proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc.)
  - confirmation of providing access to relevant monitoring and evaluation reports when available
  - contact details for the response coordinator.

DNP notification to marineparks@environment.gov.au is required:

- When the EP is approved by NOPSEMA.
- Notification at least 10-days prior to all inspection, monitoring (including scientific monitoring), maintenance or repair activities occurring within the Montebello AMP (excluding transiting) and conclusion of that activity.
- In cases where inspections are required for emergent issues or following a cyclone, notifications will be provided as soon as practicable. Notification information should be consistent with the Petroleum activities and AMP guidance note.

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 the updating of the OPEP. Regulation 14(8AA) outlines the requirements for the OPEP which must include adequate arrangements for responding to and monitoring of 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 7-5**.

Table 7-5: Oil Pollution Preparedness and Response Overview

Content	Environment Regulations Reference	Document/Section Reference
Details (oil pollution response) control measures that will be used to reduce the impacts and risks of the activity to ALARP and an acceptable level	Regulation 13 (5), (6), 14 (3)	Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**).

Content	Environment Regulations Reference	Document/Section Reference
Describes the oil pollution emergency plan	Regulation 14 (8)	Environment Plan: **Section 7.9**. Woodside's oil pollution emergency plan has the following components: • Woodside Oil Pollution Emergency Arrangements (Australia) • Julimar Oil Pollution First Strike Plan (**Appendix H**) • Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). In accordance with Regulation 31 of the Environmental Regulations the Woodside Oil Pollution Emergency Arrangements (Australia) was provided with the Julimar Phase 2 Drilling and Subsea Installation EP, accepted by NOPSEMA on 8 November 2019.
Details the arrangements for responding to and monitoring oil pollution (to inform response activities), including control measures	Regulation 14 (8AA)	Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). Julimar 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)	Environment Plan: **Section 7.9.7**. Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**).
Details provisions for monitoring impacts to the environment from oil pollution and response activities	Regulation 14 (8D)	Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**).
Demonstrates that the oil pollution response arrangements are consistent with the national system for oil pollution preparedness and control	Regulation 14 (8E)	Woodside 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 shown in **Table 7-6**.

Table 7-6 Emergency Response Training Requirements

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 • Incident Coordination Centre (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 (refresher)
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 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 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 Oil Spill Response (OSR) capabilities. • Woodside Learning Services (WLS) are responsible for collating and maintaining personnel training records. The Hydrocarbon Spill Preparedness (HSP) Dashboard reflects the competencies required for each oil spill role (IMT/operational).	

7.9.3 Emergency Response Preparation

The Corporate Incident Communication Centre (CICC), based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CICC is staffed by an appropriately skilled team available on call 24-hours a day. The purpose of the team is to coordinate incidents, maintain the safety of personnel, minimise damage to the environment and facilities, and to liaise with external agencies. A description of Woodside's Incident Command Structure and arrangements is further detailed in the Woodside Oil Pollution Emergency Arrangements (Australia).

Woodside has a number of Emergency Response Plans (ERP) in place, which detail the actions and resources available in the event of various emergency scenarios. Electronic copies of the ERPs are available on the S&EM intranet page. Hard controlled copies are available. The ERP for activities covered by this EP references the *Wheatstone Upstream Emergency Response Plan* (ERP). The ERP contains instructions for oil pollution emergencies, 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).

The *Wheatstone Start-up and Operations Oil Pollution Emergency Plan* outlines requirements for response to an oil spill from field production systems tied into the Wheatstone Platform. Initial response to a subsea release from the Julimar Field Production System would be managed in accordance with the *Julimar Development Emergency Response Interface Plan* and the *Wheatstone Upstream ERP*, until transferred to Woodside control.

In addition, the Emergency Preparedness MSPS (M06) is in place to assure that in the event of an incident, the organisation is appropriately prepared for all necessary actions which may be required for the protection of People, Environment, Asset, Reputation and Livelihood.

7.9.3.1 Initial Response to Field Production System Incident

In the event of an emergency arising from the Julimar Field Production System, the Wheatstone Platform OIM will assume overall onsite command and continue initial emergency response operations until transfer of control as described in the *Wheatstone Upstream ERP*. The *Wheatstone Upstream ERP* provides guidance on establishing emergency management control, mobilising resources offshore and onshore, and dealing with external authorities and third party contractors.

As per the *Julimar Development Emergency Response Interface Plan*, Chevron will notify Woodside immediately (within 2 hrs) upon detection of spills from, or suspected to be from, the Julimar Field Production System via the WCC. Key incident details that will be communicated include:

- Time of incident
- Whether the release is controlled
- Weather, tide and current details
- Apparent trajectory of the spill.

If an emergency occurs, including unplanned release of hydrocarbon, the Wheatstone Platform operator shall promptly take such action that is necessary to remedy or alleviate such an emergency. For an oil spill incident initial actions to be undertaken by Chevron may include deployment of tracker buoy and opportunistic visual observations, as per the Julimar Operations Oil Pollution First Strike Plan (**Appendix H**).

In the event of an oil pollution emergency arising from the Julimar Field Production System, Woodside is Control Agency. Woodside would activate a concurrent CICC, in close liaison with Chevron, including stand up and activation of relevant response arrangements suitable to the nature and scale of the event and subject to relevant Net Environmental Benefit Assessment and Incident Action Plan.

Transfer of Control

The *Emergency Response Interface Plan* describes transfer of control in an emergency event from Chevron and Woodside. With regards to an emergency that is determined to be attributable to the Julimar Field Production System that would require a long-term response (i.e. > 12 hrs); when safe to do so, a decision may be taken for Woodside to take over the coordination of the emergency response and manage the long-term resolution. Such a decision must be agreed between Chevron and Woodside and communicated to key stakeholders detailed in the Emergency Response Interface Plan. To extent required, the appropriate regulatory agency(s) must also approve the transfer of control of the response operations to the Woodside.

Woodside has established EPOs, EPSs and MCs to be used for hydrocarbon spill response during the Petroleum Activities Program, as detailed in Appendix D. These performance outcomes, standards and measurement criteria apply to all activities within Woodside control. Activities controlled by Chevron would be subject to the *Start-Up and Operations Environment Plan: Wheatstone Project* (Chevron Doc. WS2-COP-00001) and associated Oil Spill Offshore Response Plan commitments and performance measures.

7.9.3.2 Initial response to Vessel Incident

In the event of an emergency on a vessel, the Vessel Master will assume overall onsite command and act as the Emergency Response Coordinator (ERC). All persons aboard the vessel will be required to act under the ERC's directions. The vessel will maintain communications with the

Wheatstone Platform OIM, Asset Manager and/or other emergency services in the event of an emergency, as set out in the relevant ERP. Emergency response support can be provided by the Contractor's emergency centre or CICC if requested by the ERC.

The Julimar Oil Pollution First Strike Plan provides immediate actions required to commence a response (**Appendix H**). 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 Julimar 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.

7.9.4 Oil and Other Hazardous Materials Spill

A significant hydrocarbon spill during the Petroleum Activities Program is unlikely, but should such an event occur, it has the potential to cause serious environmental and reputational damage if not managed properly. Following transfer of control from Chevron, the Woodside Oil Pollution Emergency Arrangements (Australia) document, supported by the Julimar Oil Pollution First Strike Plan which provides tactical response guidance to the activity/area (**Appendix H**) and **Appendix D** of this EP, cover spill response for this Petroleum Activities Program.

The Security and Emergency Management Function is responsible for the management of Woodside's hydrocarbon spill response equipment and for the maintenance of hydrocarbon spill preparedness and response documentation. In the event of a major spill, Woodside will request that AMSA (administrator of the National Plan) 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 a hydrocarbon spill.

7.9.5 Emergency and Spill Response

Woodside categorises incidents in relation to response requirements as follows:

- **Level 1 Incident** – A Level 1 incident can be resolved through the use of existing resources, equipment and personnel. A Level 1 incident is contained, controlled and resolved by site/regionally based teams using existing resources and functional support services.
- **Level 2 Incident** – A Level 2 incident is characterised by a response that requires external operational support to manage the incident. It is triggered in the event the capabilities of the tactical level response are exceeded. This support is provided to the activity via the activation of all, or part of, the responsible CICC.
- **Level 3 Incident** – A Level 3 incident or crisis is identified as a critical event that seriously threatens the organisation's People, the Environment, company Assets, Reputation, Livelihood. 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 & commercial, reputation, etc.). The CICC may also be activated as required to manage the operational incident response requirements.

7.9.6 Emergency and Spill Response Drills and Exercises

Testing of Woodside's capability to respond to incidents will be conducted in alignment with the Emergency and Crisis Management Procedure. The scope, frequency and objective of these tests is described in **Table 7-7**. Woodside's emergency response testing regime is aligned to existing or developing risks associated with Woodside's operations and activities. Corporate hazards/risks outlined in the corporate risk register, respective Safety Cases or project Risk Registers, are reference point for emergency management and crisis management exercising schedule development. External participants may be invited to attend exercises such as government agencies, specialist service providers, hydrocarbon spill response organisations or industry members with which we have mutual aid arrangements.

The overall objective of exercising is to tests procedures, skills and teamwork of the Emergency Response and Command Teams in their ability to respond to MAEs and MEEs. After each exercise, the team holds a debrief session, during which the exercise is reviewed. Any lessons learnt or areas for improvement are identified and incorporated into revised procedures where appropriate.

Table 7-7: Testing of Response Capability to Incidents

Response Category	Scope	Responsibilities	Response Testing Frequency	Response Testing Objective
Level 1 Response	Exercises are vessel specific	Woodside	Within two weeks of arriving on location to commence activities (only required if vessel is in the Operational Area for >2 weeks). There is no need to re-test with the same vessel returns to the Operational Area within 12 months.	• Comprehensive exercises test elements of the Julimar Oil Pollution First Strike Plan for a Level 1 incident (**Appendix H**).
Level 2 Response	Exercises are asset specific	Woodside or Chevron	A minimum of one Emergency Management exercise will be conducted annually.	• 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	Woodside	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 the ability of the company 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 in the Environment Regulations. Woodside's arrangements for spill response are common across Australian operating assets and activities to ensure 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 processes and procedures and improvements made where required.

In the event that new response arrangements are introduced, or existing arrangements significantly amended, additional testing is undertaken accordingly.

In addition to the testing of response capability described in Table 7-7, up to eight formal exercises are planned annually, pan-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 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. In the event of a spill, enacting these arrangements will underpin Woodside's ability to implement a response across its petroleum activities. **Figure 7-5** provides a condensed snapshot of Woodside's five-year rolling Testing of Arrangements Schedule.

HSP TESTING OF ARRANGEMENTS SCHEDULE

WOODSIDE ID: 10058092

5 YEAR ROLLING SCHEDULE

Column groups for each year (2020, 2021, 2022, 2023, 2024): Assurance Actions | Additional Assurance Actions | Discussion Based (DISC EX): Communication or Notificati[on], Seminar, Workshop, Desk top | Operations Based: Drill, Functional Exercises, Field, Full Scale Exercises

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	FRS	Equipment and Personnel

Figure 7-5: Indicative Five Yearly Testing of Arrangements Schedule (Snapshot of a selection of OSR arrangements tested annually)

Note: schedule is subject to change, additional detail is included in live document

7.9.8 Cyclone and Dangerous Weather Preparation

Tropical cyclones and other severe weather events are a potential risk to the safety and health of personnel and can potentially cause spills of hazardous materials into the environment from infrastructure and/or damaged vessels.

Subsea support vessels receive regular forecasts from the BoM. 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 vessel's Cyclone Contingency Plan will be actioned. If required, vessels can transit from the proposed track of the cyclone (severe weather event).

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9 LIST OF TERMS AND ACRONYMS

Acronym	Description
@	At
<	Less/fewer than
>	Greater/more than
≤	Less than or equal to
≥	Greater than or equal to
°C	Degrees Celsius
24/7	24-hours a day, seven days a week
3D	Three-dimensional
ACN	Australian Company Number
ACS	Australian Customs Service
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AIMS	Australian Institute of Marine Science
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines (for Fresh and Marine Water Quality)
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASB	Above Seabed
AS/NZS	Australian Standard/New Zealand Standard
bbl	Barrel
bbl/d	Barrels per day
BDV	Blow-down Valve
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BOP	Blowout Preventer
BP	Boiling Point
BPP	Benthic Primary Producer
BTEX	Benzene, toluene, ethylbenzene, and xylene compounds
CALM	Former Western Australian Department of Conservation and Land Management (now DBCA)
CAPEX	Capital Expenditure
CCE	Common cause event
CCR	Central Control Room

Acronym	Description
CFA	Commonwealth Fisheries Association
CH_4	Methane
CI	Continuous improvement
CICC	Corporate Incident Communication Centre
cm	Centimetre
cm^3	Cubic centimetre
CMMS	Computerised Maintenance Management System
CMT	Crisis Management Team
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COO	Chief Operations Officer
cP	Centipoise
CS	Cost Sacrifice
CV	Company Value
CVS	Contractor Verification Service
CWLH	Cossack, Wanaea, Lambert, and Hermes
D&C	Drilling and Completions
DAWR	Commonwealth Department of Agriculture and Water Resources
dB re 1 µPa	Decibels relative to one micropascal; the unit used to measure the intensity of an underwater sound
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DCS	Distributed control system
DEC	Former Western Australian Department of Environment and Conservation (now DBCA)
DEH	Former Commonwealth Department of the Environment and Heritage (now DAWE)
DEWHA	Former Commonwealth Department of the Environment, Water, Heritage and the Arts (now DAWE)
DHNRDT	Deepwater Horizon Natural Resource Damage Assessment Trustees
DIIS	Commonwealth Department of Industry, Innovation and Science
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DNP	Director of National Parks
DoEE	Commonwealth Department of the Environment and Energy (now DAWE)
DoT	Western Australian Department of Transport
DP	Dynamic positioning
DpaW	Former Western Australian Department of Parks and Wildlife (now DBCA)
DPIRD	Western Australian Department of Primary Industries and Regional Development
DPLH	Western Australian Department of Planning, Lands and Heritage
DRIMS	Document Retrieval Integrated Management System

Acronym	Description
DSEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DAWE)
eCAR	Environmental Commitments and Actions Register
EET	Emission Estimation Techniques
EEZ	Exclusive Economic Zone
EMBA	Environment that may be affected
ENVID	Environment Identification (study)
EP	Environment Plan
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPO	Environmental Performance Objective
EPS	Environment Performance Standard
ER	Emergency Response
ERP	Emergency Response Plan
ESD	Ecologically Sustainable Development
FFS	Fitness for Services
FPSO	Floating production, storage, and offtake
g	Gram
GEL	Gas Export Line
GP	Good Practice
GWA	Goodwyn Alpha
ha	Hectare
HAZID	Hazard identification (study)
HP	High Pressure
HQ	Hazard Quotient
HSE	Health, Safety, and Environment
HSEC	Health, Safety and Environment Coordinator
HSEQ	Health, Safety, Environment, and Quality
HT	High Temperature
HVAC	Heating, ventilation, and air conditioning
ICSS	Integrated Control and Safety System
IMMR	Inspection, maintenance, monitoring, and repair
IMS	Invasive Marine Species
IMSMP	Invasive Marine Species Management Plan
IPIECA	International Petroleum Industry Environmental Conservation Association
ISO	International Organization for Standardization
ISSoW	Integrated Safe System of Work
ITF	Indonesian Throughflow

Acronym	Description
ITOPF	International Tanker Owners Pollution Federation Ltd
IUCN	International Union for the Conservation of Nature
KEF	Key Ecological Feature
kg	Kilogram
KGP	Karratha Gas Plant
kHz	Kilohertz
km	Kilometre
kn	Knot
KO	Knock Out (drum)
KPI	Key Performance Indicator
kW	Kilowatt
L	Litre
LAT	Lowest Astronomical Tide
LCS	Legislation, Codes and Standards
LHM	Lambert Hermes manifold
LNG	Liquefied Natural Gas
LP	Low Pressure
LT	Low Temperature
LTO	Licence to Operate
m	Metre
m/s	Metres per second
m^2	Square metre
m^3	Cubic metre
MAE	Major Accident Event
MAH	Monocyclic Aromatic Hydrocarbon
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978
MBES	Multibeam Sonar
MC	Measurement Criteria
MEE	Major Environmental Event
MEG	Monoethylene glycol
mg	Milligram
MGO	Marine Gas Oil
ml	Millilitre
MMscfd	Million standard cubic feet per day
MNES	Matters of National Environmental Significance
MoC	Management of Change
MOPO	Manual of Permitted Operation

Acronym	Description
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MPRA	Marine Parks and Reserves Authority
MSL	Mean Sea Level
MSPS	Management System Performance Standards
MVA	Megavolt-ampere
MW	Megawatt
n.d.	No date
N/A	Not Applicable
N_2O	Nitrous oxide
NERA	National Energy Resources Australia
NGERS	National Greenhouse and Energy Reporting Scheme
NIMS	Non-indigenous Marine Species
nm	Nautical mile
NMFS	National Marine Fisheries Service (US)
NOAA	National Oceanic and Atmospheric Administration (US)
NOEC	No observed effect concentrations
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NORM	Naturally Occurring Radioactive Material
NO_X	Oxides of nitrogen
NPI	National Pollutant Inventory
NRA	North Rankin Alpha
NRC	North Rankin Complex
NSW	New South Wales
NWMR	North-west Marine Region
NWS	North West Shelf
OCIMF	Oil Companies International Marine Forum
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OIW	Oil in water
OMDAMP	Offshore Marine Discharges Adaptive Management Plan
OPEA	Oil Pollution Emergency Arrangements
OPEP	Oil Pollution Emergency Plan
OPEX	Operating Expenditure
OPGGS Act	Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OSPAR	Oslo–Paris Convention for the Protection of the Marine Environment of the North East Atlantic

Acronym	Description
PAH	Polycyclic aromatic hydrocarbon
PAR	Photosynthetically active radiation
PARCOM	former Paris Convention 1997/16
PAU	Pre-assembled unit
PC	Protection Concentration; e.g. PC99 is 99% protection concentration, PC95 is 95% protection concentration etc.
PEC	Predicted Effects Concentration
pH	Measure of acidity or basicity of a solution
PJ	Professional Judgement
PMST	Protected Matters Search Tool
PNEC	Predicted No Effect Concentration
PPA	Pearl Producers Association
ppb	Parts per billion
ppm	Parts per million
PSM	Process Safety Management
PSRA	Process Safety Risk Assessment
PSU	Practical salinity unit
PSZ	Petroleum safety zone
PTS	Permanent threshold shift
PW	Produced Water
RBA	Risk-based Analysis
RBI	Risk-based Inspection
RCC	Rescue Coordination Centre
RESDV	Riser Emergency Shutdown Valve
rms	Root Mean Square
RO	Reverse osmosis
ROV	Remotely operated vehicle
RTM	Riser turret mooring
SA	South Australia
SBP	Sub-bottom profiler
SCE	Safety and Environmental Critical Element
SCM	Subsea Control Module
SCC	Safety and Environmental Critical Component
SCSSV	Surface controlled subsurface safety valve
SEL	Sound Exposure Level
SIMAP	Spill Impact Mapping and Analysis program
SKM	Sinclair Knight Mertz (company)
sm^3	Standard cubic metres

Acronym	Description
SMP	Scientific Monitoring Program
SOPEP	Ship Oil Pollution Emergency Plan
SO_X	Sulfur oxides
SPL	Sound Pressure Level
SSPL	Subsea Pipeline
SSS	Side Scan Sonar
SV	Societal Value
SVP	Senior Vice President
T	Tonne
TEG	Triethylene glycol
TRC	Total Residual Chlorine
TTS	Temporary threshold shift
UK	United Kingdom
UPS	Uninterrupted Power Supply; battery power system
US	United States
USBL	Ultra-short baseline
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
VP	Vice President
VRU	Vapour recovery unit
WA	Western Australia
WAF	Water-accommodated fraction
WAFIC	Western Australian Fishing Industry Council
WANPE	Wanaea Pipeline End
WC GEL	Wanaea Cossack Gas Export Line
WEL	Woodside Energy Limited
WET	Whole Effluent Toxicity
WGS84	Word Geodesic System 1984
WHA	World Heritage Area
WMS	Woodside Management System
WOMP	Well Operations Management Plan

APPENDIX A WOODSIDE HEALTH, SAFETY, ENVIRONMENT AND QUALITY AND RISK MANAGEMENT POLICIES

WOODSIDE POLICY

Health, Safety, Environment and Quality Policy

OBJECTIVES

Strong health, safety, environment and quality (HSEQ) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSEQ 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, incorporating a right first time approach to quality.

PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSEQ 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 HSEQ performance
- embedding HSEQ considerations in our business planning and decision making processes
- integrating HSEQ requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSEQ obligations and feels empowered to speak up and intervene on HSEQ issues
- undertaking and supporting research to improve our understanding of HSEQ 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 HSEQ expectations in a mutually beneficial manner
- publicly reporting on HSEQ 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.

This policy will be reviewed regularly and updated as required.

Reviewed in December 2019

APPROVED

WOODSIDE POLICY

Risk Management Policy

OBJECTIVES

Woodside recognises that risk is inherent to its business and that effective management of risk is vital to delivering on our objectives, our success and our continued growth. We are committed to managing all risk in a proactive and effective manner.

Our approach to risk enhances opportunities, reduces threats and sustains Woodside's competitive advantage.

The objective of our risk management system is to provide a consistent process for the recognition and management of risks across Woodside's business. The success of our risk management system lies in the responsibility placed on everyone at all levels to proactively identify, manage, review and report on risks relating to the objectives they are accountable for delivering.

PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive risk management system across Woodside which establishes common risk management understanding, language and methodology
- Identifying, assessing, monitoring and reporting risks to provide management and the Board with the assurance that risks, including contemporary and emerging risks, are being effectively identified and managed, and that Woodside is operating with due regard to the risk appetite set by the Board
- Ensuring risks consider impacts across the following key areas of exposure: health and safety, environment, finance, reputation and brand, legal and compliance, and social and cultural
- Understanding our exposure to risk and applying this to our decision making
- Embedding risk management into our critical business activities and processes
- Assuring the effectiveness of risk controls and of the risk management process
- Building our internal resilience to the effects of adverse business impacts in order to sustain performance.

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 6 December 2019.

DRIMS# 5443801

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APPENDIX B RELEVANT REQUIREMENTS

This appendix 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 matters of national environmental significance (NES). 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.

Commonwealth Legislation	Legislation Summary
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.

Commonwealth Legislation	Legislation Summary
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 nautical miles (nm) off the coast out to the end of the Australian Exclusive Economic Zone (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.

APPENDIX C EPBC ACT PROTECTED MATTERS SEARCH TOOL REPORTS

Australian Government

Department of the Environment and Energy

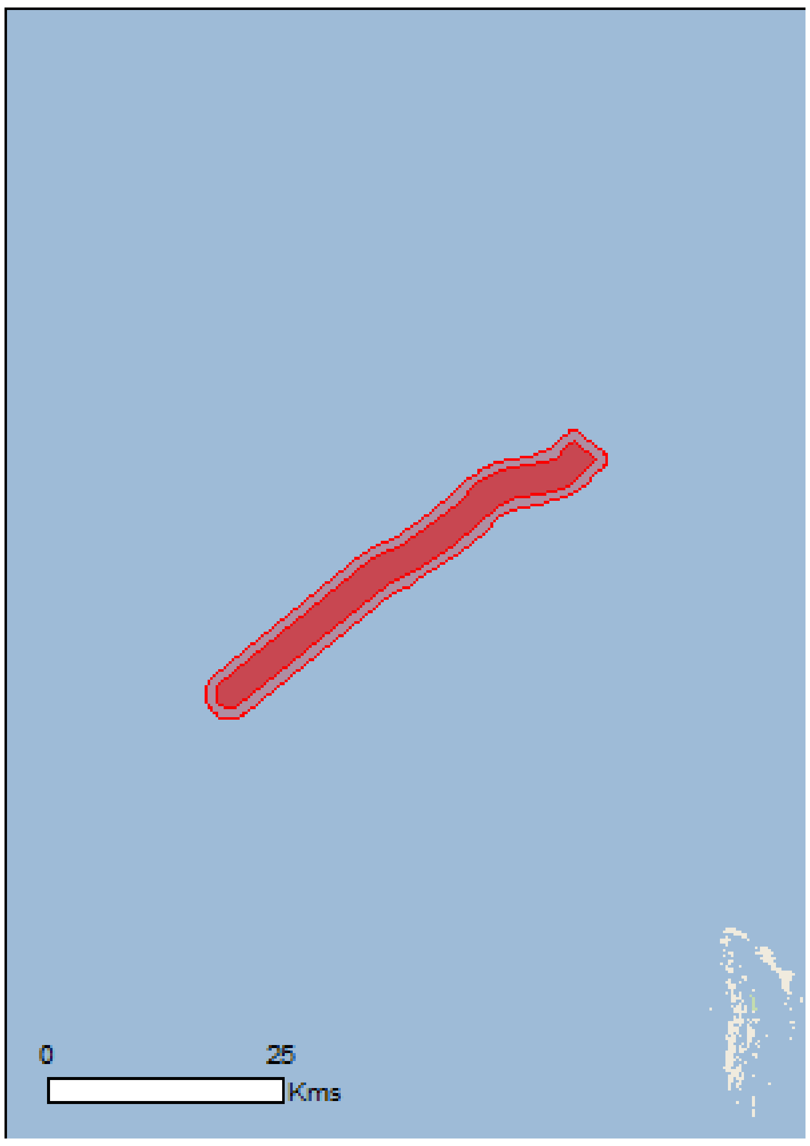
EPBC Act Protected Matters Report

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

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

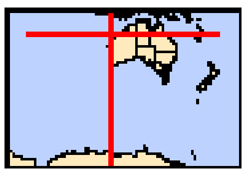
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 11/06/20 12:37:48



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	19
Listed Migratory Species:	33

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:	63
Whales and Other Cetaceans:	25
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

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
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may 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 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	Migration route known 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

Name	Status	Type of Presence within area
Reptiles		
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	Congregation or aggregation known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
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 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
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	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

Name	Threatened	Type of Presence
		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	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 likely 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 likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation 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

Name	Threatened	Type of Presence
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		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

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

Name	Threatened	Type of Presence
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
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 may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		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 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
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 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
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

Name	Threatened	Type of Presence
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat 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
Ephalophis greyi North-western Mangrove Seasnake [1127]		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

Name	Threatened	Type of Presence
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation 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 borealis Sei Whale [34]	Vulnerable	Species or species habitat 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	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, 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
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		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

Name	Status	Type of Presence
		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
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 Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
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
Montebello	Multiple Use Zone (IUCN VI)

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

-19.92199 115.3746,-19.93723 115.3936,-19.94419 115.3854,-19.95489 115.3748,-19.95857 115.37,-19.9628 115.3608,-19.96869 115.3406,-19.97199 115.3194,-19.97401 115.3113,-19.97949 115.2982,-19.9825 115.294,-19.99544 115.2805,-20.01472 115.2562,-20.03921 115.2173,-20.04416 115.2082,-20.04961 115.1929,-20.15942 115.0504,-20.16161 115.0447,-20.1615 115.0391,-20.15937 115.034,-20.15555 115.0301,-20.1512 115.0282,-20.1465 115.028,-20.14201 115.0295,-20.13828 115.0325,-20.02763 115.1762,-20.02385 115.1832,-20.01999 115.1946,-20.01561 115.2026,-19.99199 115.2398,-19.97479 115.2613,-19.96 115.277,-19.95529 115.2842,-19.95092 115.2934,-19.94752 115.303,-19.94486 115.314,-19.94294 115.3293,-19.93626 115.3532,-19.92454 115.3652,-19.91953 115.3716,-19.92199 115.3746

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

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

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

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

Australian Government
Department of the Environment and Energy

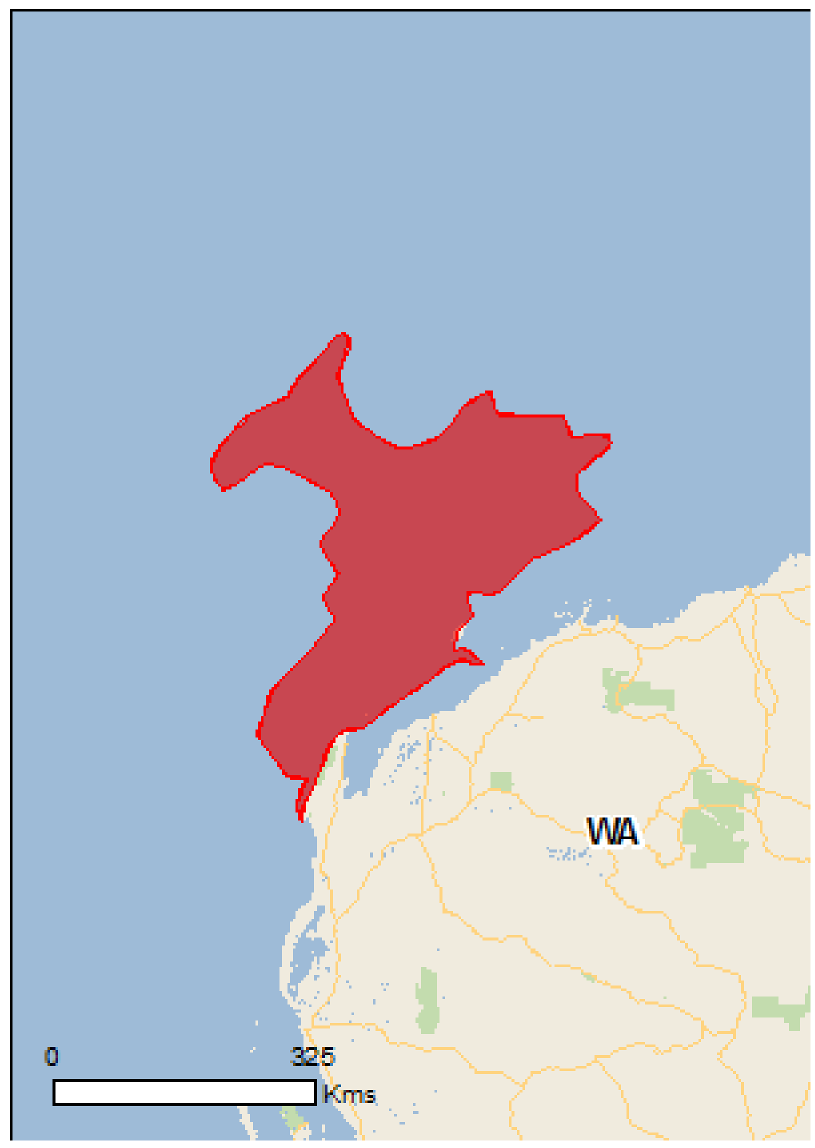
EPBC Act Protected Matters Report

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

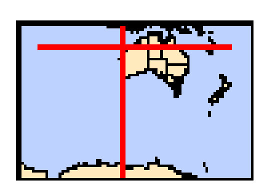
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 10/07/20 10:56:13



Coordinates
Buffer: 1.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	38
Listed Migratory Species:	54

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:	2
Commonwealth Heritage Places:	2
Listed Marine Species:	96
Whales and Other Cetaceans:	29
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	3

Extra Information

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

State and Territory Reserves:	10
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	6

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

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 known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri		
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri		
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi		
White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to 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
Pezoporus occidentalis		
Night Parrot [59350]	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
Bettongia lesueur Barrow and Boodie Islands subspecies		
Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known 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
Isoodon auratus barrowensis		
Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus		
Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Osphranter robustus isabellinus		
Barrow Island Wallaroo, Barrow Island Euro [89262]	Vulnerable	Species or species habitat likely 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

Name	Status	Type of Presence
		habitat known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	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
Ctenotus zastictus Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat likely 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

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur 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
Sterna dougallii Roseate Tern [817]		Breeding 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
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
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

Name	Threatened	Type of Presence
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
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

Name	Threatened	Type of Presence
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 known to 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 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 Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely 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
Commonwealth Land - Defence - EXMOUTH VLF TRANSMITTER STATION

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Learmonth Air Weapons Range Facility	WA	Listed place
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		
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

Name	Threatened	Type of Presence
		within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known 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 known to 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 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 known 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 known 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 habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
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
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 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
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
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		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

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 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 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
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
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 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

Name	Threatened	Type of Presence
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
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

Name	Threatened	Type of Presence
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
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 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

Name	Threatened	Type of Presence
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 Dophin, Short-beaked Common Dolphin [60]		Species or species 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
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
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within

Name	Status	Type of Presence
		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
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
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	Recreational Use Zone (IUCN IV)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Barrow Island	WA
Boodie, Double Middle Islands	WA
Cape Range	WA
Jurabi Coastal Park	WA
Lowendal Islands	WA
Montebello Islands	WA
Muiron Islands	WA
North Sandy Island	WA
Unnamed WA41080	WA
Unnamed WA44667	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 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

Nationally Important Wetlands [Resource Information]

Name	State
Cape Range Subterranean Waterways	WA

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

Name	Region
Glomar Shoals	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

-20.9497450473 115.431902901,-20.9855937975 115.51699261,-21.1062706162 115.664067286,-21.0975327306 115.577082336,-21.0630007981 115.433778728,-21.0977128256 115.290887284,-21.1820135997 115.171011549,-21.27316757 115.05582065,-21.3578876326 114.935077496,-21.4359824431 114.809351158,-21.5074964999 114.679124302,-21.5897804061 114.557027807,-21.6866630826 114.447246576,-21.7740961632 114.332754573,-21.7752787843 114.182401734,-21.8304880493 114.045576209,-21.9363512983 113.947638395,-22.0655447637 113.887019719,-22.2014069766 113.847507454,-22.3276748562 113.780432428,-22.4548453886 113.718883376,-22.5731278438 113.650368087,-22.7053987578 113.62825389,-22.580316496 113.593509843,-22.4442154475 113.632922614,-22.2833149492 113.687561987,-22.2729751783 113.567829638,-22.2552581494 113.479542886,-22.1066879127 113.339973005,-21.992245504 113.251328591,-21.8754459285 113.166600965,-21.8151965575 113.15315518,-21.6080136553 113.226367707,-21.4749934575 113.276861694,-21.3458579525 113.336898206,-21.2441196812 113.440901818,-21.1462460885 113.549421353,-21.0472987217 113.656776594,-20.9418430011 113.756700151,-20.8323415195 113.851626956,-20.6573428653 113.995279342,-20.5973767676 113.997169105,-20.4806766371 113.913313115,-20.3953620019 113.885879945,-20.2507973062 114.009147244,-20.1670300298 114.049301095,-20.0044968187 113.949150038,-19.8430733067 113.853193742,-19.7606272141 113.892138825,-19.6578494248 113.994410938,-19.5367847702 114.061696698,-19.3992484783 114.030027587,-19.29558547 113.933481189,-19.2200534012 113.807786184,-19.1462507379 113.681036988,-19.0870480946 113.54632271,-19.0357403591 113.407951644,-19.0016278996 113.265071379,-19.0640566425 113.133328522,-19.1433103227 113.01044431,-19.2224380876 112.887436278,-19.2701801571 112.752377705,-19.1619958179 112.663103624,-19.0245504895 112.639209069,-18.8909319283 112.682378541,-18.7763800449 112.768579075,-18.6740496194 112.870541239,-18.5734908236 112.97443161,-18.4823998123 113.086928163,-18.4213137933 113.220185821,-18.3704742994 113.358155708,-18.2974329785 113.482267148,-18.1786185759 113.562047301,-18.0661320234 113.65123863,-17.9613534022 113.750259333,-17.8572640779 113.850041719,-17.6572632014 114.042294389,-17.6252894622 114.11929837,-17.6846706368 114.156397187,-17.7492115027 114.156369631,-17.9533050181 114.075551118,-18.0888364213 114.038078285,-18.2238919824 114.0795381,-18.3555589635 114.133251271,-18.537449349 114.22111156,-18.5950874156 114.279798106,-18.6733176996 114.403247454,-18.7507186057 114.527363334,-18.8484286209 114.710843882,-18.843207422 114.795963212,-18.8086191098 114.939906756,-18.7715968293 115.083173961,-18.7347148062 115.171015799,-18.5897538814 115.300471745,-18.419819281 115.43716004,-18.3750766919 115.491957432,-18.2531612661 115.687220891,-18.2615076022 115.74456288,-18.3949736551 115.786455396,-18.4778296607 115.814129448,-18.495799147 115.884997172,-18.5013642095 116.166681279,-18.5026612344 116.314947284,-18.5140085208 116.547769056,-18.5637831624 116.584692581,-18.6970173153 116.630833316,-18.7226099553 116.688942674,-18.7090306594 116.921859517,-18.7212279983 117.067573953,-18.7841917593 117.084758799,-18.8367513427 117.046977234,-19.0278188331 116.810672346,-19.1253100029 116.703758015,-19.2634210534 116.702252638,-19.3502525057 116.741884686,-19.4859181336 116.877755936,-19.5972571616 116.964717856,-19.6960843773 116.861941141,-19.7765725806 116.739158162,

-19.838582816 116.604937882,-19.8952942113 116.467974468,-19.982779892 116.260929905,-20.0256232875 116.20368211,-20.1175042331 116.089896776,-20.2114422806 115.977939589,-20.3437411241 115.830259364,-20.3684611454 115.738954119,-20.3412687713 115.592092721,-20.3617273584 115.493387007,-20.4471820775 115.484920962,-20.6036912033 115.538353993,-20.7643525488 115.355980283,-20.9759073128 115.329631272,-20.9497450473 115.431902901

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

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

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

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

APPENDIX D OIL SPILL PREPAREDNESS AND RESPONSE STRATEGY SELECTION AND EVALUATION

Oil Spill Preparedness and Response Mitigation Assessment for Julimar Operations

Security and Emergency Management
Hydrocarbon Spill Preparedness

January 2021
Revision 1a

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EXECUTIVE SUMMARY

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Julimar Operations, 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 0-1.

Table 0-1: Summary of the key details for assessment

Key details of assessment	Summary	Reference to additional detail
Credible Scenario	**Credible Scenario 1 (CS-01) - Worst Case Credible Scenario (WCCS): Hydrocarbon release caused by loss of well containment BRUA-2 well** Subsea release of 55,647 m³ over 75 days of Brunello condensate (location: 115°12'05.6357" E, 20°01'49.1571" S, 149 m below sea level). 6.9% residual component of 3825 m³	Section 2.2
	Credible Scenario 2 (CS-02): Hydrocarbon release caused by a subsea infrastructure loss of containment Subsea release of 1062 m³ over 5.2 hours of Brunello Condensate (115°12'09.28" E, 20°01'53.43" S, 175 m below sea level). 6.9% residual component of 73 m³	
	Credible Scenario 3 (CS-03): Hydrocarbon release due to a vessel collision Instantaneous release of 250 m³ of marine diesel from a support vessel (location: 115°12'05.6357" E, 20°01'49.1571" S). 5% residual component of 13 m³	
Hydrocarbon Properties	**Brunello Condensate** (API 49.8) contains a low proportion (6.9% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds will persist in the marine environment. The un-weathered mixture has a dynamic viscosity of 1.4257 cP at 15° C. The pour point of the whole oil (minus 36 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 45.5% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 37.3% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 10.3% should evaporate over several days (265 °C < BP < 380 °C). **Marine Diesel** 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 (50 m³). Under calm conditions the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes.	Section 6.7.1 of the EP Appendix A of the First Strike Plan (Link)

Modelling Results	A quantitative, stochastic assessment has been undertaken for credible spill scenarios to help assess the environmental risk of a hydrocarbon spill. For CS-01 and CS-02, a total of 100 replicate simulations were completed over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). For CS-03, a total of 200 replicate simulations were completed over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (50 simulations per quarter).		Section 2.3
	Model A Minimum time to shoreline contact (above 100 g/m^2)	NA – all modelled scenarios confirmed no shoreline contact above 100 g/m^2	
	Model B Largest volume ashore at any single Response Priority Area (RPA) (above 100 g/m^2)	NA – all modelled scenarios confirmed no shoreline contact above 100 g/m^2	
	Model C Largest total shoreline accumulation (above 100 g/m^2) all shorelines	NA – all modelled scenarios confirmed no shoreline contact above 100 g/m^2	
Net Environmental Benefit Analysis	Monitor and Evaluate, Source Control via capping stack, Source Control via relief well drilling, and Oiled Wildlife Response, are all identified as potentially having a net environmental benefit (dependent 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 risks presented in Sections 2 and 3, without the implementation of considered additional, alternative or improved control measures.		Section 6

1 INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for the Julimar Operations, hereafter known as the Petroleum Activities Program (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.

- Julimar Operations Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- Julimar Operations Oil Pollution Emergency Plan (OPEP) including:
  - First Strike Plan (FSP)
  - Relevant Operations Plans
  - Relevant Tactical Response Plans (TRPs)
  - 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 As Low as Reasonably Practicable (ALARP) and Acceptable levels.

1.3 Scope

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 risks and impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the 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. It should be read in conjunction with the documents listed in Table 1-1. The location of the Petroleum Activity Program is shown in Figure 3-1 of the EP.

1.4 Oil spill response document overview

The documents outlined in Table 1-1 and Figure 1-1 are collectively used to manage the preparedness and response for a hydrocarbon release.

The Oil Pollution First Strike Plan (FSP) (Link) 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 (ME) operations and the pre-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 (Section 4).

The response will continue as described in Section 5 until the response termination criteria have been met.

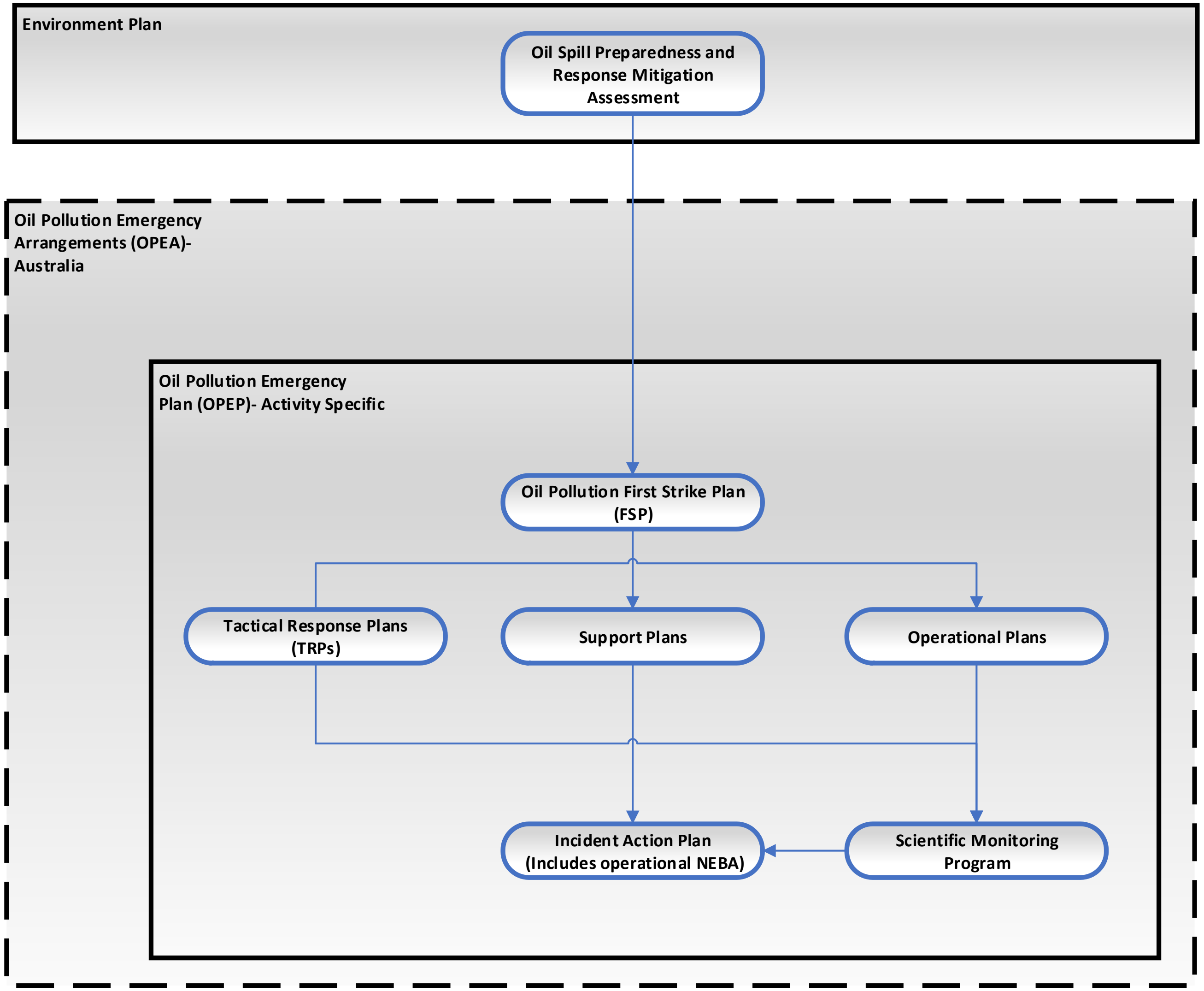


Figure 1-1: Woodside hydrocarbon spill document structure

Table 1-1: Hydrocarbon spill preparedness and response – document references

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Julimar Operations Environment Plan (EP)	Demonstrates that potential adverse impacts on the environment associated with the Julimar Operations (during both routine and non-routine operations) are mitigated and managed to As Low As Reasonably Practicable (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 7 (Implementation strategy – including emergency preparedness and response) EP Section 7 (Reporting and compliance) EP Section 6 (Performance outcomes, standards and measurement criteria)	
Oil Pollution Emergency Arrangements (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	
Oil Spill Preparedness and Response Mitigation Assessment for the Julimar Operations (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 performance outcomes, standards 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)
Julimar Operations Oil Pollution First Strike Plan (FSP)	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 Incident Action Plan (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 Incident Management Team (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, aerial surveillance and oil spill tracking buoy details.	
Operational Plans	List 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 Source Control and Well Intervention Oiled Wildlife Scientific Monitoring
Tactical Response Plans	Provides options for response techniques in selected 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.	Modelling confirmed no shoreline contact at response thresholds.

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.	Strategy 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 (First Strike Response) IT (Extended Response) Communications (First Strike Response) Communications (Extended Response) 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, identified in the EP. 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 Julimar Operations First Strike 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.

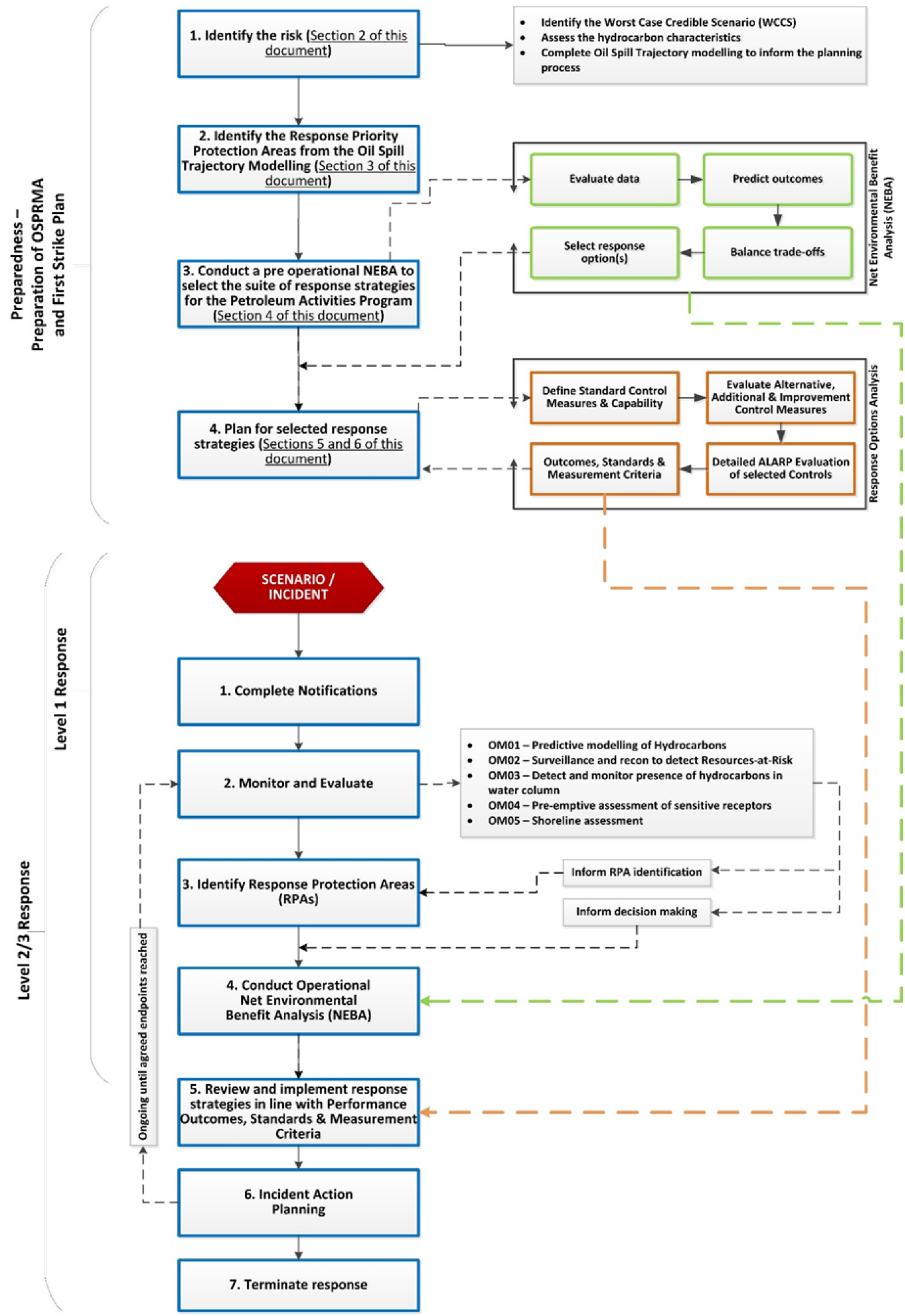


Figure 2-1: Response planning and selection process

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

- 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

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 assumption – timing, resourcing and effectiveness

2.2 Environment plan risk assessment (credible spill scenarios)

Potential hydrocarbon release scenarios from the PAP 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. Three unplanned events or credible spill scenarios for the PAP have been selected as representative across types, sources and incident/response levels, up to and including the WCCS.

Table 2-1 presents the credible scenarios for the PAP. The WCCS for the activity is then used for response planning purposes, as all other scenarios are 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.

Loss of well containment scenarios (CS-01) has been modelled and considered to determine the WCCS for response planning purposes. Modelling of all scenarios has confirmed that the WCCS will not result in shoreline accumulation.

The Hydrocarbon release caused by subsea loss of containment is considered the worst case when responding to floating hydrocarbons, given the release is over a short period of time (5.2 hours). As such this scenario is used when assessing the feasibility of the surface dispersant and containment and recovery response.

Table 2-1: Petroleum Activities Program credible spill scenarios

Credible Scenario No.	Scenario selected for planning purposes	Scenario description	Maximum credible volume released (liquid m³)[1]	Incident Level	Hydrocarbon (HC) type	Residual proportion	Residual volume (liquid m³)	Key credible scenarios informing response planning
CS-01 (WCCS)	Yes	Hydrocarbon release caused by a well loss of containment (subsea well)	55,647	3 (WCCS)	Brunello Condensate	6.9%	51 m³ per day	A long-term (75-day) uncontrolled subsea release from Brunello Well BRUA2, representing loss of containment after a loss of well control
CS-02	No	Hydrocarbon release caused by a flowline loss of containment (subsea)	1062	2	Brunello Condensate	6.9%	73 m³	A short term (5.2 hours) subsea release due to a full bore rupture at the JP2 flowline inlet when isolation between Brunello and Julimar flowlines is open
CS-03	No	Hydrocarbon release caused by vessel collision	250	2	Marine Diesel	5.0%	13 m³	An instantaneous release of marine diesel at the Julimar site due to a vessel collision

2.2.1 Hydrocarbon characteristics

Hydrocarbon characteristics, including modelled weathering data and ecotoxicity, are included in Section 6.7 of the EP.

Brunello condensate

Brunello Condensate (API 49.8) contains a relatively low proportion (~6.9% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds are expected to persist in the marine environment.

The unweathered mixture has a dynamic viscosity of 1.43 cP. The pour point of the whole oil (≤ 36 °C) ensures it will remain in a liquid state over the annual temperature range observed on the North West Shelf.

The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 45.5% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 37.3% should evaporate within the first 24 hours 180°C < BP < 265 °C); and a further 10.3% should evaporate over several days (265 °C < BP < 380 °C).

Soluble aromatic hydrocarbons contribute approximately 11.2% by mass of the whole oil, with a moderate proportion (6.9%) in the C4-C10 range of hydrocarbons. These compounds will evaporate slowly, leaving the potential for dissolution of a proportion of them into the water.

Diesel

Marine Diesel Oil is typically classed as an International Tanker Owners Federation (ITOPF) Group I oil. Group I oils are non-persistent and tend to dissipate completely through evaporation within a few hours and do not normally form emulsions.

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. a 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 tend 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.

2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises that 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. 2007a and 2007b; 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

Stochastic modelling has been completed for the scenarios outlined in Table 2-1. A quantitative, stochastic assessment has been undertaken for credible spill scenarios to help assess the environmental consequences of a hydrocarbon spill.

A total of 100 replicate simulations were completed for CS-01 and CS-02 over an annual period to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). For CS-03 a total of 200 replicate simulations were run over an annual period (50 simulations per quarter). Further details relating to the assessments for the scenarios can be found in Section 6.7 of the EP.

2.3.1.1 Environmental impact thresholds – EMBA and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenarios. The stochastic modelling results are 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 the Environment that May Be Affected (EMBA) and is discussed further in Section 4 of the EP. 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 within the EP.

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 and described in Section 6.7 of the EP.

Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine the EMBA and environmental impacts

Threshold (Julimar Operations - Brunello Condensate)	Theshold (marine diesel)	Description
10 g/m²	10 g/m²	Surface hydrocarbon
100 ppb	500 ppb	Entrained hydrocarbon (ppb)
50 ppb	500 ppb	Dissolved aromatic hydrocarbon (ppb)
100 g/m²	100 g/m²	Shoreline accumulation

2.3.2 Deterministic modelling

Stochastic modelling confirmed that there is no shoreline contact above the response thresholds for any of the credible spill scenarios. For CS-02, surface concentrations exceed 50 g/m² in close proximity (less than 3 km) of the release location but naturally disperse rapidly. Based on these outcomes, stochastic modelling only has been used to scale the response.

2.3.3 Response planning thresholds for surface and shoreline hydrocarbon exposure

Thresholds to determine the EMBA are used to predict and assess environmental impacts and inform the SMP; however, they do not appropriately represent the thresholds at which an effective response can be implemented. Additional response thresholds are used for response planning and to determine areas where response techniques would be most effective.

In the event of an actual response, modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform Incident Management Team decisions.

The modelling outputs are presented at response planning thresholds for surface hydrocarbons for the WCCS. Surface spill concentrations are expressed as grams per square metre (g/m²). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised in the next subsections.

2.3.3.1 Surface hydrocarbon concentrations

Table 2-3: Surface hydrocarbon thresholds for response planning

Surface hydrocarbon concentration (g/m^2)	Description	Bonn Agreement Oil Appearance Code (BAOAC)	Mass per area (g/m^2)
>10	Predicted minimum threshold for commencing operational monitoring [1]	Code 3 – Dull metallic colours	5 to 50
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [2]	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/m^2)	**Description**	**National Plan Guidance on Oil Contaminated Foreshores**	**Mass per area (g/m^2)**
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

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 that overall the average thickness is 0.1 mm (or approximately 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.

Stochastic modelling confirmed that the majority (82.8%) of hydrocarbons released to the marine environment in the WCCS (CS-01) would evaporate within the first 24 hours, with a further 10.3% evaporating over several days. The light-weight nature of Brunello Condensate means that the WCCS would not result in hydrocarbon accumulation at a surface thickness at which dispersants would be effective.

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], 2015a).

[1] 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 Western Australia Department of Transport (WA DoT).

[2] At 50 g/m^2, 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 AMSA (AMSA, 2015) indicates that spreading of spills of Group II or III products will rapidly decrease slick thickness over the first 24 hours of a spill resulting in the potential requirement of up to a ten-fold increase in capability on day 2 to achieve the same level of performance.

Further guidance from the European Maritime Safety Authority (EMSA) states that spraying the ‘metallic’ looking area of an oil slick (BAOAC 3, approximately 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 on applying surface dispersants to only BAOAC 4 and 5. Spraying areas of oil designated as BAOAC Code 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 Code 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).

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, 2014a, 2014b).

Figure 2-3 from AMSA’s Identification of Oil on Water – Aerial Observation and Identification Guide (AMSA, 2014) shows expected percent 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/m² was chosen as an average/equilibrium thickness (50 g/m² as an average is 50% coverage of 0.1 mm Bonn Agreement Code 4 – discontinuous true oil colour, or 25% coverage of 0.2 mm Bonn Agreement Code 5 – continuous true oil colour, which would represent small patches of thick oil or wind-rows).

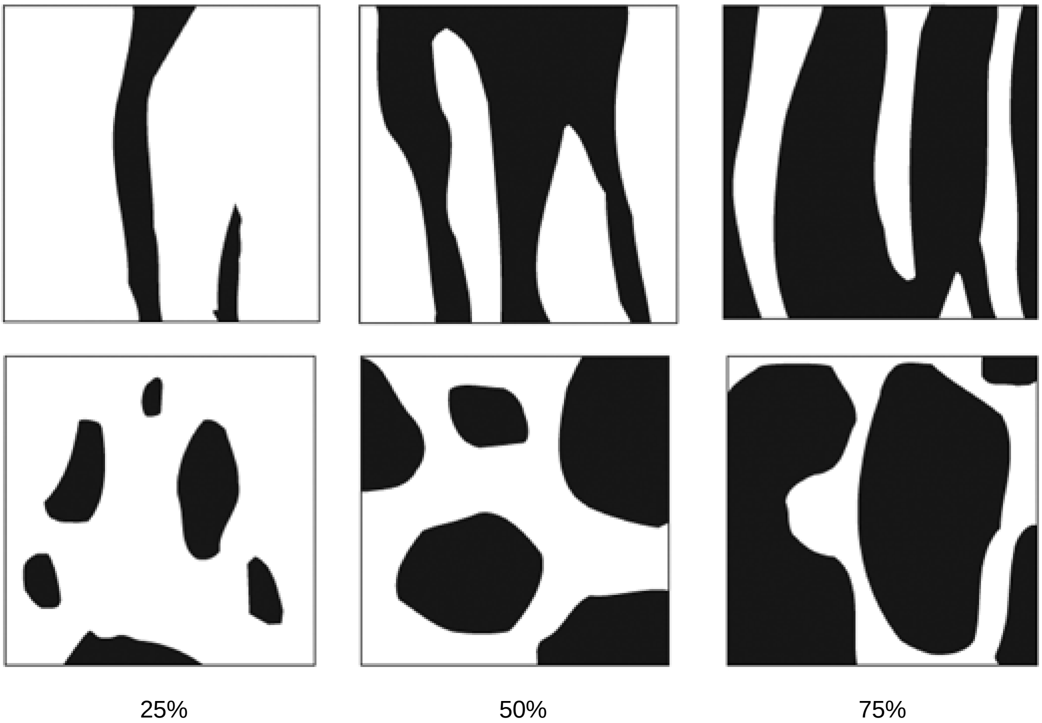


Figure 2-3: Proportion of total area coverage (AMSA, 2014)

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.

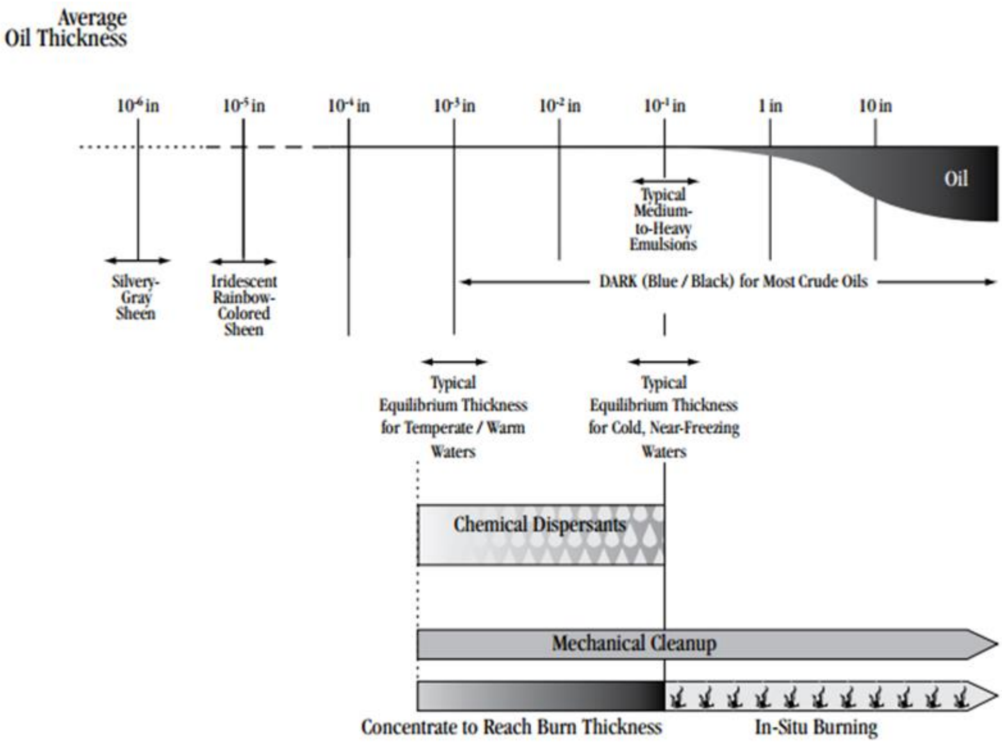


Figure 2-4: Oil thickness versus potential response options (from Allen and Dale, 1996)

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.

2.3.3.2 Surface hydrocarbon viscosity

Table 2-4: Surface hydrocarbon viscosity thresholds

Surface viscosity (cSt)	Description	European Maritime Safety Authority	Viscosity at sea temperature (cSt)
5,000*	Predicted optimum viscosity for surface dispersant operations	Generally possible to disperse	500 to 5000
10,000*	Predicted maximum viscosity for effective surface dispersant operations	Sometimes possible to disperse	5,000 to 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 that products with a range of 500 to 5000 cSt at sea temperature are generally possible to disperse, while 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 are 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).

2.3.4 Spill modelling results

Details of the scenario and modelling inputs are included in Table 2-5.

Table 2-5: Worst case credible scenario modelling results

Scenario description	Results
Worst-case credible scenario(s) Total volume released	**CS-01** Hydrocarbon release caused by well loss of containment Subsurface release of 55,647 m^3 over 75 days of Brunello Condensate **CS-02** Hydrocarbon release caused by subsea loss of containment Subsurface release of 1062 m^3 over 5.2 hours of Brunello Condensate **CS-03**[3] Hydrocarbon release caused by a vessel collision Surface release of 250 m^3 of Marine Diesel
Worst-case credible scenario(s) Residual volume remaining post-weathering	**CS-01** 6.9% residual component, 3825 m^3 of Brunello Condensate **CS-02** 6.9% residual component, 73 m^3 of Brunello Condensate **CS-03** 5% residual component, 13 m^3 of Marine Diesel
Stochastic modelling results	
Minimum time to shoreline contact (above 100 g/m²)	NA **–** stochastic modelling confirmed no shoreline accumulation at or above 100 g/m² under any credible spill scenario
Largest volume ashore at any single RPA (above 100 g/m²)	NA – stochastic modelling confirmed no shoreline accumulation at any RPA at or above 100 g/m² under any credible spill scenario
Largest total shoreline accumulation (above 100 g/m²) all shorelines	NA – stochastic modelling confirmed no shoreline accumulation at any shoreline at or above 100 g/m² under any credible spill scenario

As shown in Figure 2-5 to Figure 2-8 and from analysis of the results, modelling predicts the following:

- Julimar Facility loss of well containment (CS-01) (Figure 2-5):
  - The subsea release results in surface concentrations below thresholds suitable for containment and recovery and surface dispersant operations (CS-01, Figure 2-5).
  - Spreading and weathering of the surface oil occurs rapidly due to the loss of light, volatile components.
- Julimar Facility loss of well containment (CS-02, Figure 2-6 and Figure 2-7):
  - The subsea release results in concentrations below thresholds suitable for containment and recovery and surface dispersant operations (CS-02, Figure 2-6).
  - There is a very small area where surface oil concentrations are greater than 50 g/m². Spreading and weathering of the surface oil occurs rapidly due to the loss of light volatile components (CS-02, Figure 2-7).

[3] WCCS loss of Marine Diesel for CS-03 is 250 m^3. Modelled results for Scenario 3 are highly conservative and based on a 550 m^3 loss from a previous Marine Diesel loss scenario close to the Julimar wells.

- Julimar Facility loss caused by a vessel collision (CS-03) (Figure 2-8):
  - The surface release results in surface concentrations below thresholds suitable for containment and recovery during the first seven days (CS-03, Figure 2-8).
  - 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 operations as shown in Figure 2-8.
  - 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.

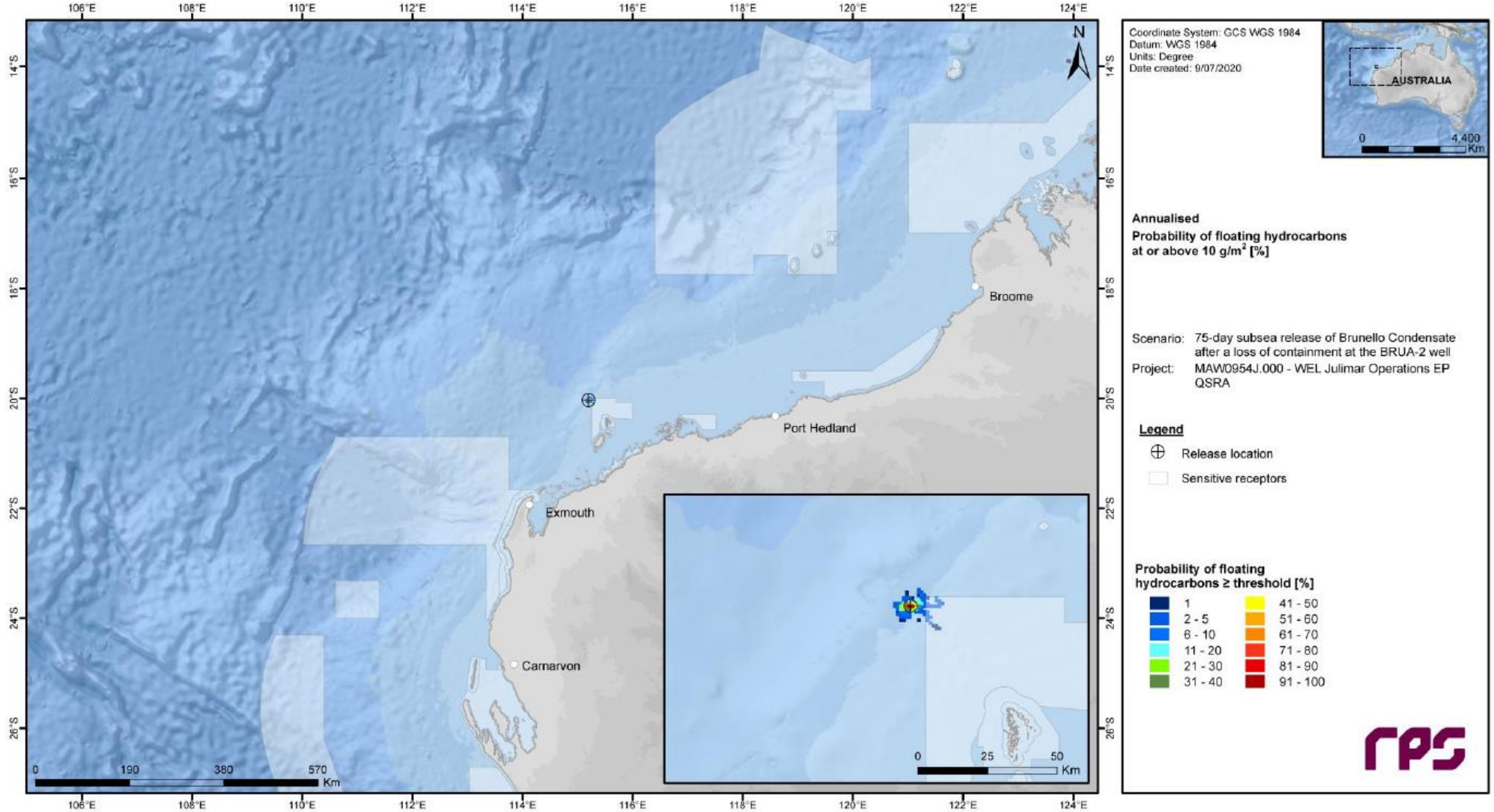


Figure 2-5: Julimar Operations CS-01 – surface concentrations above 10 g/m²

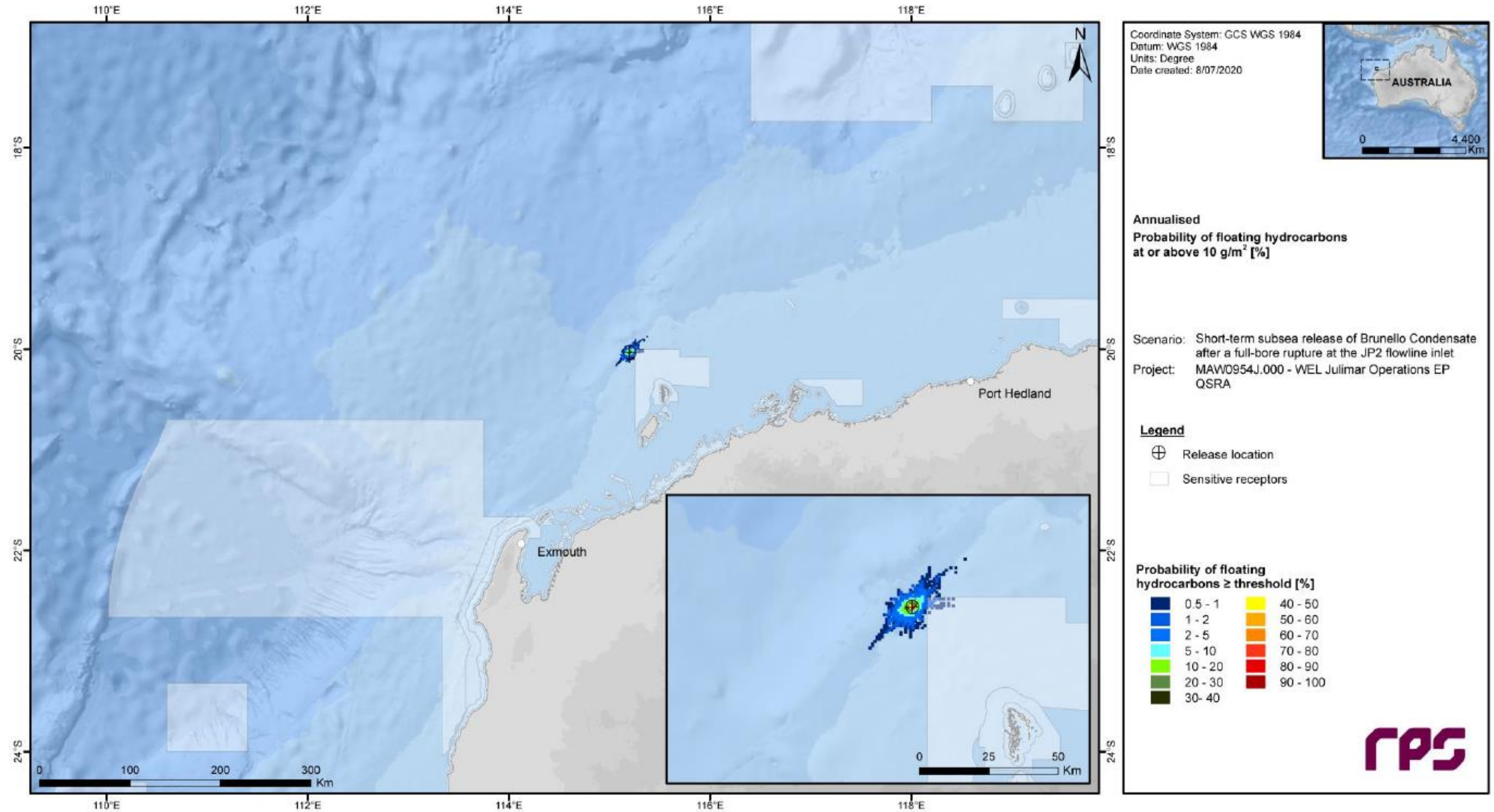


Figure 2-6: Julimar Operations CS-02 – surface concentrations above 10 g/m²

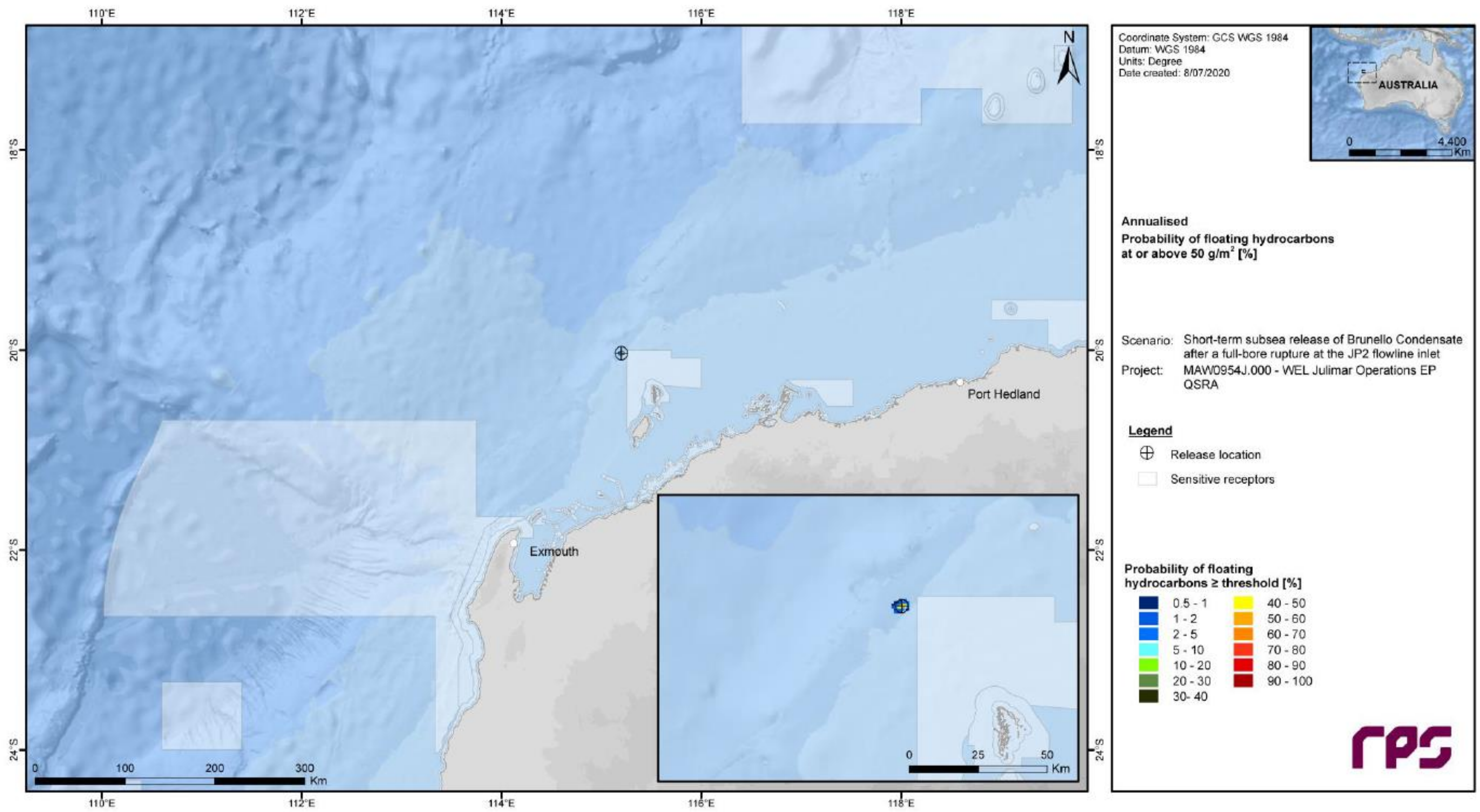


Figure 2-7: Julimar Operations CS-02 – surface concentrations above 50 g/m²

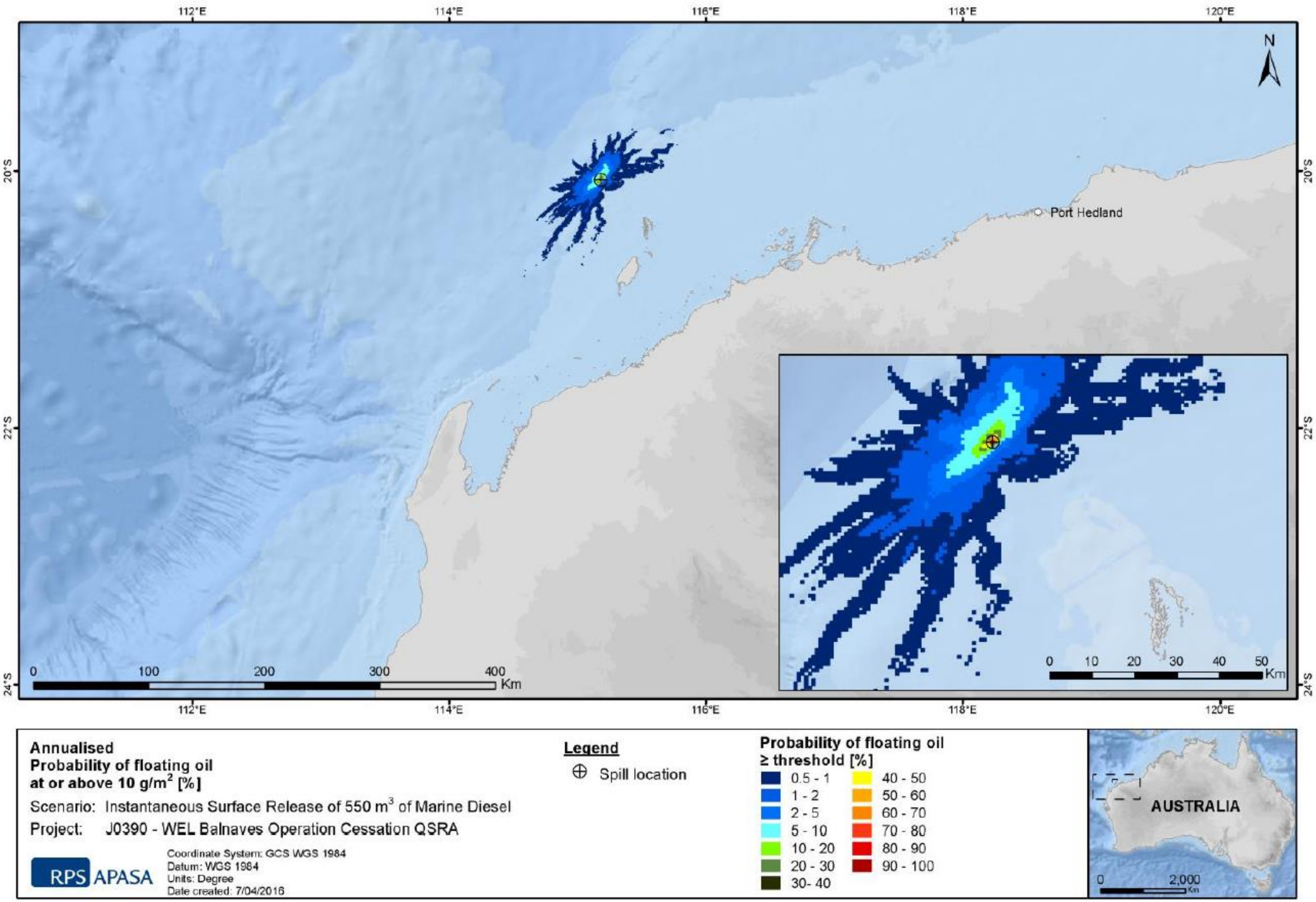


Figure 2-8: Julimar Operations CS-03 – surface concentrations above 10 g/m²

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.

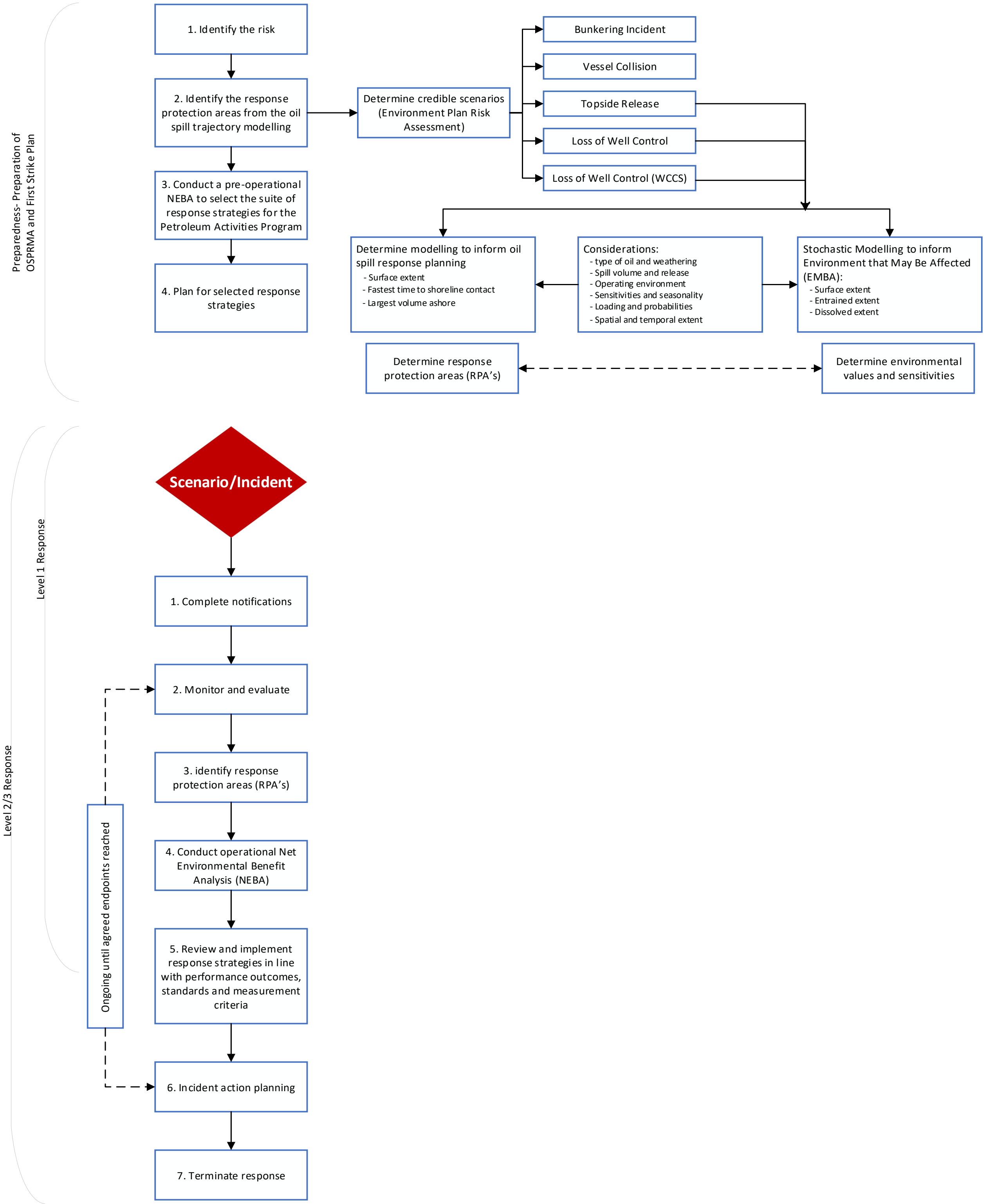


Figure 3-1: Identify Response Protection Areas flowchart

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 Identified response protection areas

From the identified sensitive receptors described in Section 4 of the EP, only those which a shoreline response could feasibly be conducted (accumulation > 100 g/m² for shoreline assessment and/or contact with surface slicks > 10 g/m² for operational monitoring) have been selected for response planning purposes.

3.2.1 Response protection areas

The modelling has shown that no shorelines are expected to be contacted at 10 g/m² and no shoreline accumulation above 100 g/m² is expected and therefore no RPAs are defined for this activity. Operational monitoring will, however, be undertaken from the outset of a spill to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It will also inform if or when the spill enters State Waters and/or control of the incident passes to statutory authorities e.g. WA DoT or AMSA. If operational monitoring does identify RPAs at risk of impact during a real spill event, TRPs for a shoreline response will be drafted in advance for any RPAs with a contact time of <14 days.

Sensitive receptors are presented in the existing environment description and impact assessment section of the EP (Section 4 and Section 6.7 respectively) for each respective spill scenario. The pre-operational NEBA (Section 4) considers the results from the stochastic modelling to ensure all feasible response techniques are considered in the planning phase.

4 NET ENVIRONMENTAL BENEFIT ANALYSIS

A Net Environmental Benefit Analysis (NEBA) is a structured process to consider which response techniques are likely to provide the greatest net environmental benefit (IPIECA, 2015b).

The NEBA process typically involves the 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.

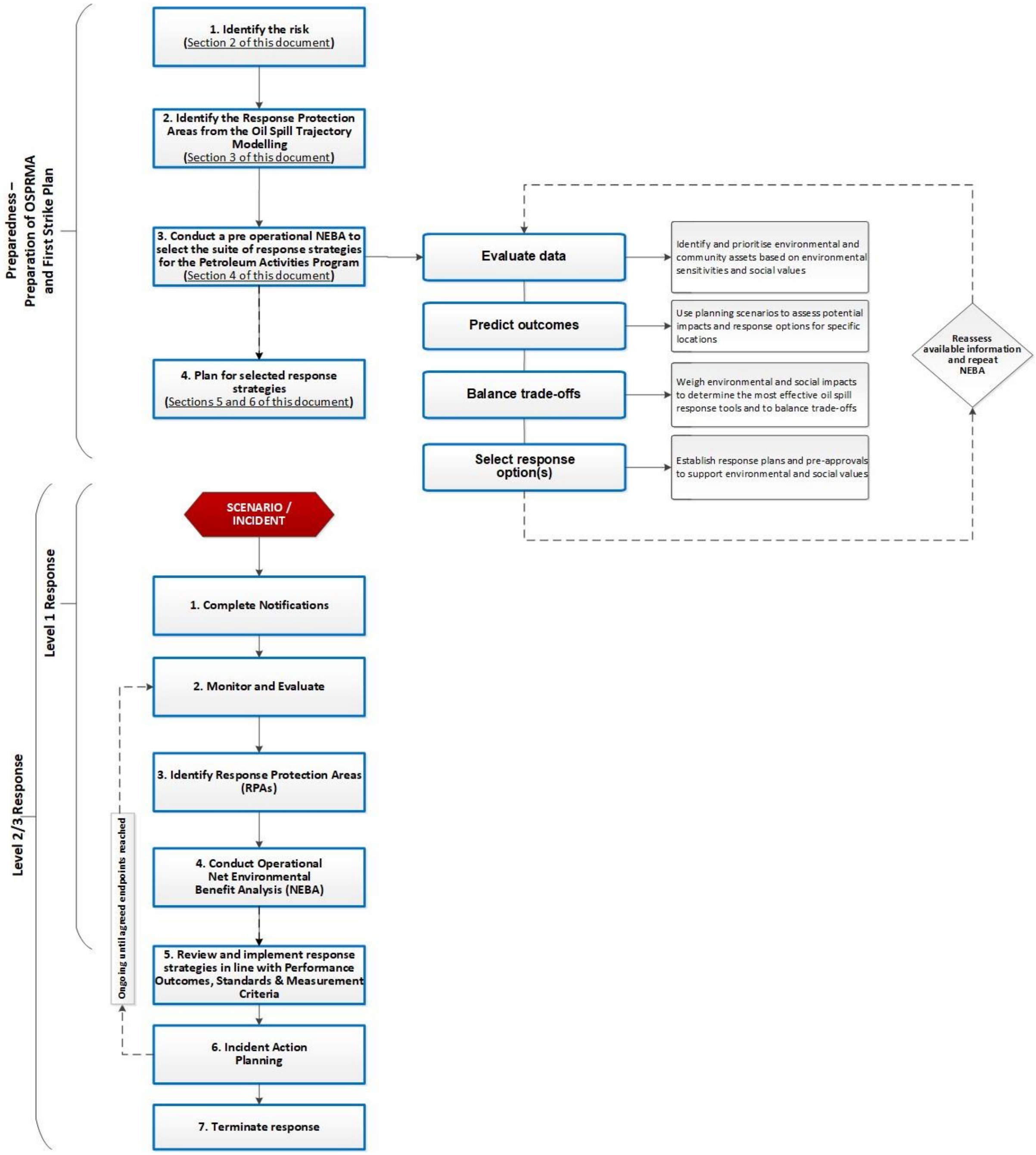


Figure 4-1: Net Environmental Benefit Analysis flowchart

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 2.3.3) and the surface concentrations (Section 2.3.3.1) from the deterministic modelling (deterministic modelling not undertaken as stochastic modelling confirmed no shoreline contact above thresholds).

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: Net Environmental Benefit Analysis Detailed Outcomes.

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 Defining 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 overall WCCS is then used for this pre-operational NEBA. Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. The worst-case diesel release scenario is also analysed to meet regulatory requirements. Response thresholds and modelling are then used to assess the feasibility/effectiveness and scale of the response.

Table 4-1: Scenario summary information

Scenario summary information (WCCS – CS-01)	
Scenario	Hydrocarbon release caused by loss of well containment – BRUA-2 well
Location (WGS 84)	Lat: 115°12’05.6357” E Long: 20°01’49.1571” S
Oil Type	Brunello Condensate
Fate and Weathering	45.5% of the mass should evaporate within the first 12 hours (BP < 180 °C) 37.3% of the mass should evaporate within the first 24 hours (180 °C < BP < 265 °C) 10.3% of the mass should evaporate over several days (265 °C < BP < 380 °C)
Volume and duration of release	55,647 m³ over 75 days
Scenario summary information (CS-02)	
Scenario	Hydrocarbon release caused by subsea loss of containment – full bore rupture of JP2 flowline inlet
Location (WGS 84)	Lat: 115°12’09.28 E” Long: E, 20°01’53.43” S
Oil Type	Brunello Condensate
Fate and Weathering	45.5% of the mass should evaporate within the first 12 hours (BP < 180 °C) 37.3% of the mass should evaporate within the first 24 hours (180 °C < BP < 265 °C) 10.3% of the mass should evaporate over several days (265 °C < BP < 380 °C)
Volume and duration of release	1062 m³ over 5.2 hours
Scenario summary information (CS-03)	
Scenario	Hydrocarbon release caused by a vessel collision - Breach of vessel fuel tank due to collision with third party vessel.
Location (WGS 84)	Lat: 115°12’05.6357” E Long: 20°01’49.1571” S
Oil Type	Marine diesel
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	250 m³ (instantaneous)

4.2.1.1 Hydrocarbon characteristics

Brunello condensate

Brunello Condensate Crude (API 49.8) contains a low proportion (6.9% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds are expected to persist in the marine environment.

Selective evaporation of the lower boiling-point components will lead to a shift in the physical properties of the remaining mixture, including an increase in the viscosity and pour point.

Subsea release (CS-01)

A site-specific plume analysis was undertaken for the Julimar Facility Operations (RPS, 2020), which showed that with absolute open hole flow rate, scenario 1 (CS-01) would result in a plume radius of approximately 19 m.

The results of the OILMAP simulation predicted that the discharge would generate a cone of rising gas that would entrain the oil droplets and ambient sea water up to the water surface. The mixed plume is initially forecast to jet towards the water surface with a vertical velocity of around 7 m/s, gradually slowing and increasing in plume diameter as more ambient water is entrained. The diameter of the central cone of rising water and oil at the neutral-buoyancy point is predicted to be approximately 19 m.

The discharge velocity and minimal turbulence generated by the expanding gas plume is predicted to result in relatively large oil droplets (131 to 794 µm in diameter) that will have a relatively high terminal rise velocity (5.4 m/s). These droplets will be subject to mixing due to turbulence generated by the lateral displacement of the rising plume, as well as vertical mixing induced by wind and breaking waves. Therefore, despite reaching the surface due to the lift produced by the rising plume, the droplets will then tend to remain within the wave-mixed layer of the water column (3 to 10 m deep, depending on the conditions), where they can resist surfacing due to their weak buoyancy relative to other mixing processes.

The ongoing nature of the release combined with the potential for oil to reach the water surface may present other hazards, including conditions that may lead to high local concentrations of atmospheric volatiles. These issues should be considered when evaluating the practicality of response operations at or near the blowout site. The results suggest that beyond the immediate vicinity of the blowout the majority of the released hydrocarbons will be present in the upper layers of the ocean. The whole oil has a low asphaltene content (around 0.5%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle.

Diesel

Marine Diesel Oil is classed as an ITOPF Group I/II oil. These oils are non-persistent and tend to dissipate completely through evaporation within a few hours and do not normally form emulsions.

For these reasons deterministic modelling was not undertaken and the only response techniques that would be considered are monitor and evaluate.

Table 4-2: Oil fate, behaviour and impacts

Stochastic modelling results	
Surface area of hydrocarbons (>50 g/m²)	**CS-02** The area that may experience surface concentrations > 50 g/m² is 12.6 km², extending to a maximum of 3 km from the release location. However, the actual area in an individual spill would be significantly less than this.
Minimum time to shoreline contact (above 100 g/m²)	N/A – no shoreline accumulation at or above 100 g/m².
Largest volume ashore at any single RPA (above 100 g/m²)	N/A – no shoreline accumulation at or above 100 g/m².
Largest total shoreline accumulation (above 100 g/m²)	N/A – no shoreline accumulation at or above 100 g/m².
Response Protection Areas	
NA – no shoreline contact above response thresholds	

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:
  - remotely operated vehicle (ROV) intervention
  - debris clearance and/or removal
  - capping stack
  - remote intervention (shut in of flowlines)
  - containment dome
  - relief well drilling
- Subsea dispersant injection
- Containment and recovery
- In-situ burning
- Surface dispersant application:
  - aerial dispersant application
  - vessel dispersant application
- Shoreline protection and deflection:
  - protection
  - deflection
- Shoreline clean-up:
  - Phase 1 – Mechanical clean-up
  - Phase 2 – Manual clean-up
  - Phase 3 – Final polishing
- In-situ burning
- Oiled wildlife response (including hazing)
- Waste management
- Post spill monitoring/scientific monitoring

An assessment of which response options are feasible for the scenarios is included in Table 4-3 and Table 4-4. 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 4-3: Response technique evaluation – WCCS loss of well containment (CS-01)

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Brunello Condensate				
Monitor and Evaluate	Will be effective in tracking the location of the spill, informing if/when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons to assess resources at risk – 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 which RPAs have been impacted.	Monitoring of a Brunello Condensate spill is a feasible response technique and is an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and whether the spill passes into State Waters and thus control of the incident moves to WA Department of Transport (DoT) (if a Level 2/3 event).	Yes	Monitoring and Evaluation is an essential element of oil spill response and will be necessary to: • validate trajectory and weathering models • determine the behaviour of the condensate in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine whether the condensate is dispersing naturally or not • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • determine if/when the spill crosses into State Waters and thus control of the spill passes to WA DoT.
Source Control via Debris Clearance (if needed) and Capping Stack Deployment	Controlling a loss of well containment at source via a capping stack would be an effective way to limit the quantity of hydrocarbon entering the marine environment.	Julimar wells fitted with Xmas trees that have a horizontal axis can potentially be fitted with a capping stack. The use of a proven subsea deployment method such as a heavy lift vessel, is considered the most reliable and, in turn, ALARP approach for this activity. Alternative Capping Stack approaches are considered in Section 6.2.8 but due to the complex nature of implementation or inability to implement were not considered ALARP. If environmental conditions permit (wind speed, wave height, current and plume radius), deployment of a capping stack would be attempted with a heavy lift vessel. Modelling shows that the surface plume diameter is expected to be approximately 19m diameter at the surface. Woodside maintains several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment is monitored monthly. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames. A site-specific landing force analysis through CFD modelling confirms the ability to land the capping stack on a xmas tree. The Brunello wells have vertical Xmas trees upon which a capping stack cannot be utilized. Furthermore, in the event of the complete removal or major damage to the vertical production trees, debris clearance and capping activities are not considered viable as there would not be any infrastructure to land the capping device on and secure it for well control operations.	Yes	Conventional/vertical capping stack deployment with a heavy lift vessel will be attempted if well loss of containment occurs on a horizontal Xmas tree, plume radius is ~25 m and environmental conditions permit (wind speed, wave height and plume radius).
Source Control via Relief Well Drilling	Relief well drilling will be the primary option to stop a release from a blow-out well if intervention attempts from topsides fail. The drilling of a relief well will take approximately 75 days.	For a WCCS spill from the Julimar Operations (CS-01), and where topsides intervention methods are not possible or have failed to stop the release, relief well drilling will be the only feasible means of regaining well control. Relief well drilling is a widely accepted technique for source control of a blow-out well.	Yes	Relief well drilling will be the main technique employed to control a loss of well containment event where attempts to stop the flow of hydrocarbons from topsides are not possible or have failed.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Containment and Recovery	Containment and recovery has an effective recovery rate of 5 to 10% when a hydrocarbon encounter rate of 25 to 50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability of, extent of, contact with and accumulation of hydrocarbons on shoreline receptors. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by entrained/dissolved hydrocarbons.	Brunello Condensate is prone to rapid spreading and evaporation, and does not tend to form emulsions thus reducing the feasibility of containment and recovery as a response technique. In addition, containment and recovery can have low effectiveness with, on average <10% of available oil successfully contained and recovered. The largest operation ever mounted was during the Deepwater Horizon/Macondo which achieved an effectiveness of approximately 3 to 5%. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles due to the condensates propensity to evaporate. Modelling has shown that surface concentrations at a sufficient concentration for Containment and Recovery operations (>50 g/m^2) are not expected from this scenario.	No	In addition to low effectiveness and potential safety issues from predicted high local concentrations of atmospheric volatiles, the modelling results show that the non-persistent characteristics and fate/trajectory of Brunello Condensate would make containment and recovery an unsuitable response technique.
Subsea Dispersant Application	Application of subsea dispersant can potentially reduce the scale and extent of surface hydrocarbons and reduce the volumes of surface hydrocarbons contacting sensitive areas. It is expected that the extent of the gas cloud will be independent of any subsea dispersant injection treatment, due to the high gas-to-oil ratio of the expected flow stream (INPEX, 2019). As such, the exclusion zone for the deployment of other response techniques will be governed by the gas boil at the sea surface and resulting gas plume, thus no safety benefit would be realised through using SSDI.	The high discharge velocity and turbulence from the hydrocarbon plume in the event of a WCCS well release is predicted to generate very small oil droplets with low-rise velocities. These droplets will be subject to mixing from plume turbulence, wind and breaking waves. Therefore, at the surface, the droplets will tend to remain within the wave-mixed layer of the water column due to their weak buoyancy. This effectively replicates the action of a chemical dispersant thus rendering the use of SSDI unnecessary.	No	Due to the predicted behaviour of a subsea plume from a well blow out, the lack of any safety benefit from its use, and the characteristics of Brunello Condensate, particularly the low residue of 6.9%, the use of subsea dispersant injection would be unwarranted and would unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.
Surface Dispersant Application	Application of surface dispersant would likely reduce the volumes of hydrocarbons in the case that contact with sensitive receptors occurs. It has the potential to remove large volumes of oil from the surface that could cause secondary contamination of wildlife or shorelines. Dispersant can also enhance biodegradation and may reduce VOC emissions therefore reducing potential health and safety risks to responders.	Dispersants are not considered a feasible response technique when applied on thin surface films such as Brunello Condensate as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon thus providing no net benefit. The modelling undertaken predicts that a spill of Brunello Condensate would be prone to rapid spreading and evaporation and thus the application of dispersant would be deemed inappropriate given the high level of natural dispersion. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles due to the rapid evaporation of the spilt condensate.	No	Due to the predicted behaviour of a surface condensate spill coupled with the characteristics of Brunello Condensate, particularly the low residual of 6.9%, and the fact that condensate will rapidly evaporate from the sea surface naturally, the use of surface dispersant application would be unwarranted and would unnecessarily introduce additional chemical substances to the marine environment.
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 Brunello Condensate is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading and evaporation. 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, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.	No	Brunello Condensate characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants and also pose a safety risk due to the presence of high VOC levels.
Shoreline Protection and Deflection	Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to use skimmers effectively.	The modelling undertaken predicts that a spill of Brunello Condensate would be prone to rapid spreading and evaporation, and no shoreline contact at or above threshold levels is predicted. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving towards shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	No	Stochastic modelling confirmed no shoreline contact at or above threshold levels and characteristics of Brunello Condensate are not conducive to shoreline protection and deflection efforts.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Shoreline Clean Up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines. To be optimally effective, a level of 250 g/m² is needed before a realistic shoreline clean-up response can be executed.	The modelling undertaken predicts that a spill of Brunello condensate would be prone to rapid spreading and evaporation, and no shoreline contact at or above response threshold levels is predicted. Additionally, no contact above $1g/m^2$ is predicted at any shoreline receptors. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate hydrocarbons will contact shorelines, however, pre-emptive assessments of sensitive receptors at risk (OM04), shoreline assessments (OM05) and existing TRPs will be utilised, in agreement with WA DoT (for Level 2/3 spills), to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations.	No	Stochastic modelling confirmed no shoreline contact at or above threshold levels.
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 fauna from being contaminated and through rehabilitation of fauna already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a loss of well containment, response options would be limited to hazing to ensure the safety of response personnel. Any rehabilitation can only be undertaken by trained specialists.	Potentially	The modelling undertaken predicts that no sensitive shoreline areas will be impacted at response or impact thresholds thus it is unlikely that this technique would be required. However, if fauna are at risk of contamination, oiled wildlife response will be undertaken as and where needed.

Table 4-4: Response technique evaluation – subsea loss containment (CS-02)

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Brunello Condensate				
Monitor and Evaluate	Will be effective in tracking the location of the spill, informing if/when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons to assess resources at risk – 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 which RPAs have been impacted.	Monitoring of a Brunello Condensate spill is a feasible response technique and is an essential element of all spill response incidents. Outputs will be used to guide decision-making on the use of other monitoring/response techniques and whether the spill passes into State Waters and thus control of the incident moves to WA DoT (if a Level 2/3 event).	Yes	Monitoring and Evaluation is an essential element of oil spill response and will be necessary to: • validate trajectory and weathering models • determine the behaviour of the condensate in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine whether the condensate is dispersing naturally or not • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • determine if/when the spill crosses into State Waters and thus control of the spill passes to WA DoT.
Source Control - Remote Intervention	Following loss of containment, as a result of reduced flow from the Julimar Brunello field arriving at the Wheatstone platform, source control will be effective in isolating/ preventing forward flow from the reservoir by remotely shutting in the wells to the pipeline system, as well as remotely isolating each flowline (Julimar 1, Julimar 2 and Brunello) and isolating the subsea system from the platform inventory by actuating the riser ESDVs. This would effectively limit flow of hydrocarbons through the failed flowline section within minutes from detecting the abnormal condition. Source control actions will be taken from the Wheatstone platform Central Control Room, following established field operating procedures for a controlled field shutdown.	Source control via intervention from the WP Central Control Room is a feasible response technique and required by industry standards.	Yes	Capacity to apply source control reponses via remote intervention is required to achieve compliance with with industry standards. Provides for prevention and/or mitigation of LOC events and Process Safety events (fire, explosions at the platform).

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Containment and Recovery	Containment and recovery has an effective recovery rate of 5 to 10% when a hydrocarbon encounter rate of 25 to 50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability of, extent of, contact with and accumulation of hydrocarbons on shoreline receptors. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by entrained/dissolved hydrocarbons.	Brunello Condensate is prone to rapid spreading and evaporation and does not tend to form emulsions thus reducing the feasibility of containment and recovery as a response technique. In addition, containment and recovery can have low effectiveness with, on average <10% of available oil successfully contained and recovered. The largest operation ever mounted was during the Deepwater Horizon/Macondo which achieved an effectiveness of approximately 3-5%. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles due to the condensates propensity to evaporate.	No	In addition to low effectiveness and potential safety issues from predicted high local concentrations of atmospheric volatiles, the modelling results show that the non-persistent characteristics and fate/trajectory of Brunello Condensate would make containment and recovery an unsuitable response technique. Surface concentrations > 50g/m^2 are confined to the release location and are expected to rapidly entrain making Containment and Recovery operations ineffective.
Subsea Dispersant Application	Application of subsea dispersant can potentially reduce the scale and extent of surface hydrocarbons and reduce the volumes of surface hydrocarbons contacting sensitive areas.	There is a limited window of opportunity in which SSDI can be effectively applied. The short release period (5.2 hours) means that SSDI is not a feasible response technique. Brunello Condensate also rapidly entrains in within the wave-mixed layer of the water column. This effectively replicates the action of a chemical dispersant thus rendering the use of SSDI unnecessary.	No	SSDI application not feasible due to short release period (5.2 hours).
Surface Dispersant Application	Application of surface dispersant would likely reduce the volumes of hydrocarbons in the case that contact with sensitive receptors occurs. It has the potential to remove large volumes of oil from the surface that could cause secondary contamination of wildlife or shorelines. Dispersant can also enhance biodegradation and may reduce VOC emissions therefore reducing potential health and safety risks to responders.	Dispersants are not considered a feasible response technique when applied on thin surface films such as Brunello Condensate as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon thus providing no net benefit. The modelling undertaken predicts that a spill of Brunello Condensate would be prone to rapid spreading and evaporation and thus the application of dispersant would be deemed inappropriate given the high level of natural dispersion. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles due to the rapid evaporation of the spilt condensate.	No	Due to the predicted behaviour of a surface condensate spill coupled with the characteristics of Brunello Condensate, particularly the low residue of 6.9%, and the fact that condensate will rapidly evaporate from the sea surface naturally, the use of surface dispersant application would be unwarranted and would unnecessarily introduce additional chemical substances to the marine environment.
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 Brunello Condensate is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading and evaporation. 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, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.	No	Brunello Condensate characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants and pose a safety risk due to the presence of high VOC levels.
Shoreline Protection and Deflection	Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to use skimmers effectively.	The modelling undertaken predicts that a spill of Brunello Condensate would be prone to rapid spreading and evaporation, and no shoreline contact at or above response or impact threshold levels is predicted. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving towards shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	No	Stochastic modelling confirmed no shoreline contact at or above response threshold levels and characteristics of Brunello Condensate are not conducive to shoreline protection and deflection efforts.
Shoreline Clean up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines. To be optimally effective, a level of 250 g/m² is needed before a realistic shoreline clean-up response can be executed.	The modelling undertaken predicts that a spill of Brunello condensate would be prone to rapid spreading and evaporation, and no shoreline contact at or above response or impact threshold levels is predicted. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate hydrocarbons will contact shorelines, however, pre-emptive assessments of sensitive receptors at risk (OM04), shoreline assessments (OM05) and existing TRPs will be utilised, in agreement with WA DoT (for Level 2/3 spills), to establish the extent and distribution of oiling and thus direct any shoreline clean-up operations.	No	Stochastic modelling confirmed no shoreline contact at or above threshold levels.
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 fauna from being contaminated and through rehabilitation of fauna already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a loss of well containment, response options would be limited to hazing to ensure the safety of response personnel. Any rehabilitation can only be undertaken by trained specialists.	Potentially	The modelling undertaken predicts that no sensitive shorelines will be impacted at response or impact thresholds thus it is unlikely that this technique would be required. However, in the event that fauna are at risk of contamination, oiled wildlife response will be undertaken as and where needed.

Table 4-5: Response technique evaluation – loss of marine diesel fuel (vessel collision) (CS-03)

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Brunello Condensate				
Monitor and Evaluate	Will be effective in tracking the location of the spill, informing if/when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons to assess resources at risk – 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 which RPAs have been impacted.	Monitoring of a Marine Diesel spill is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and whether the spill passes into State Waters and thus control of the incident moves to WA DoT. Techniques 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 and Evaluation is an essential element of oil spill response and will be necessary to: • validate trajectory and weathering models • determine the behaviour of the diesel in the water • determine the location and state of the slick • provide forecasts of spill trajectory • determine whether the diesel is dispersing naturally or not • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • determine if/when the spill crosses into State Waters and thus control of the spill passes to WA DoT.
Source Control	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 is likely to be instantaneous and source control will be limited to what the vessel or facility can safely achieve to prevent further spillage whilst responding to the incident.	Potentially	Ability to stop the spill at source will be dependent upon the specific spill circumstances and vessel configuration, and whether or not it is safe for response personnel to access/isolate the source of the spill.
Containment and Recovery	Containment and recovery has an effective recovery rate of 5 to 10% when a hydrocarbon encounter rate of 25 to 50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability of, extent of, contact with and accumulation of hydrocarbons on shoreline receptors. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by entrained/dissolved hydrocarbons.	Marine diesel is non-persistent, prone to rapid spreading and evaporation, and does not tend to form emulsions thus reducing the feasibility of containment and recovery as a response technique.	No	Containment and recovery would be an inappropriate response technique as it requires the spilled hydrocarbon to be BAOAC 4 or 5 with a 50 to 100% coverage of 100 g/m² to 200 g/m² which a spill of marine diesel would not achieve. In addition, most of the spilled diesel would have been subject to rapid evaporation and natural dispersion prior to the commencement of containment and recovery operations.
Surface Dispersant Application	Dispersants are not considered effective when applied on thin surface films such as marine diesel as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon.	Marine diesel fuel is non-persistent and is prone to rapid spreading and evaporation, thus the use of dispersant would be deemed an unnecessary response technique.	No	The application of dispersant to marine diesel is unnecessary as the diesel will rapidly evaporate and disperse naturally and would thus unnecessarily introduce additional chemicals to the marine environment. Any additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.
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 marine diesel is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading and evaporation. In addition, there is a limited window of opportunity in which this technique can be applied (prior to evaporation of the flammable volatiles) which is unlikely to be achieved. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel.	No	Marine diesel characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants.
Shoreline Protection and Deflection	Shoreline protection and deflection can be effective at preventing contamination of at-risk areas.	Use of shoreline protection and deflection for a spill of marine diesel in the vicinity of the Julimar operations is unlikely to provide any significant environmental benefit as the diesel will be subject to rapid spreading and evaporation prior to contact with any sensitive shoreline areas. Furthermore, the volatile nature of marine diesel 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 the rapid spreading and evaporation of the diesel, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at impact or response thresholds.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Shoreline Clean up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines. To be optimally effective, a level of 250 g/m² is needed before a realistic shoreline clean-up response can be executed.	Use of shoreline clean-up for a spill of marine diesel is unlikely to provide any significant environmental benefit as the diesel will be subject to rapid spreading and evaporation prior to contact with any sensitive shoreline areas. In addition, coverage from marine diesel on a shoreline would not be high enough to allow effective hydrocarbon removal and the volatile nature of marine diesel 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 the rapid spreading and evaporation of marine diesel and lack of optimum coverage thickness for effective clean-up, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at impact or response thresholds.
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 fauna from being contaminated and through rehabilitation of fauna already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a marine diesel spill, response options would be limited to hazing to ensure the safety of response personnel. Any rehabilitation can only be undertaken by trained specialists.	Potentially	The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. However, if fauna are at risk of contamination, oiled wildlife response will be undertaken as and where needed.

4.2.3 Exclusion of response techniques

This section discusses the excluded response techniques for the WCCS in Table 4-3 (CS-01 – loss of well containment).

4.2.3.1 Subsea dispersant injection

While the high discharge velocity and turbulence generated by the release is expected to result in the droplets reaching the surface, due to wind and wave activity droplets are predicted to remain entrained within the wave-mixed layer of the water column (approximately 3 to 10 m deep) where they are likely to remain due to their relative weak buoyancy.

Modelling also indicates it is likely that 6.9% of the hydrocarbon will be highly volatile and 2.4% moderately volatile contributing to the flammable hazard at the surface. It is expected that the extent of the gas cloud will be independent of any SSDI treatment due to the high gas-to-oil ratio of the expected flow stream (INPEX, 2019). As such, the exclusion zone will be governed by the gas boil at the sea surface and resulting gas plume, thus no safety benefit would be realised through the use of SSDI.

Furthermore, due to the predicted behaviour of a surface spill coupled with characteristics of Brunello Condensate, particularly the low residue of 6.9%, the use of subsea dispersant injection would unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.

4.2.3.2 Surface dispersant application

Modelling results for a hydrocarbon release caused by a loss of well containment of Brunello Condensate (CS-01) indicate that surface thresholds for surface dispersant application will not be reached: no surface hydrocarbons above threshold concentration (> 50 g/m^2) are predicted to occur.

Modelling results for a hydrocarbon release caused by subsea loss of containment (CS-02) indicate that while thresholds for surface dispersant application (> 50 g/m^2) are predicted to occur (to a maximum of 3 km for the spill location), the characteristics of Brunello Condensate mean that it will rapidly entrain in the wave mixed layer without the use of dispersants.

The weathering data indicates that thicker surface hydrocarbons are likely to rapidly spread, thin and evaporate leading to concentrations of surface hydrocarbons that are not conducive to effective surface dispersant application. Under these circumstances, dispersant droplets tend to pass through the surface films without binding to the hydrocarbon, thus providing no net benefit.

The ongoing nature of the release combined with the potential for the plume to breach the surface may cause conditions leading to high local concentrations of atmospheric volatiles producing a health and safety risk, thus limiting the ability of a surface dispersant response to safely target fresh Brunello condensate.

Surface application of dispersants is therefore considered ineffective, with no incremental benefit over natural dispersion. It would unnecessarily introduce additional chemical substances to the marine environment and increase exposure of subsea species and habitats to hydrocarbons.

4.2.3.3 Mechanical dispersion

Mechanical dispersion involves the use of a vessel’s propeller wash and/or fire hose to target surface hydrocarbons to encourage 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. This is especially the case for a light oil product such as Brunello Condensate.

4.2.3.4 In-situ burning

This technique requires calm sea state conditions as is required for containment and recovery operations, which limits its feasibility in the region of the Julimar operations. Optimum weather conditions are < 20 knot wind speed and waves < 1 to 1.5 m with oil collected to a minimum 3 mm thick layer. Due to the conditions in the vicinity of the Julimar operations the ability to contain oil is expected to be limited as the sea state may exceed these optimum conditions. It is preferable that oil is fresh and does not emulsify to maximise burn efficiency and reduce residue thickness, which further reduces the feasibility of this response option due to the response timings.

There are health and safety risks for response personnel associated with the containment and subsequent burning of hydrocarbons. It is also suggested that the residue from attempts to burn would sink, thereby posing an additional risk to the environment. The longer-term effects of burn residues on the marine environment are not fully understood and therefore, no assessment of the potential environmental impact can be determined.

Until further operational and environmental information becomes available, Woodside does not consider in-situ burning a viable response option.

4.2.3.5 Containment and recovery

Modelling results for a hydrocarbon release caused by a loss of well containment of Brunello Condensate (CS-01) indicate that surface thresholds required for containment and recovery (> 50 g/m²) will not be reached.

Modelling results for a hydrocarbon subsea loss of containment (CS-02) indicate that although surface thresholds required for containment and recovery (> 50 g/m²) will be reached, the limited extent of the area exceeding this threshold and rapid spreading, thinning and evaporation of Brunello Condensate will render containment and recovery operations ineffective.

In addition, conditions leading to high local concentrations of atmospheric volatiles are expected, producing a health and safety risk. This will limit containment and recovery operations in targeting the higher concentrations of Brunello condensate.

Modelling has confirmed that shoreline accumulation above threshold levels will not occur under any scenario, therefore containment and recovery would not be effective in preventing isolated incidents of shoreline accumulation.

The effectiveness of containment and recovery is predicted to be very low based on the met-ocean conditions in the region, the inherent inefficiency of containment and recovery operations, and the light, volatile nature of the Brunello Condensate.

4.2.3.6 Shoreline protection and deflection

Shoreline surface contact (above thresholds), as a result of a hydrocarbon spill modelling conducted for this petroleum activity program, is not expected to occur. Therefore, shoreline protection and deflection is not considered feasible.

4.2.3.7 Shoreline clean up

Shoreline accumulation (above thresholds), as a result of a hydrocarbon spill modelling conducted for this petroleum activity program is not expected to occur. Therefore, shoreline clean up is not considered feasible.

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. The NEBA can be found in ANNEX A: Net Environmental Benefit Analysis Detailed Outcomes.

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 4-6: Selection and prioritisation of response techniques

Response planning scenario	Key characteristics for response planning (times are minimum times to contact for first receptor and/or shoreline contacted above response threshold)	Monitor and evaluate (ME)	Vessel source control	Feasibility of response techniques									Summary outline of preferred response technique
				Source control – capping stack	Source control – relief well	Source control – remote intervention	Subsea dispersant injection	Surface dispersant injection	Containment and recovery (CAR)	Shoreline protection and deflection (SPD)	Shoreline clean-up	Oiled wildlife response (OWR)	
CS-01 (WCCS) - Hydrocarbon release caused by a loss of well containment (subsea) 55,647 m³ of Brunello condensate over 75 days (residual component of 3825 m³)	No shoreline receptors are predicted to be contacted by floating oil concentrations at any of the assessed thresholds.	Yes Primary Technique	*N/A*	Yes*	Yes Primary Technique	*N/A*	No	No	No	No	No	Potentially	Monitor and evaluate. Initiate capping stack placement. Initiate relief well drilling if topsides intervention not possible/fails. Plan for oiled wildlife response and implement if oiled wildlife is observed.
CS-02 - Hydrocarbon release caused by loss of containment (subsea) 1062 m³ of Brunello Condensate over 5.2 hours (residual component of 73 m³)	No shoreline receptors are predicted to be contacted by floating oil concentrations at any of the assessed thresholds.	Yes Primary Technique	*N/A*	No	No	Yes Primary Technique	No	No	No	No	No	Potentially	Monitor and evaluate. Shutdown and isolation of flowlines by remote valve actuation from Wheatstone Platform Plan for oiled wildlife response and implement if oiled wildlife is observed.
CS-03 - Hydrocarbon release caused by a vessel collision (surface): 250 m³ of marine diesel fuel released instantaneously (residual component of 13 m³)	No shoreline receptors are predicted to be contacted by floating oil concentrations at any of the assessed thresholds.	Yes Primary Technique	Potentially	*N/A*	*N/A*	*N/A*	No	No	No	No	No	Potentially	Monitor and evaluate. Initiate source control if safe and feasible. Plan for oiled wildlife response and implement if oiled wildlife is observed.

** Note: This option would only viable for a loss of well containment of a lower magnitude than the WCCS where the plume radius is around 25 m.*

From the NEBA undertaken on the WCCS (Julimar Operations loss of well containment - CS-01), and additional scenarios of a subsea loss of containment (CS-02) and a loss of diesel fuel through a vessel collision (CS-03) the primary response techniques are:

- Monitor and Evaluate
- Source Control: Capping stack – if loss of containment occurs from well fitted with horizontal Xmas tree and plume radius is around 25 m
- Source Control: Relief well drilling – if topsides intervention to stop the release is not possible or fails.
- Source Control: Remote intervention (well shut in)

Secondary response techniques may be considered based on the monitor and evaluate inputs and field reports. These may include:

- Wildlife Response.

Support functions may include:

- Scientific Monitoring Programmes.

5 HYDROCARBON SPILL ALARP PROCESS

Woodside's hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *Guidance Note GN1488* (2018) and is set out in the 'Woodside Hydrocarbon Spill Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Development Guidelines' (Link).

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. Considers the Response Planning Need identified in terms of surface area (km^2) and available surface hydrocarbon volumes (m^3) against existing Woodside capability
2. Considers 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. Evaluates 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 the 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: Net Environmental Benefit Analysis Detailed Outcomes.

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 for this activity.

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* (Link). The proximity of Exmouth, Onslow and Dampier to the spill event location means that multiple logistical options are available to monitor a spill in relatively short timeframes. The primary mobilisation base for initial monitoring activities would be Dampier. However, in the unlikely event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Exmouth, Onslow and Broome.

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:

- Operational monitoring will be undertaken from the outset of a spill. This is needed to assess the nature of the spill and track its location. The data collected from the operational monitoring will inform the need for any additional operational monitoring, deployment of response techniques and may assist post-spill scientific monitoring. It also informs if/when the spill has entered State Waters and control of the incident passes to WA DoT. Floating surface oil in sufficient concentrations for effective operational monitoring is expected to be limited to approximately 90 km from a diesel spill. However, it should be noted that the modelling used for a Diesel spill is conservative in its application given that the volume for CS-03 (250m^3) is less than the modelled volumes 550m^3 [4]. For a subsea release of Brunello condensate (CS-01 and CS-02), sufficient surface concentrations for operational monitoring are limited to within 24km of the release location.
- Modelling confirmed no shoreline contact above response threshold levels for surface hydrocarbons or accumulated hydrocarbons.
- The time to contact for oil at concentrations of entrained hydrocarbons greater than 100 ppb at shoreline receptors is 99 hours at the Montebello Islands.
- 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.

[4] WCCS loss of Marine Diesel for CS-03 is 250 m^3. Modelled results for CS-03 are highly conservative and based on a 550 m^3 loss from a previous Marine Diesel loss scenario close to the Julimar wells.

- The duration of the spill may extend up to 75 days (relief well execution time) with response operations potentially extending beyond 75 days.

5.1.2 Environmental performance based on need

Table 5-5-2: Environmental performance – Monitor and Evaluate

Environmental Performance Outcome		To gather information from multiple sources to establish an accurate common operating picture (COP) 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**
1	Oil spill trajectory modelling	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 APASA 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 Wheatstone facility and support vessel and ready for deployment 24/7.	1, 3A, 3C, 4
		2.2	Deploy tracking buoy from facility within two hours as per the FSP - deployment from Wheatstone Platform and/or a support vessel if vessel on location.	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 1 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 1.	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 three 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
		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.	

Environmental Performance Outcome		To gather information from multiple sources to establish an accurate common operating picture (COP) 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**
		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 impact predicted by OM01/02/03, and 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 Response Protection Areas (RPAs) and maximise effective utilisation of resources.	1, 3B, 4
7	Shoreline assessment	7.1	10 days prior to any impact predicted by OM01/02/03, and in agreement with WA DoT (for Level 2/3 incidents), deployment of 1 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

The control measures and capability of Woodside and its third-party service providers are shown to support Monitor and Evaluate activities up to and including the identified WCCS. 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 clearly 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. 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 SOPEP

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 WCCS vessel collision event, the vessel master may engage precautionary marine manoeuvres to avoid collision or commence pumping operations to transfer marine diesel 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 EP Section 7.3.

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 Source control and well intervention

The worst-case scenario identified for the petroleum activity program is considered to be a loss of well containment from the BRUA-2 well (CS-01). This well has a vertical Xmas tree upon which a capping stack cannot be used. Furthermore, major damage to or complete loss of the Xmas tree from a producing well would result in there being no infrastructure upon which to land the capping stack and secure it for well control operations. The primary response would therefore be relief well drilling for wells with a vertical Xmas tree. The Julimar field is comprised of both vertical and horizontal Xmas trees. In the case of a well loss of containment from a horizontal Xmas tree, the placement of a capping stack is a potential intervention method.

The Woodside Source Control Response Procedure includes the process for the IMT to mobilise resources for Subsea First Response Toolkit (SFRT) support, and capping support. This plan has pre-identified vessel specifications and contracts required for SFRT debris clearance work and Woodside continually monitors the availability and location of these vessels.

Woodside is a signatory to the APPEA Memorandum of Understanding (MOU) between Australian offshore operators to provide mutual aid to facilitate and expedite mobilising a mobile offshore drilling unit (MODU) and drilling a relief well, if a loss of well containment incident were to occur. The MOU commits the signatories to share rigs, equipment, personnel and services to assist another operator in need. Dynamically positioned and most jack up rigs are not suitable for Julimar water depth, therefore a moored MODU would be required.

Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. Circumstances that limit the safe execution of this control measure include lower explosive limit concentrations, volatile concentrations of hydrocarbons in the atmosphere, weather window, waves and/or sea states (> 1.5 m waves) and high ambient temperatures.

5.3.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Prior to any source control activities, Woodside will implement protocols to ensure that the site is safe including subsea ROV surveys and surface air monitoring.
- Hydrocarbons will flow from the well until interventions can be made, either:
  - closure of the Tubing Retrievable Safety Valve (TRSV)
  - a relief well is drilled and first attempt at well kill within 75 days.
- 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.
- The duration of the spill may extend up to 75 days with monitor and evaluate response operations potentially extending beyond 75 days. In addition, a number of assumptions are required to estimate the response need for source control. These assumptions have been described in Table 5-3.

Table 5-3: Response planning assumptions – source control

Response planning assumptions	
Capping Stack	Woodside commissioned an independent study on the feasibility of using a capping stack for the Petroleum Activities Program (Wild Well Control, 2019). Wild Well Control (WWC) has analysed the plume and reported that with the WCCS (CS-01), surface gas boil could extend up to 90 m from the well centre; hence, conventional vertical deployment is not feasible based on safety. The model was based on a current speed of 0.2 m/s and a wind speed of 3.0 m/s to 6.5 m/s to present the worst-case scenario. Various options for safe and effective deployment of a capping stack in these conditions were assessed but due to the complex nature of implementation or inability to implement some were deemed as not ALARP. These are detailed in Section 6.2.8.1. The WCCS modelled during the Drilling and Completions phase was significantly greater in magnitude than the WCCS (CS-01) in the Julimar Operations phase and thus a Capping Stack option is retained should the surface gas boil be sufficiently small to deploy a Capping Stack.
Safety considerations	Source control 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, in accordance with the Woodside Management System (WMS). Personnel safety issues may include: • hydrocarbon gas and/or liquid exposure • high winds, waves and/or sea states • high ambient temperatures.
Feasibility considerations	Woodside's primary source control option would be ROV intervention followed by relief well drilling for the Julimar wells. The following approaches outline Woodside's hierarchy for relief well drilling; • Primary relief well – review internal drilling programs and MODU availability to source an appropriate MODU operating within Australia with an approved Safety Case. • Alternate relief well – source and contract a MODU through APPEA MOU that is operating within Australia with an approved Safety Case. • Contingency relief well – if required, source and contract a MODU outside Australia with an approved Australian Safety Case.

5.3.2 Environmental performance based on need

Table 5-4: Environmental performance – source control

Environmental Performance Outcome		To stop the flow of hydrocarbons into the marine environment		
Control measure		**Performance Standard**		**Measurement Criteria**
8	Well intervention	8.1	Frame agreements with ROV providers in place to be mobilised upon notification. ROV equipment deployed within seven days.	1, 3B, 3C
		8.2	Frame agreements for ISVs require vessels to maintain/enforce regulatory approvals and provide support in the event of an emergency.	
		8.3	Source Control vessel will have the following minimum specifications: • active heave compensated crane, rated to at least 150 T in shallow water and 250 T in deeper water • at least 90 m in length • deck has water/electricity supply • deck capacity to hold at least 110 T of capping stack.	
		8.4	Identify source control vessel availability within 24 hours and begin contracting process. Vessel mobilised to site for deployment within 16 days for conventional capping (if loss of well containment occurs on horizontal xmas tree).	
		8.5	ROV available on MODU ready for deployment within 48 hours to attempt initial BOP well intervention.	
		8.6	Well intervention attempt made using ROV and SFRT within 11 days.	
		8.7	Capping stack on suitable vessel mobilised to site within 16 days. Deployment and well intervention attempt will be made once plume size is acceptable and safety and metocean conditions are suitable.	1, 3C
		8.8	Wild Well Control Inc (WWCI) staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the Capping Stack and Well intervention equipment.	1, 3B, 3C
		8.9	MODU mobilised to location for relief well drilling within 21 days.	1, 3C
		8.10	First well kill attempt within 75 days.	1, 3B, 3C
		8.11	Open communication line(s) to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
		8.12	Relief well peer review undertaken during well design which includes screening and identification of suitable MODU(s) with in-force Australian safety cases for relief well drilling.	1, 3C
		8.13	Monthly monitoring of the availability of MODUs through existing market intelligence including current Safety Case history, to meet specifications for source control. Titleholders of suitable MODUs notified.	3C
		8.14	At least two communication methods, one of which will include the capability to communicate with aviation.	1, 3A
		8.15	Prior to entering the reservoir, reconfirm that pre-identified/screened MODU(s) remain available for relief well drilling and engage titleholder.	1, 3C
9	Subsea First Response Toolkit (SFRT)	9.1	Oceaneering support staff available all year round, via contract, to assist with the mobilization, deployment, and operation of the SFRT equipment.	1, 3B, 3C

Environmental Performance Outcome		To stop the flow of hydrocarbons into the marine environment		
Control measure		**Performance Standard**		**Measurement Criteria**
		9.2	Intervention vessel with minimum requirement of a working class ROV and operator.	1, 3C
		9.3	Mobilised to site for deployment within 11 days.	1, 3B, 3C
		9.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
10	Support vessels	10.1	At least two communication methods, one of which will include the capability to communicate with aviation.	1, 3A
		10.2	Monthly monitoring of the availability of larger vessels through existing Frame Agreements and market intelligence to meet specifications for source control.	3C
		10.3	Frame agreements for installation support vessels (ISVs) require vessels to maintain in-force safety case approvals covering ROV operations and provide support in the event of an emergency.	1, 3B, 3C
		10.4	MODU and vessel contracts include clause outlining requirement for support in the event of an emergency	1, 3C
		10.5	Monthly monitoring of Registered Operators and Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for Safety Case guidance.	1, 3B, 3C
11	Safety Case	11.1	Woodside will prioritize MODU or vessel(s) for intervention work(s) that have an existing safety case.	1, 3C
		11.2	Woodside Planning, Logistics, and Safety Officers (on roster/Call 24/7) to assist in expediting the safety case assessment process as far as practicable.	1, 3C
		11.3	MODU and vessel contracts include clause outlining requirement for support in the event of an emergency.	1, 3C
		11.4	Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for safety case guidance.	
		11.5	Wheatstone Production Operations Safety Case includes inspection, maintenance and repair to allow for ROV inspection.	

The resulting source control capability has been assessed against the WCCS. The range of techniques provide a feasible and viable approach to relief well drilling operations to stop the well flowing.

- 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 insignificant environmental benefit gained and/or not reasonably practicable for this PAP.
- 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 6.2.
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as additional, alternative and improved control measures.

5.4 Oiled wildlife response (including hazing)

Woodside would implement a response in accordance with the *Oiled Wildlife Operational Plan* (Link). 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 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* (WA).

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 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 Exmouth and Dampier. 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 that no shoreline contact above thresholds will occur.
- The offshore location of the release site is expected to initially result in low numbers of at-risk or impacted wildlife.
- It is estimated that an oiled wildlife response would be between Level 1 and 4, as defined in the WA OWRP.

Table 5-5: Key at-risk species potentially in open ocean waters

Species	Open ocean
Marine turtles (including foraging and inter-nesting areas and significant nesting beaches)	✓
Whale sharks	✓
Seabirds and/or migratory shorebirds	✓
Cetaceans – migratory whales	✓
Cetaceans – dolphins and porpoises	✓
Dugongs	
Sharks and rays	✓

The oiled wildlife response technique targets key wildlife populations at risk within Commonwealth open waters and the nearshore waters as described in Section 4 of the EP. 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 Exmouth and Dampier have been identified in the draft Regional 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 are observed on water or transiting near or within the spill area, observations would be recorded through surveillance records.

Staging sites would be established as forward bases for 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 Exmouth and 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 DBCA and use the capability outlined in the WA OWRP, with additional capability if required (e.g. volunteers) accessible through Woodside's *People and Global Capability Surge Labour Requirement Plan* (Woodside doc. W0000AH9420020).

The WA OWRP provides indicative oiled wildlife response levels (below) 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/day < 5 total	None	None	None	None	None
Level 2	26	> 4 to 14 days	1 to 5/day < 20 total	None	< 20 hatchlings No juv/adults	None	None	None
Level 3	59	> 4 to 14 days	5 to 10/day	1 to 5/day < 10 total	< 5 juv/adults < 50 hatchlings	None	< 5	None
Level 4	77	> 4 to 14 days	5 to 10/day < 200 total	5 to 10/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/day > 200 total	10 to 50/day	> 20 juv/adults > 500 hatchlings	< 5 dolphins	> 50	Dugongs oiled
Level 6	122	> 4 to 14 days	> 100/day	10 to 50/day	> 20 juv/adults > 500 hatchlings	> 5 dolphins	> 50	Dugongs oiled

5.4.2 Environmental performance based on need

Table 5-8: 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* (WA).		
Control measure		**Performance Standard**		**Measurement Criteria**
12	Wildlife response equipment	12.1	Contracted capability to treat 100 individual fauna for immediate mobilisation	1, 3A, 3B, 3C, 4
		12.2	Contracted capability to treat up to an additional 250 individual fauna within a five-day period.	
		12.3	National plan access to additional resources under the guidance of the DoT (up to a Level 3 oiled wildlife response as specified in the OWRP), with the ability to treat about 600 individual fauna by the time hydrocarbons contact the shoreline.	1, 3C, 4
		12.4	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
		12.5	Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WAOWRP.	1, 3A, 4
13	Wildlife responders	13.1	Two wildlife divisional commanders to lead the oiled wildlife operations who have completed an Oiled Wildlife Response Management course	1, 2, 3B
		13.2	Wildlife responders to be accessed through resource pool and additional agreements with specialist providers	1, 2, 3A, 3B, 3C, 4
		13.3	Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan.	1
		13.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s)	1, 3A, 3B

The resulting wildlife response capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to response at identified RPAs.

Under optimal conditions, during the subsea or 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 approximately two wildlife collection teams by Week one for an open ocean response.
- Mobilisation and deployment of one central wildlife treatment and rehabilitation locations at Exmouth and Dampier in accordance with WA OWRP.

Wildlife collection operations are not predicted to be required based on modelling results indicating that no shoreline contact at threshold levels will occur. In the event of a spill, one oiled wildlife response team will maintain contact with personnel managing the Monitor and Evaluate response. The oiled wildlife response team will remain on standby for mobilisation and deployment in the event that oiled wildlife are observed.

Woodside would establish a wildlife collection point at the response location for identified oiled wildlife collection and sorting. From these locations, recovered wildlife would be transported to a central treatment location at Exmouth or Dampier.

5.5 Scientific monitoring

A scientific monitoring program (SMP) would be activated following a Level 2 or 3 unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) for the entire predicted EMBA and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the credible spill scenario(s) or other identified unplanned hydrocarbon releases associated with the Petroleum Activities Program (PAP) (refer to Table 2-1 PAP credible spill scenarios and Table 4-1 WCCS).

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 social-cultural EMBA based on exceedance of environmental and social-cultural hydrocarbon threshold concentrations (refer to Table 2-2, Section 2.3.1.1 and see Section 4 and 6 of the EP for further information on applicable thresholds and the EMBAs). The Petroleum Activities Program loss of well containment scenario (CS-01) has been modelled and considered to determine the WCCS for the SMP planning purposes and is 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 (RPAs) 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 5.1 Monitor and Evaluate) for the operational monitoring overview.

Key objectives of the Woodside oil spill scientific monitoring program 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 physical-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. 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 for the WCCS (CS-01) and therefore represents the largest spatial boundaries of all 100 CS-01 oil spill combinations, and not the spatial extent of a single CS-01 spill.

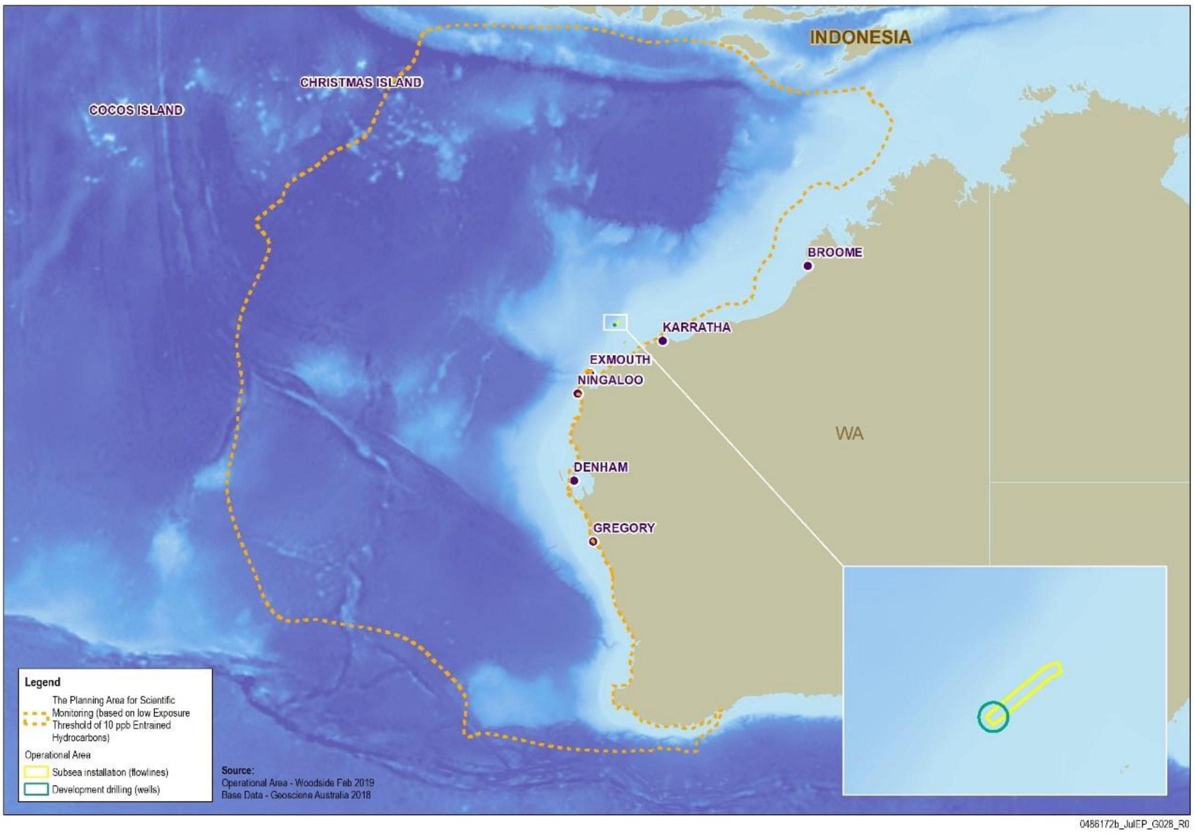


Figure 5-1: The planning area for scientific monitoring based on the area potentially contacted by the low (below ecological impact) entrained hydrocarbon threshold of 10 ppb in the event of the credible spill scenario (CS-01).

NOTE: 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 for CS-01 and therefore represents the largest spatial boundaries of 100 CS-01 oil spill combinations, and not the spatial extent of a single CS-01 spill.**

5.5.1 Scientific monitoring deployment considerations

Scientific Monitoring Deployment Considerations	
Existing baseline studies for sensitive receptor locations predicted to be affected by a spill	Pre-emptive Baseline Areas (PBAs) of the following two categories: • PBAs within the predicted < 10-day hydrocarbon contact time prediction: The approach is to conduct a desktop review of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within ten days of a spill and look to conduct baseline data collection to address data gaps and demonstrate spill response preparedness. Planning for baseline data acquisition is typically commenced pre-PAP and execution of studies undertaken with consideration of weather, receptor type, seasonality and temporal assessment requirements. • PBAs > 10 days' time to predicted hydrocarbon contact in the event of an unplanned hydrocarbon release (as documented in ANNEX C: Oil Spill Scientific Monitoring Program). SMP activation (as per the Julimar Operations First Strike Plan) directs the SMP team to follow the steps outlined in the SMP Operational Plan (Link). The steps include: checking the availability and type of existing baseline data, with particular reference to any Pre-emptive Baseline Areas (PBAs) identified as >10 days to hydrocarbon contact. 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: Oil Spill Scientific Monitoring Program).
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 (Link).
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.

5.5.2 Response planning assumptions

Response Planning Assumptions	
Pre-emptive Baseline Areas (PBAs)	Pre-emptive Baseline Areas (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 exist or 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 Julimar operations. Pre-emptive Baseline Areas for the Julimar Operations facility are identified and listed in ANNEX D: Monitoring Program and Baseline Studies for the Petroleum Activities Program, 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 (refer to ANNEX D) with potential to be contacted by entrained hydrocarbons at or above environmental thresholds within ≤ 10 days, relating to the WCCS MEE-01 (loss of well control) for the Julimar Operations has identified the following: • Montebello AMP • Montebello State Marine Park • Rankin Bank[5] All the Australian Marine Parks (AMPs) are located in offshore waters where hydrocarbon exposure is possible on surface waters and in the water column.

[5] Floating oil will not accumulate on submerged features and at open ocean locations, therefore, no surface contact is possible with only entrained hydrocarbon contact predicted at Rankin Bank and Glomar Shoals within ≤ 10 or > 10 days, respectively.

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 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: Monitoring Program and Baseline Studies for the Petroleum Activities Program, based on the PAP credible spill scenario(s) (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: • Barrow Island 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. 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 (Link). In the event key receptors within geographic locations that are potentially impacted after 10 days following a spill event or commencement of the spill and where adequate and appropriate baseline data is 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 Julimar Operations, priority would be focused on Barrow Island and potentially the offshore island groups of the Montebello and Lowendal 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. 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 WCCS CS-01 is presented Section 2.3.1. The key receptors at risk by location and corresponding SMPs based on the EMBA for the PAP are presented in ANNEX D, Table D1. This matrix maps the receptors at risk with their location and the applicable SMPs that may be triggered in the event of a Level 2 or 3 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 of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA)[6] (refer to ANNEX C: Oil Spill Scientific Monitoring Program).

5.5.3 Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP credible spill scenario. The range of techniques 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 SMP's main objectives can be met, with no additional, alternative or improved control measures providing further benefit.

[6] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

5.5.4 Response planning: need, capability and gap – scientific monitoring

The receptor locations identified in ANNEX D: Monitoring Program and Baseline Studies for the Petroleum Activities Program provide the basis of the SMPs likely to be selected and activated. Once the Woodside SMP Delivery team and the SMP standby 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 (Link).

Scope of SMP Operations in the event of a hydrocarbon spill:

Receptor locations of interest for the SMP during the response phase are:

- Barrow Island
- Montebello and Lowendal Islands
- Muiron Islands
- Ningaloo Coast.

Documented baseline studies are available for certain receptor locations including Rankin Bank and Montebello Islands (ANNEX D: Monitoring Program and Baseline Studies for the Petroleum Activities Program, Table D-2). The SMP technique; however, would still deploy SMP teams to maximise the opportunity to collect pre-emptive data at sensitive receptor locations, potentially locations such as the Muiron Islands and sections of the Ningaloo Coast not immediately exposed to hydrocarbons. 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 prioritised to obtain pre-emptive baseline data.

The ALARP assessment for the SMP (Section 6.4) considers alternate, additional, and/or improved control measures on each selected response technique.

5.5.5 Environmental performance based on need

Table 5-9: Scientific monitoring

<table>
<tr><th colspan="2">Environmental Performance Outcome</th><th colspan="3">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</th></tr>
<tr><th colspan="2">Control measure</th><th>Performance Standard</th><th colspan="2">Measurement Criteria</th></tr>
<tr><td>14</td><td>• Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the HSEQ Function.</td><td>14.1</td><td>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</td><td>• 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.</td></tr>
<tr><td>15</td><td>• Woodside has a SMP standby contractor to provide scientific personnel to resource a base capability of one team per SMP (SM01 to SM10, see ANNEX C: Oil Spill Scientific Monitoring Program, Table C-2) as detailed in Woodside's SMP standby contractor Implementation Plan (Link), 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 (Link)).
• 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.</td><td>15.1</td><td>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 (Link), as detailed within the SMP Implementation Plan (Link).
• 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.</td><td>• OSPU Internal Control Environment (Link) tracks the quarterly review of the Oil Spill Contracts Master (Link).
• SMP resource report of personnel availability provided by SMP contractor on monthly basis (SMP resourcing report register (Link)).
• Training materials.
• Training attendance registers.
• Competency criteria for SMP roles.
• SMP annual arrangement testing and reporting.</td></tr>
<tr><td>16</td><td>• Roles and responsibilities for SMP implementation are captured in ANNEX C: Oil Spill Scientific Monitoring Program (Table C-1) and the SMP team (as per the organisational structure of the ICC) is outlined in SMP Operational Plan (Link). 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 (standby SMP contractor) and linkage to the ICC is presented in ANNEX C: Oil Spill Scientific Monitoring Program, Figure C-1.
• Woodside has a defined Command, Control and Coordination structure for Incident and Emergency Management that is based on the AIIMS framework utilised in Australia.
• Woodside utilises an online Incident Management Information System (IMIS) 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 Plan
• Step by step process to activation of individual SMPs provided in the SMP Operational Plan (Link)
• All decisions made regarding SMP logged in the online IMIS (SMP team members trained in using Woodside's online Incident Management System)
• SMP component input to the ICC Incident Action Plan (IAP) as per the identified ICC timed sessions and the SMP IAP logged on the online IMIS.
• Woodside Environmental Science Team provide awareness training on the activation and standup 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 standup of the Scientific Monitoring Programme (SMP) for the SMP standby provider.
• Woodside Environmental Science Team co-ordinates an annual SMP arrangement testing exercise which the SMP standby contractor. SMP team participates in since 2016 (report on 2016 SMP simulation (Link)) and SMP standby contractor the SMP arrangements (people and equipment availability) tested annually since 2016 (Link).</td><td>16.1</td><td>• Woodside has established an SMP organisational structure and processes to stand up and deliver the SMP.</td><td>• SMP Oil Spill Scientific Monitoring Operational Plan (Link).
• SMP Implementation Plan (Link).
• SMP annual arrangement testing and reporting.</td></tr>
</table>

<table>
<tr><th colspan="2">Environmental Performance Outcome</th><td colspan="3">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</td></tr>
<tr><th colspan="2">Control measure</th><th>Performance Standard</th><th colspan="2">Measurement Criteria</th></tr>
<tr><td>17</td><td>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: Oil Spill Scientific Monitoring Program, 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: Oil Spill Scientific Monitoring Program, Table C-2)). Equipment would be sourced through the existing SMP standby contract with SMP standby 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. SMP standby contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with one marine sampling equipment companies and one analytical laboratory (SMP resourcing report register (Link)).
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.</td><td>17.1</td><td>Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 to SM10 (except desktop based SM08):
Equipment is sourced through the existing standby contract with SMP standby contractor (Link), as detailed within the SMP Implementation Plan (Link).</td><td>OSPU Internal Control Environment (Link) tracks the quarterly review of the Oil Spill Contracts Master (Link).
SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register (Link)).
SMP annual arrangement testing and reporting.</td></tr>
<tr><td>18</td><td>Woodside's SMP approach addresses the pre-PAP acquisition of baseline data for Pre-emptive Baseline Areas (PBAs) with ≤ 10 days if required following a baseline gap analysis process.
Woodside maintains knowledge of Environmental Baseline data through:
Documentation of annual reviews of the Woodside Baseline Environmental Studies Database (Link), and any specific activity baseline gap analyses.
Accessing external databases such as the Department of of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA) (refer to ANNEX C: Oil Spill Scientific Monitoring Program.</td><td>18.1</td><td>Annual reviews of environmental baseline data.
PAP specific Pre-emptive Baseline Area baseline gap analysis.</td><td>Annual review/update of Woodside Baseline Environmental Studies Database (Link).
Desktop review to assess the environmental baseline study gaps completed prior to EP submission.
Accessing baseline knowledge via the SMP annual arrangement testing.</td></tr>
<tr><th colspan="2">Environmental Performance Outcome</th><td colspan="3">SMP plan to acquire response phase monitoring targeting pre-emptive baseline data achieved</td></tr>
<tr><th colspan="2">Control measure</th><th>Performance Standard</th><th colspan="2">Measurement Criteria</th></tr>
<tr><td>19</td><td>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.</td><td>19.1</td><td>Pre-emptive Baseline Area (PBA) baseline data acquisition in the response phase
If baseline data gaps are identified for PBAs predicted to have hydrocarbon contact in > 10 days, there will be a response phase effort to collect baseline data. Priority in implementing SMPs will be 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.</td><td>Response SMP plan.
Woodside's online Incident Management System Records.
SMP component of the Incident Action Plan.</td></tr>
</table>

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**	
		19.2	**Post Spill contact** For the receptors contacted by the spill where baseline data is 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. • Incident Action Plans (IAPs).
Environmental Performance Outcome		Implementation of the SMP (response and post-response phases)		
Control measure		**Performance Standard**		**Measurement Criteria**
20	• Scientific monitoring will address quantitative assessment of environmental impacts of a level 2 or 3 spill or any release event with the potential to contact sensitive environmental receptors. The SMP comprises ten targeted environmental monitoring programs. • SMP supporting documentation: 1. Oil Spill Scientific Monitoring Operational Plan (Link); (2) SMP Implementation Plan (CRN: W0000AH9756594 Link) and (3) SMP Process and Methodologies Guideline (Link). • The Oil Spill Scientific Monitoring Operational Plan (Link) 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 (Link). Monthly resourcing report are issued by the SMP standby contractor (SMP resourcing report register (Link)). All SMP documents and their status are tracked via SMP document register (Link).	20.1	Implementation of SM01 SM01 will be implemented to assess the presence, quantity and character of hydrocarbons in marine waters during the spill event in nearshore areas	Evidence SM01 has 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.
		20.2	**Implementation of SM02-SM10** SM02-SM10 will be implemented in accordance with the objectives and activation triggers as per ANNEX C: Oil Spill Scientific Monitoring Program, 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.
		20.3	**Termination of SMP plans** The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMP's detailed in ANNEX C: Oil Spill Scientific Monitoring Program, Table C-2, and the Termination Criteria Decision-tree for Oil Spill Environmental Monitoring (ANNEX C: Oil Spill Scientific Monitoring Program, Figure C-3)	Evidence of Termination Criteria triggered: • Documentation and approval by relevant stakeholders to end SMPs for specific receptor types.

5.6 Incident management system

The Incident Management System (IMS) 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.

5.6.1 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 incident action plan (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.

5.6.2 Operational NEBA process

In the event of a response, Woodside will confirm that 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. The process also 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 the resonse and the 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 a net environmental benefit to continue response operations.

5.6.3 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.

5.6.4 Environmental performance based on need

Table 5-10: 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**
21	Operational NEBA	21.1	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
		21.2	Record the evidence and justification for any deviation from the planned response activities.	
		21.3	Record the information and data from operational and scientific monitoring activities used to inform the NEBA.	
22	Stakeholder engagement	22.1	Prompt and record that all notifications (including government notifications) for stakeholders in the region are made.	
		22.2	In the event of a response, identification of relevant stakeholders will be re-assessed throughout the response period.	
		22.3	Undertake communications in accordance with: • Woodside Crisis Management Functional Support Team Guideline – Reputation (Link) • External Communication Operating Standard (Link) • External Stakeholder Engagement Operating Standard (Link)	
23	Personnel required to support any response	23.1	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
		23.2	A duty roster (Link) of trained and competent people will be maintained to ensure that minimum manning requirements are met all year round.	3C
		23.3	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
		23.4	Collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an Incident Action Plan (IAP) and assist with the execution of that plan.	
		23.5	S&EM advisors will be integrated into ICC to monitor performance of all functional roles.	

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**
	23.6	Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role.	
	23.7	Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed.	1, 2, 3A, 4
	23.8	Contribute to Woodside's response in accordance with the aims and objectives set by the Duty Manager.	1, 2, 3B, 3C, 4

5.7 Measurement criteria for all response techniques

Woodside ensures compliance with environmental performance outcomes and standards through four primary mechanisms. The aforementioned performance tables 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 (IMS supports the implementation of the Emergency and 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 and 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 Incident Action Plan (IAP) process formally documents and communicated 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/close outs) 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
- Oil Spill Response Limited (OSRL)
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce.

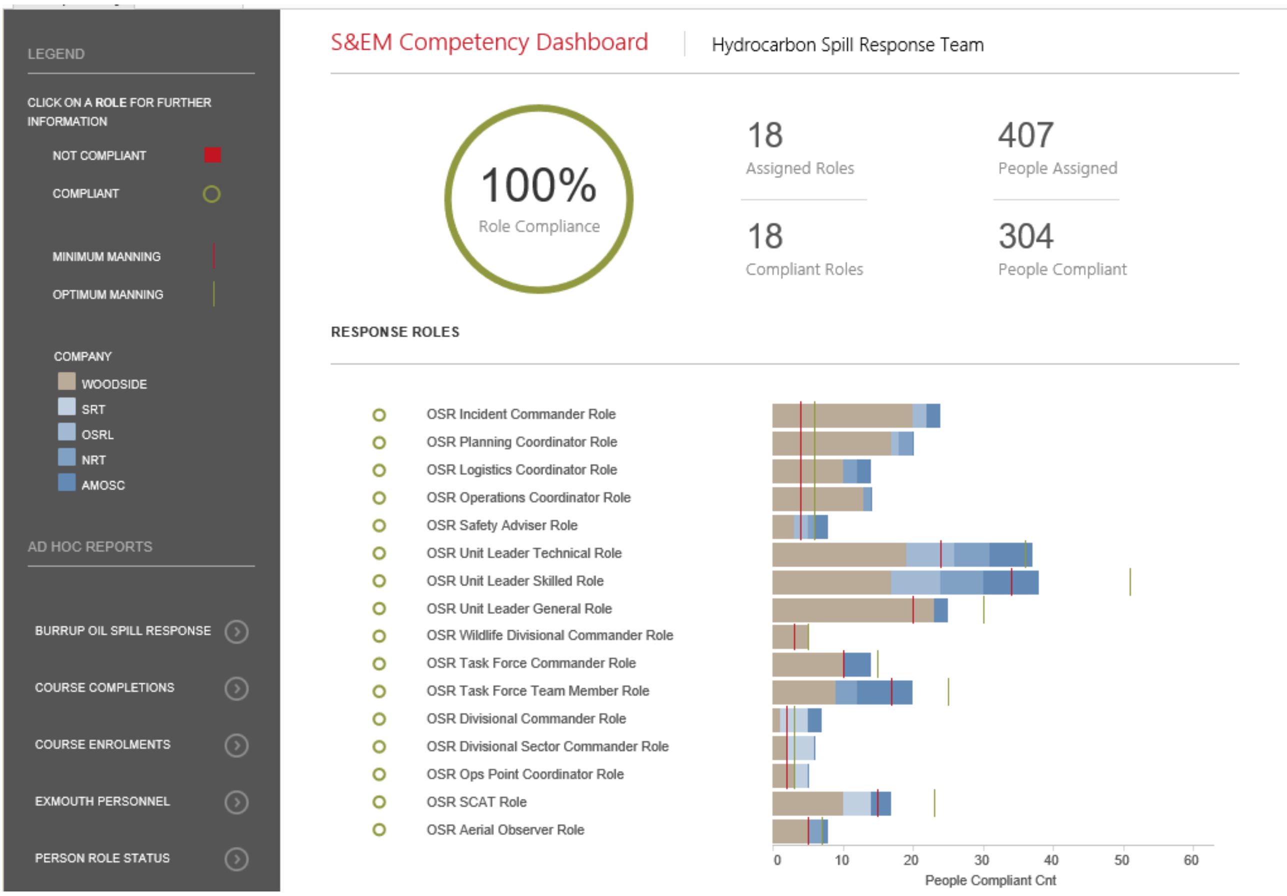
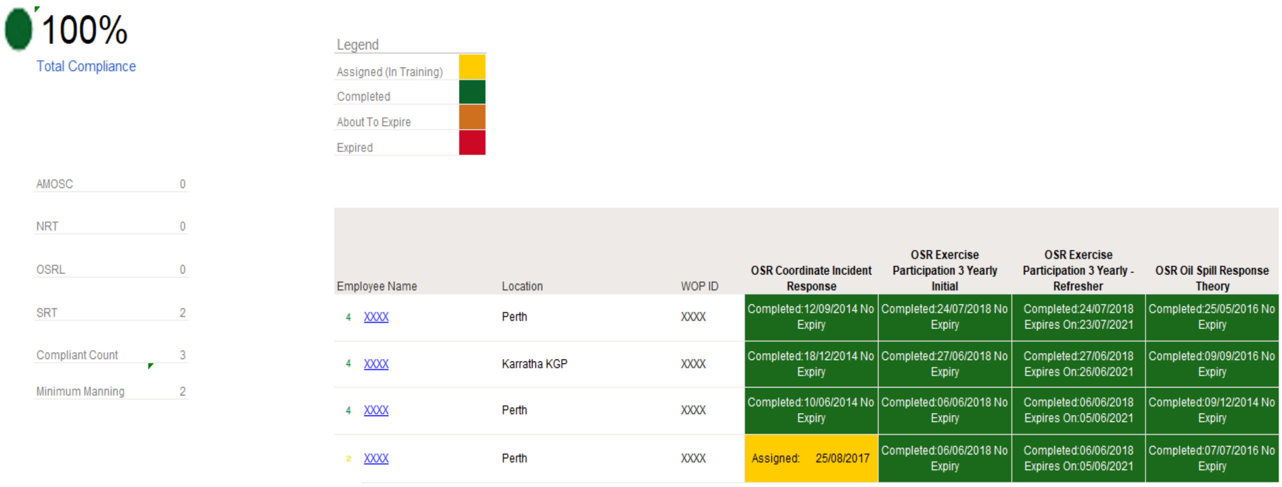


Figure 5-2: Example screen shot of the HSP competency dashboard

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.



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 plans, operational plans, support plans and tactical response plans) 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[7] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CICC duty roster.
4. **Compliance and 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 and Compliance System (WiRCs) and subject to the requirements of Woodside's Provide Assurance Procedure.

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

[7] 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.

- 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 Monitor and evaluate – control measure options analysis

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**	**Approx. 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.	Purchase cost per system approx. $300,000.	This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation.	No
Alternate analysis technologies and methods such as gravimetric, colorimetric, infra-red and UV absorption for OM03.	Due to time, limitations on sampling, equipment, methodology and analysis, the technique does not provide an environmental benefit compared to alternative available technologies.	• Gravimetric (Involves lab analysis so cannot be done on location, maybe completed with field samples in laboratory), • Colorimetric (requires chemical addition and catalysts no standard method, needs specialist training), • Infra-red (droplet size too small for infra-red analysis). • Hydrocarbons need to be extracted from water for test, therefore requires a laboratory test), and • UV absorption (Similar technology to fluorometers which are more widely available in Australia) were evaluated but all have limitations that do not improve the environmental benefit.	NA	This strategy is not considered feasible, therefore no further ALARP assessment is conducted.	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**	**Approx. Cost**	**Assessment Conclusions**	**Implemented**
Additional personnel trained to use systems for OM01.	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. $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 will be on location at manned facility, additional needs are met from Woodside owned stocks in King Bay Supply Facility (KBSF) and Exmouth or can be provided by service provider in a timely manner.	Cost for an additional satellite tracking buoy would be $200 per day or $6,000 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.	Current capability meets need. WEL 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.	Current capability meets need. WEL has 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 & guidelines ensure all aircraft crews are competent for their roles. WEL 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 $2,000 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

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.

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**	**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 $50,000 for 24-hour access plus an initial $5,000 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 no visual cross reference verification is possible 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 gained, as images from sensors (IR, UV, etc). will be low quality. Flight time limitations will be adhered to.	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
Faster mobilisation time (for water quality monitoring).	Due to the restriction on accessing the spill location on Day 1 there is no environmental benefit in having vessels available from day 1. The cost of having dedicated equipment and personnel is disproportionate to the environmental benefit. The availability of vessels and personnel meets the response need.	Operations are not feasible on day 1 as the hydrocarbon will take time to surface, and volatility has potential to cause health and safety concerns within the first 24 hours of the response. Current Woodside arrangements allow for water quality monitoring to commence by day 3. Shortening the timeframes for vessel availability would require dedicated response vessels on standby in KBSF and would accelerate the initiation of monitoring by 1 day.	Cost for purchase of equipment approx. $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. $1 million 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 - ALARP assessment

Woodside has based its response planning on the worst-case credible scenario (as described in Section 2.2). This includes the following selection of source control and well intervention techniques which would be conducted concurrently:

- Vessel SOPEP
- ROV intervention
- debris clearance and/or removal
- capping stack (only viable for a loss of well containment of a lower magnitude than the worst case credible scenario where the plume radius is ~25 m and for horizontal Xmas trees)
- relief well drilling.

6.2.1 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.

6.2.1.1 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 PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.2.2 ROV intervention

Following confirmation of an emergency event, Woodside would mobilise inspection class ROVs through existing frame agreements. It is not expected that any additional regulatory approvals would be required as inspection, maintenance and repair is within the scope of activities for the Julimar Operations Safety Case as well as the scope of activities for contracted Frame Agreement vessels.

As Woodside holds Frame Agreements for vessels along with contracts for ROV providers and pilots, inspection activities using ROVs are expected to commence within seven days.

Table 6-1: ROV timings

	Estimate ROV inspection duration for Julimar Operations Wells (days)
Source and mobilise vessel and with work class ROV	2 days
Liaise with Regulator regarding risks and impacts*	4 days
Undertake ROV Inspection	1 day
Total	**7 days***

** Based on timings from the Report into the Montara Commission of Enquiry, submission and discussion of revised documentation for limited activities inside the Petroleum Safety Zone (water deluge operations) to manage personnel risks and impacts was up to 20 days.*

6.2.2.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661, 2016), confirming that vessels conducting subsea intervention operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements to be in place.

In the event of an emergency, Woodside has access to suitable vessels (infield support vessels (ISVs)) for well intervention through existing frame agreements. The frame agreements for ISV vessels require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for intervention operations such as subsea manifold installation, maintenance and repair, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario from those presented in Table 6-4 for implementing this response would be “no safety case revision required”. Timeframes for well intervention are detailed in Table 6-2 and would be implemented concurrently to the actions required by the “no Safety Case” revision scenario detailed in Figure 6-2, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

6.2.3 Debris clearance and/or removal

The Woodside Source Control Response Procedure details the mobilisation and resource requirements for implementing this strategy. Debris clearance may be required as a prerequisite to deployment of the capping stack. The AMOSC SFRT would be mobilised from Fremantle. The mobilisation of the SFRT would take place in parallel with mobilisation of the capping stack to ensure initial ROV surveys and debris clearance have commenced before the arrival of the capping stack. The SFRT comprises ROV-deployed cutters and tools that are used to remove damaged or redundant items from the wellhead and allow improved access to the well. The SFRT can be mobilised and deployed with well intervention attempted within 11 days.

6.2.3.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661, 2016) and can confirm that vessels conducting debris clearance and removal operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements in place. In the event of an emergency, Woodside has access to suitable ISVs for these operations through existing frame agreements. The frame agreements for ISVs require the vessels to maintain in-force safety case approval covering a range of subsea activities. This would cover the requirement for debris clearance and removal operations and ROV operations. With frame agreements in place, the credible Safety Case Scenario, from those presented in Figure 6-2 for implementing this response would be “no safety case revision required”. Timeframes for debris clearance and removal equipment deployment are detailed in Figure 6-1 and would be implemented concurrently to the actions required by the “No Safety Case” revision scenario detailed in Figure 6-2, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

6.2.4 Capping stack

The Woodside Source Control Response Procedure details the mobilisation and resource requirements for implementing this strategy. A capping stack is designed to be installed on a subsea well and provides a temporary means of sealing the well, until a permanent well kill can be performed through either a relief well or well re-entry.

The BRUA-2 well on which the WCCS loss of well containment (CS-01) is based is fitted with a vertical Xmas tree which cannot be fitted with a capping stack. The potential to utilise a capping stack for Julimar Operations is therefore limited to only the Julimar wells fitted with horizontal Xmas trees.

Woodside commissioned an independent, subsea plume analysis, landing study and capping stack deployment feasibility assessment (WWC, 2019) during the drilling and completion of the JDP2 wells. The assessment indicated that shallow water in combination with high absolute open hole flow rates in the event of a worst-case blowout would produce a plume of 90 m radius and prohibit the safe deployment of a capping stack. The WCCS blowout scenario used for the assessment are significantly greater than the WCCS loss of well containment (CS-01) scenario in the Julimar Operations phase, where the plume resulting from a loss of well containment is predicted to have a diameter of approximately 19 m (RPS, 2020).

Though all capping stack deployment technologies are unproven, in the event of a loss of well containment at less than the WCCS (plume radius is ~25 m), the use of a subsea deployment method such as a heavy lift vessel, which is more commonly used in industry, is a more reliable and, in turn, ALARP approach. If a well loss of containment occurs on a well fitted with a horizontal xmas tree and environmental conditions permit (wind speed, wave height, current and plume radius is ~25 m), deployment of a capping stack with a heavy lift vessel with a 120 T crane capacity, could be feasible.

Woodside assumes that sourcing conventional capping stack deployment vessels would be per the Source Control Response Procedure. This plan has pre-identified vessel specifications for the capping stack deployment and Woodside monitors the availability and location of these vessels on a monthly basis. Woodside maintain several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment are monitored monthly. The supply arrangements and reliability to achieve the required mobilisation time will be revalidated prior to spud. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames.

In the occurrence of a loss of well containment from a horizontal Xmas tree, a capping stack will be mobilised to site within 16 days. Woodside will monitor the conditions around the wellsite and deployment for well intervention attempt will be undertaken once plume size is acceptable (~25 m radius) and safety and metocean conditions are suitable.

6.2.4.1 Safety Case considerations

Woodside has assessed against the NOPSEMA safety case guidance (NOPSEMA N-09000-GN1661, 2016) and can confirm that vessels conducting capping stack are not classified as an "associated offshore place" but as a facility and therefore require the appropriate Safety Case arrangements in place.

The 16-day timeframe to mobilise the vessel is based on the following assumptions:

- Existing frame agreement vessel, located outside the region with approved Australian Safety Case.
- A safety case revision and scope of validation is required.
- Vessel has an active heave compensated crane, rated to at least 120 T and at least 90 m in length and a deck capacity to hold at least 110 T of capping stack.

Timeframes for capping stack deployment detailed in Figure 6-1 would be implemented concurrently with the actions required for the Safety Case revision development scenarios detailed in Figure 6-2 and Table 6-4. To reduce uncertainty in regulatory approval timeframe, Woodside is collaborating with The Drilling Industry Steering Committee (DISC) and a contracted IMR Vessel Operator to develop a generic Safety Case Revision that contemplates a capping stack deployment. This Safety Case Revision will be used for early engagement with NOPSEMA before entering the reservoir to reduce uncertainty in permissioning timeframes in the event a capping stack deployment is required. Woodside will execute the capping stack response in the fastest possible timeframe, provided the required safety and metocean conditions allow. Woodside has considered a broad range of alternate, additional, and improved options as outlined later in Section 6.2.7.

6.2.5 Relief well drilling

The following approaches outline Woodside's hierarchy for sourcing a rig for relief well drilling;

- Primary – Review internal drilling programs and MODU availability to source an appropriate rig operating within Australia with an approved Safety Case;
- Alternate – Source and contract a MODU through APPEA MOU that is operating within Australia with an approved Safety Case;
- Contingency – Source and contract a MODU outside Australia with an approved Australian Safety Case

Based on the detail provided below, the Primary, Alternate and Contingency approaches are expected to be achieved within the 75 day period. The detail of these arrangements demonstrates that the risks have been reduced to ALARP and Acceptable levels through the control measures and performance standards outlined in Section 5.2.

The options analysis detailed in this section considers options to source, contract and mobilise a MODU and ensure necessary regulatory approvals are in place to meet timelines for relief well drilling.

A Safety Case revision may be required for the relief well drilling MODU based on the existing scope of activities and agreement with the Operator. Whilst due consideration has been given to relief well drilling rig availability, the Report of the Montara Commission of Enquiry (2010) noted that blowouts are typically rare and infrequent and the associated costs of maintaining a standby rig would be neither practical nor cost-effective. Additionally, the Report also noted that whilst efforts should be made to identify the needs and requirements for relief well drilling, it is also necessary to retain a degree of flexibility in relation to the choice of rig for these activities.

6.2.5.1 Relief well drilling timings

The duration of a blowout (from initiation to a successful kill) is assessed as 75 days for Julimar Operations well. The estimate is specific to a relief well for the worst case credible blowout case for BRUA-2. However, relief wells for other wells within the field are expected to be similar duration.

Details on the time required to source and contract a MODU is shown in Table 6-2 below.

The internal and external availability of both DP and moored MODUs, plus rig activities of registered operators and rigs with approved safety cases, are tracked by Woodside on a monthly basis to ensure that the best available option can be sourced and utilised in the event of the worst-case credible scenario. Under any circumstances, Woodside will execute relief well drilling in accordance with the Operational NEBA decision.

Woodside has considered a broad range of alternate, additional, and improved options as outlined later in this section. Contingency is included in the timing breakdown due to the many unpredictable variables which could be present during the relief well drilling.

Table 6-2: Relief well drilling timings

	Estimate Relief Well duration for Julimar Operations Well (days) – Moored
Source and contract MODU comprising the following stages:	**21 days total:**
• Activate MOU. Secure and suspend well. • Complete relief well design. • Secure relief well materials.	*8 days*
• Transit to location based on mobilisation from Northwest shelf region.	*2 days*
• Backload and loadout bulks and equipment, complete internal assurance of relief well design.	*2 days*
• Contingency for unforeseen event (e.g.: Longer transit from another area of Australia, problems in securing well, cyclone event)	*9 days*
Pre-spud survey	**Already included**
Mooring spread installation *NB Occurs in parallel with the 21 days to mobilise the rig, so the timing included here is the difference*	15.7 days
Drilling, casing and look ahead estimate *NB timing variation between the two wells is due to Julimar Operations well having an additional casing string which is related to the well design.*	23.7 days
Intersection and well kill comprising the following stages:	**14 days total:**
• Drill out shoe, conduct formation integrity test and drill towards intersection point	*1.5 days*
• Execute well-specific ranging plan to intersect blowout wellbore in minimum timeframe, with highest possible accuracy.	*9.5 days*
• Pump kill weight drilling fluid per the relief well plan. Confirm the well is static with no further flow.	*0.5 days*
• Contingency for unforeseen technical issues (e.g.: more ranging runs required to make intersect, additional mud circulations required to execute kill	2.5 days
	74.4 days (75 days)

The following conditions and assumptions are applicable:

- A pre-lay mooring spread is required to moor the rig over subsea infrastructure. Estimated duration to procure and install the pre-lay moorings is five weeks, which would occur in parallel to MODU mobilisation. The breakdown of this timeframe is shown in Table 6-3.
- There is extensive existing seabed infrastructure surrounding the wells thus making the installation of the mooring spread a very complex process.
- While Woodside will make every endeavour to accelerate these activities to reduce the pre-lay mooring timeframe, Woodside believes the five-week timeframe is sufficiently conservative to ensure these activities can be completed. Based on the key tasks outlined above to be achieved within the five-week timeframe, Woodside has considered a broad range of alternate, additional and improved options as outlined in Section 6.2.7.

- Intersect and well kill duration is estimated at 14 days. This is a moderately conservative estimate. During the intersect process, the relief well will be incrementally drilled and logged to accurately approach and locate the existing well bore. This will result in the highest probability of intersecting the well on the first attempt and thus will reduce the overall time to kill the well. During the Montara incident, it took five attempts to achieve a successful intersect

Table 6-3: Mooring spread installation timings

Activity	Duration (days)
Design mooring spread and commence sourcing equipment	7
Source equipment and mobilise to supply base	21
Install pre-lay spread	7
Run anchors and prepare to spud	1.7
Total	**36.7**

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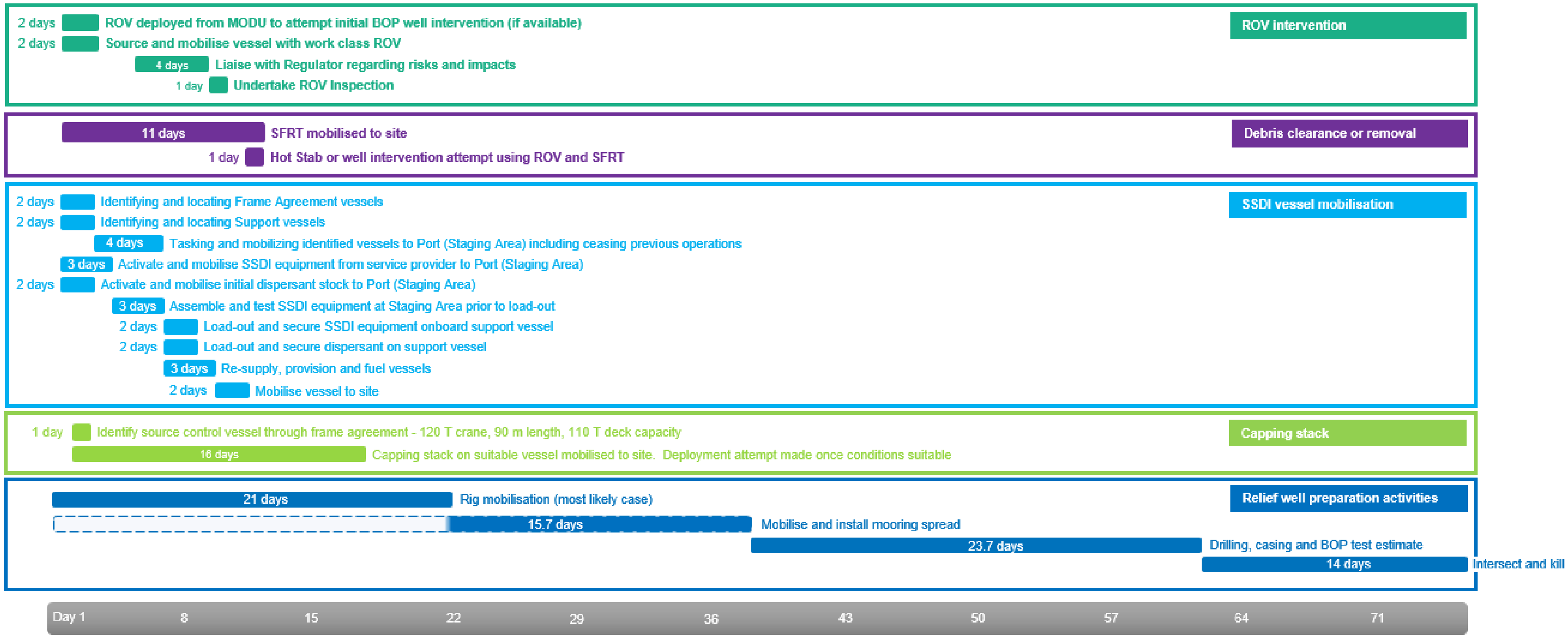

Figure 6-1: Source control and well intervention response strategy deployment timeframes

6.2.5.2 Safety Case revision

Woodside recognises that it will not be the Operator or holder of the Safety Case for the MODU and/or vessels involved in relief well activities. In the event that a revision to the Operator's Safety Case is required for relief well drilling, Woodside has identified measures to ensure timely response and optimise preparedness as far as practicable that can be undertaken to expedite a straightforward Safety Case revision for a MODU/vessel to commence drilling a relief well. Performance standards associated with these measures have been included in Section 5.2.

These include:

- Access to Safety and Risk discipline personnel with specialist knowledge.
- Monitoring of internal and external rigs and vessel availability in the region and extended area through contracted arrangements on a monthly basis.
- Prioritisation of rigs/vessels with current or historical contracting arrangements. Woodside maintains records of previous contracting arrangements and companies. All current contracts for vessels and rigs are required to support Woodside in the event of an emergency.
- Leverage of mutual aid arrangements such as the APPEA MOU for vessel and rig support.
- Woodside Planning and Logistics, and Safety Officers (on roster/call 24/7) which can articulate need for, and deliver Woodside support in, key delivery tasks including sitting with potential outside operators.
- Ongoing strategic industry engagement and collaboration with NOPSEMA to work toward time reductions in regulatory approvals for emergency events.

Woodside has assessed the timing for three possible safety case revisions for a SSDI vessel/ MODU and plotted these alongside the other relief well preparation activities in Figure 6-2. The assumptions for each of the cases are detailed in the subsequent table.

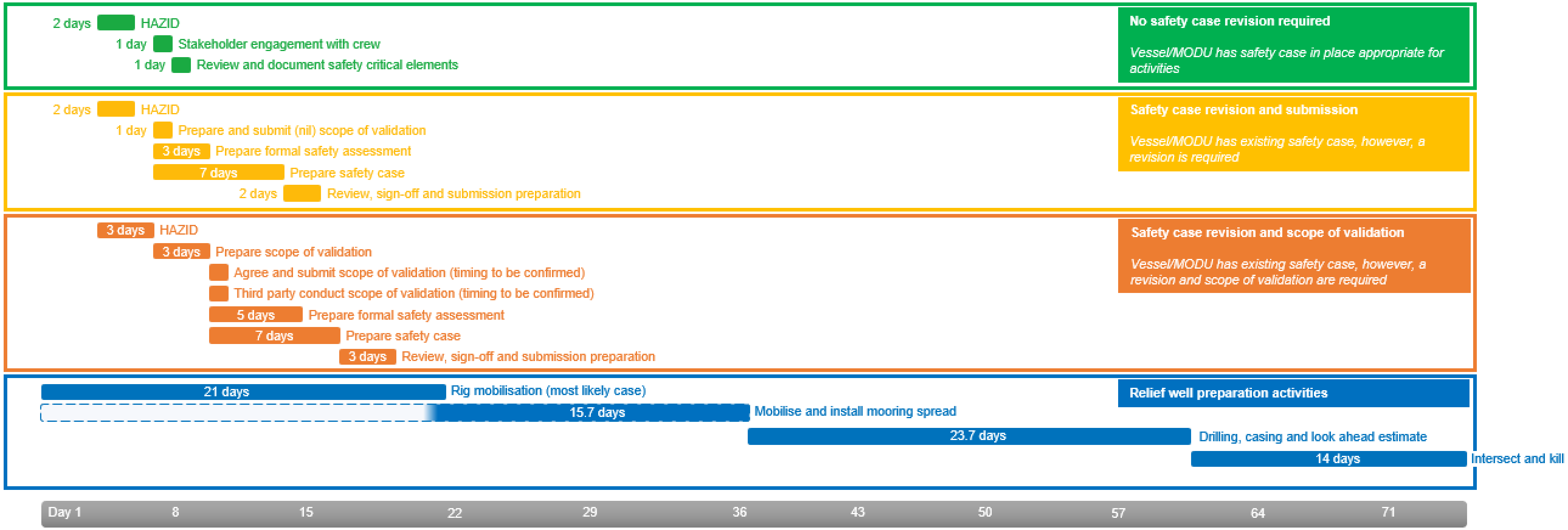

Figure 6-2: Timeline showing safety case revision timings alongside SSDI vessel mobilisation and other relief well preparation activity timings

Table 6-4: Safety case revision conditions and assumptions

Case	No safety case revision required	Safety case revision and submission	Safety case revision and scope of validation	New safety case submission
Description	Vessel/MODU has a safety case in place appropriate for activities	Vessel/MODU has an existing safety case, however, a revision is required	Vessel/MODU has an existing safety case; however, a revision is required plus scope of validation	No safety case in force of vessel/MODU. New safety case submission required.
Conditions/ assumptions	• Assumes that existing vessel/MODU safety case covers working under the same conditions or the loss of containment is not severe enough to result in any risk on the sea surface.	• Safety case timing assumes vessel/MODU selected and crew and available for workshops and safety case studies. • Assumes nil scope of validation. This assumes that the vessel for SSDI allows for working in a hydrocarbon environment and control measures are already in place in the existing safety case. For MODU, it assumes that the relief well equipment is already part of the MODU facility and MODU safety case. • Assumes safety case preparation is undertaken 24/7.	• Safety case timing assumes vessel/MODU selected and crew and available for workshops and safety case studies. • Validation will be required for new facilities only. The time needed for the validator to complete the review (from the last document received) and prepare validation statement is undetermined. This is not accounted for here as the safety case submission is not dependent on the validation statement, however the safety case acceptance is. • Assumes safety case preparation is undertaken 24/7.	• Safety case timing assumes vessel/MODU selected and crew and available for workshops and safety case studies. • Validation will be required for new facilities. The time needed for the validator to complete the review (from the last document received) and prepare validation statement is undetermined. This is not accounted for here as the safety case submission is not dependent on the validation statement, however the safety case acceptance is. • Assumes safety case preparation is undertaken 24/7.

6.2.6 Primary response – relief well drilling

The Primary response would be sourcing and mobilising a MODU that is operating within Australia with an existing Safety Case and currently contracted to Woodside.

This option is considered the worst-case scenario and is therefore the planning case for environmental impacts. It is expected to achieve the predicted 75-day well kill.

Woodside would complete a safety case revision for an available MODU already operating within Australia to commence relief well drilling. This option has been included as the worst-case scenario (base case) for planning. Given the low associated costs and potential environmental benefits, this would be the primary option selected for implementation in the event of a loss of well containment. Woodside has planned for the worst-case scenario of major damage or complete loss of well control during operations and would prioritise sourcing a MODU operating within Australia with existing regulatory approvals and contracted to Woodside. A revision of the safety case would be undertaken if required. This option is considered feasible and reliable with the associated dependencies outlined above.

A moored MODU will likely be used in this water depth. The internal and external availability of both DP and moored MODUs, plus rig activities of registered operators and rigs with approved safety cases, are tracked by Woodside on a monthly basis to ensure the best available option can be sourced and utilised in the event of the worst-case credible scenario. Woodside will execute the relief well drilling in accordance with the Operational NEBA decision-making process (outlined in Section 4).

6.2.7 Alternate response – relief well drilling

The Alternate response would be to source a rig operating within Australia through the APPEA MOU and approving a revision to that Operator’s Safety Case.

Woodside would utilise an existing MODU with in force regulatory approvals sourced through the APPEA MOU to commence relief well drilling as soon as possible. Dependent upon the scope of activities in the Safety Case and Operator, relief well drilling may be able to commence without the need for a Safety Case revision.

Given the low associated costs and potential environmental benefits, may allow the well to be killed up to seven days sooner, in a reduction of up to 5194 m^3 of Brunello Condensate for the worst-case credible scenario, this option has been selected as the Alternate approach in the event of a loss of well containment. Woodside has planned for the worst-case scenario of a loss of well control during drilling operations but would prioritise sourcing a MODU with existing regulatory approvals through the APPEA MOU/Mutual Aid arrangements if available. This option is considered feasible and reliable with the associated dependencies outlined above.

A moored MODU will likely be used in this water depth. The internal and external availability of both DP and moored MODUs, plus rig activities of registered operators and rigs with approved safety cases, are tracked by Woodside on a monthly basis to ensure the best available option can be sourced and utilised in the event of the worst-case credible scenario. Woodside will execute the relief well drilling in accordance with the Operational NEBA decision making process (outlined in Section 4).

6.2.8 Source control – control measure options analysis

The assessment described in Section 6.2.6 and 6.2.7 outlines the primary and alternate approach respectively that Woodside would implement for relief well drilling**.** Whilst a contingency option has been identified in Section 6.2.5, it has not been carried forward for further evaluation as sufficient detail has been provided regarding the primary and alternate options as the two key techniques that would be implemented.

Woodside has outlined the options considered against the activation, mobilisation (improved options), deployment (alternate and additional options) process described in Section 2.1.1 that provides an evaluation of:

- predicted cost associated with adopting the option
- predicted change/environmental benefit
- predicted effectiveness/feasibility of the option.

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.

- Alternative options, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control.
- Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures.
- 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.

Options where there is not a clear justification for their inclusion or exclusion may be subject to a detailed assessment.

6.2.8.1 Activation/mobilisation options considered

Alternative

- Standby MODU shared for all Woodside activities.
- Standby MODU shared across APPEA MOU Titleholders.

Additional

- Implement and maintain minimum standards for Safety Case development.

Improved

- Monitor internal drilling programs for rig availability.
- Monitor external activity for rig availability.
- Monitor status of Registered Operators/Approved Safety cases for rigs.

6.2.8.2 Deployment options considered

Additional

- Deploy dual vessel capping stack.
- Deploy a lighter capping stack.

- Use Subsea Containment System alternative to capping stack deployment.
- Pre-drill top-holes.
- Purchase and maintain mooring system.
- Contract in place with WWCI and Oceaneering.

Improved

- Maintain relief well drilling supplies (mud, casing, etc).

6.2.9 Activation/mobilisation – control measure options analysis

Of the four steps outlined in Table 6-2, reducing the time to source, contract and mobilise the rig to site is the key step where timing may be reduced for well kill operations. The other three steps may be reduced once operations commence but limited options are available to reduce their duration until relief well drilling commences.

Table 6-5: Alternative control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Assessment conclusions	Implemented
Standby MODU shared for all Woodside activities	A standby MODU shared across all Woodside activities is likely to provide a moderate environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to ten days (to 11 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. This may allow the well to be killed up to ten days sooner and may result in a reduction of up to 7420 m³ of Brunello Condensate for the worst-case credible scenario.	This option is not considered feasible for all Woodside activities as there are a large range of well depths, complexities, geologies and geophysical properties across all Woodside's operations. The large geographic area of Woodside activities also means that the MODU is unlikely to be in the correct location at the right time when required.	Even with costs shared across Woodside operations, the costs (US$219M per annum, US$1,095 million over the Petroleum Activities Program) of maintaining a shared MODU are considered grossly disproportionate to the environmental benefit potentially achieved by reducing mobilisation times by up to ten days.	The costs and complexity of having a MODU and maintaining this arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios.	No
Standby MODU shared across APPEA MOU Titleholders	A standby MODU shared across all titleholders who are signatories to the APPEA MOU is likely to provide a minor environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to seven days (to 14 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities. This may result in a reduction of up to 5194 m³ on Brunello Condensate for the worst-case credible scenario.	This option is not considered feasible for a number of Titleholders due to the remote distances in Australia as well as a substantial range of well depths, types, complexities, geologies and geophysical properties across a range of Titleholders	As the environmental benefit is only considered minor and the reduction in timing would only be for the mobilisation period (reduction from 21 days to 14 days) the costs are considered grossly disproportionate to the minor benefit gained (reducing well relief drilling by seven days). The costs of contracting and maintaining a MODU for a number of titleholders (approx. US$219 million per annum, Woodside proportion predicted up to US$21.9 million.	The costs and complexity of having a MODU and maintaining a shared arrangement for the duration of the Petroleum Activities Program are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios.	No

Table 6-6: Additional control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Assessment conclusions	Implemented
Implement and maintain minimum standards for Safety Case development	Woodside's contingency planning consideration would be to source a rig from outside Australia with an existing Safety Case. This would require development and approval of a safety case revision for the rig and activities prior to commencing well kill operations.	This option is considered feasible and would require Woodside to develop minimum standards for safe operations for relevant Safety Case input along with maintaining key resources to support review of Safety Cases. Woodside would not be the operator for relief well drilling and would therefore not develop or submit the Safety Case revision. Woodside's role as Titleholder would be to provide minimum standard for safe operations that MODU operators would be required to meet and/or exceed.	Woodside has outlined control measures and performance standards regarding template Safety Case documentation and maintenance of resources and capability for expedited Safety Case review.	This option has been selected based on its feasibility, low cost and the potential environmental benefits it would provide.	Yes

Table 6-7: Improved control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Assessment conclusions	Implemented
Monitor internal drilling programs for rig availability	Woodside may be conducting other campaigns that overlap with the Petroleum Activities Program, potentially providing availability of a relief well drilling rig within Woodside. The environmental benefit of monitoring other drilling programs internally is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment.	Woodside monitors vessel and MODU availability through market intelligence services for location. Woodside will continually monitor other drilling and exploration activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations. Priority would be given to rigs with current or historical contracting arrangements as these have been through Woodside/NOPSEMA review and approvals.	Associated cost of implementation is minimal to the environmental benefit gained. Woodside has outlined control measures and performance standards	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment.	Yes
Monitor external activity for rig availability	The environmental benefit achieved by monitoring drilling programs and rig movements across industry provides the potential for increased availability of suitable rigs for relief well drilling. Additional discussions with other Petroleum Titleholders may be undertaken to potentially gain faster access to a rig and reduce the time taken to kill the well and therefore volume of hydrocarbons released.	Woodside will source a relief well drilling rig in accordance with the APPEA MOU on rig sharing in the unlikely event this is required. Commercial and operational provisions do not allow WEL to discuss current and potential drilling programs in detail with other Petroleum Titleholders.	Associated cost of implementation is moderate to the environmental benefit gained. Woodside will continually engage with other Titleholders and Operators regarding activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations.	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment	Yes
Monitor status of Registered Operators/ Approved Safety cases for rigs	The environmental benefit of monitoring rigs is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment.	Woodside will monitor the status of rigs operating within Australia (and therefore safety case status) on a quarterly basis. This allows for a prioritised selection of rigs in the event of a response with priority given to those with an existing safety case.	Associated cost of implementation is minimal to the environmental benefit gained, Woodside will monitor the status of safety cases on a quarterly basis. Woodside has outlined control measures and performance standards to meet these controls.	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment	Yes

6.2.10 Deployment – control measure option analysis

Table 6-8: Additional control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Assessment conclusions	Implemented
Dual vessel capping stack placement	While the use of dual vessel to deploy the capping system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, the feasibility issues surrounding a dual vessel capping deployment in the water depths of horizontal Xmas tree Julimar wells (149 m to 174 m), together with mobilisation lead times for both a cap and required vessels and support equipment, would minimise any environmental benefit.	A dual vessel deployment is somewhat feasible provided a large enough deck barge can be located. Deck barges of 120 m are not, however, very common and will present a logistical challenge to identify and relocate to the region. Further, the longer length barges may need mooring assist to remain centred over the well. The capping stack would be handed off from a crane vessel to the anchor handler vessel (AHV) work wire outside of the exclusion zone. The AHV would then manoeuvre the barge into the plume to get the capping stack over the well. In this method, the barge would be in the plume, but the AHV and all personnel would be able to maintain a safe position outside of the gas zone. The capping stack would actually be lowered on the AHV work wire so a crane would not be required on the barge.	Due to there being minimal environmental benefits gained by the prolonged lead times needed to execute this technique, plus a potential increase in safety issues, any cost would be disproportionate to the benefits gained.	Given there is minimal environmental benefit and an increase in safety issues surrounding SIMOPS and deployment in shallow waters, this option would not provide an environmental or safety benefit.	No
Lighter valve based capping stack	Lighter capping stacks (40 tonnes) were considered in the assessment for the WCCS.	The lighter weight of the capping stack does not change the feasibility of capping in shallow water due to the predicted plume size and associated vessel exclusion zones.	Capping in shallow water is restricted by vertical acces to plume size, hence no environmental benefit gained.	Assessment concludes that the feasibility of capping is not improved by the reduction in weight of the capping stack.	No
Subsea Containment System alternative to capping stack deployment	While the use of a subsea containment system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, the system is unlikely to be feasibly deployed and activated for at least 90 days following a blowout due to equipment requirements and logistics. No environmental benefit is therefore predicted given the release duration is 75 days before drilling of a relief well under the adopted control measure.	The timing for mobilisation, deployment and activation of the subsea containment system is likely to be longer (> 90 days), than the expected 75 day relief well drilling operations based on the location, size and scale of the equipment required, including seabed piles that can only be transported by vessel.	Woodside has investigated the logistics of reducing this timeframe by pre-positioning equipment but the costs of purchasing dedicated equipment by Woodside for this Petroleum Activities Program is not considered reasonably practical and are considered disproportionate to the environmental benefit gained.	This option would not provide an environmental benefit.	No
Pre-drilling top-holes	This option represents additional environmental impacts associated with discharge of additional drill cuttings and fluids along with benthic habitat disturbance. It is also not expected to result in a significant decrease in relief well timings	This option is not considered feasible due to the uncertainties related to the location and trajectory of the intervention well, which may vary according to the actual conditions at the time the loss of containment event occurs. Additionally, there is only expected to be a minor reduction in timing for this option of one to two days based on the drilling schedule. Duration to drill and kill may be reduced by one to two days, but top-hole may have to be relocated, due to location being unsafe or unsuitable and further works will be required each year to maintain the top holes.	Utilising an existing MODU and pre-drilling top-hole for relief well commencement would significantly increase costs associated the Petroleum Activities Program. Estimated cost over the program's life is approx. $555,000 per day over the Petroleum Activities Program based on two to four days of top-hole drilling (plus standby time) for the BRUA-2 well as the worst-case scenarios.	This option would not provide an environmental benefit due to the additional environmental impacts coupled with a lack of improved relief well timings.	No
Contract in place with Wild Well Control and Oceaneering	Woodside has an agreement in place with Wild Well Control Inc and Oceaneering to provide trained personnel in the event of an incident. This will ensure competent personnel are available in the shortest possible timeframe.	Having contracts in place to access trained, competent personnel in the event of an incident would reduce mobilisation times. This option is considered reasonably practicable.	Minimal cost of implementation – Woodside has standing contract in place to provide assistance across all activities.	This control measure is adopted as the costs and complexity are not considered grossly disproportionate to any environmental benefit that might be realised.	Yes

Table 6-9: Improved control measures

Option considered	Environmental consideration	Feasibility	Approx. Cost	Assessment conclusions	Implemented
Maintaining relief well drilling supplies	There is not predicted to be any reduction in relief well timing or spill duration from Woodside maintaining stocks of drilling supplies (mud, casing, cement, etc.)	It would be feasible to source some relief well drilling supplies such as casing but the actual composition of the cement and mud required will need to be specific to the well. This option is also not deemed necessary as the lead time for sourcing and mobilising these supplies is included in the 21 days for sourcing and mobilising a rig.	The capital cost of Woodside purchasing relevant drilling supplies is expected to be approximately $600,000 with additional costs for storage and ongoing costs for replenishment. These costs are considered grossly disproportionate to the environmental benefit gained.	This option would not provide an environmental benefit.	No

6.2.11 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
  - Implement and maintain minimum standards for Safety Case development.
  - Contract in place with Wild Well Control and Oceaneering to supply trained, competent personnel.
- Improved
  - Monitor internal drilling programs for MODU availability.
  - Monitor external activity for MODU availability.
  - Monitor status of Registered Operators/Approved safety cases for MODUs.

6.3 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.

6.3.1 Existing capability – wildlife response

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 Wildlife response – control measure options analysis

6.3.2.1 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**
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.	*N/A*	No

6.3.2.2 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**
Additional wildlife treatment systems	The selected delivery options provide access to call-off contracts with selected specialist providers. The agreements ensure 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. Current capability meets the needs required and there is no additional environmental benefit in adopting the improvements.	Although hydrocarbon contact above threshold concentrations with offshore waters is expected from day one, given the low likelihood of such an event occurring and the low environmental benefit of an offshore response, the cost of implementing measures to reduce the mobilisation time is considered disproportionate to the benefit. Additionally, the remote offshore location of the release site with no predicted contact of shoreline receptors provides sufficient opportunity for the ongoing monitoring and surveillance operations to inform the scale of the response. 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 $1,700 per operational site per day.	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 fauna) by day six, 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 fauna. Materials for holding facilities, portable pools, enclosures and rehabilitation areas would be sourced as required.	Additional wildlife response personnel cost $2,000 per person per day.	No

6.3.2.3 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**
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. The cost of having dedicated equipment and personnel available to respond faster is considered grossly disproportionate to the environmental benefit.	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 generally 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 four OWR 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 $700 per package per day.	No

6.3.3 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
  - None selected.
- Improved
  - None selected.

6.4 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.

6.4.1 Existing capability – scientific monitoring

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, seven 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.

6.4.2 Scientific monitoring – control measure options analysis

6.4.2.1 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 and 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 this delivery option.

6.4.2.2 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 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 a loss of well control 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 a loss of well control from the PAP activities.

6.4.2.3 Improved control measures

No reasonably practicable improved control measures identified.

6.4.3 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
  - Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release.
- Improved
  - None selected.

6.4.4 Operational plan

Key actions from the Scientific Monitoring Program Operational Plan (Link) for implementing the response are outlined below in Table 6-10.

Table 6-10: Scientific monitoring program operational plan actions

Responsibility	Action
Activation	
Perth ICC Planning (ICC Planning – Environment Unit)	Mobilises Chief Environmental Scientist/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. Reviews 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. Stands up subject matter experts, if required.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Establishes 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, SMP Standby contractor)	If response phase data acquisition is required, stands up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the IMT.

Responsibility	Action
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	SMP contractor, SMP standby contractor, to prepare the Field Implementation Plan. Prepares and obtains sign-off of the Response Phase SMP work plan and Field Implementation Plan. Updates the IAP.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Liaises with ICC Logistics, and determines the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure. Engages 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 detailed in the Scientific Monitoring Program Operational Plan (Link) • 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)	Confirms communications procedures between Woodside SMP team, SMP standby contractor, SMP Team Leads and Operations Point Coordinator.
Mobilisation	
Perth ICC Logistics	Engages vessels and vehicles and arranges fitting out as specified by the mobilisation Plan Confirms vessel departure windows and communicates with the Jacob's SMP Manager. Agrees SMP mobilisation timeline and induction procedures with the Division and Sector Command Point(s).
Perth ICC Logistics	Coordinates with SMP standby contractor to mobilise teams and equipment according to the logistics plan and Sector induction procedures.
SMP Survey Team Leads	SMP Survey Team Leader(s) coordinates on-ground/on-vessel mobilisations and support services with the Sector Command point(s).

6.4.5 ALARP and acceptability summary

ALARP and Acceptability Summary		
Scientific Monitoring		
ALARP Summary	X	All known reasonably practicable control measures have been adopted
		No additional, alternative and improved control measures would provide further benefit
		No reasonably practical additional, alternative, and/or improved control measure exists
	The resulting scientific monitoring capability has been assessed against the credible spill scenarios. The range of techniques 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 a loss of well control. • The level of impact and risk to the environment has been considered with regards to the principles of ESD; 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 credible case scenarios, and uncertainty has not been used as a reason for postponing control measures.	
On the basis from the ALARP assessment, above and the risk assessment Section 9.8 of the Julimar Operations 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 EP, specifically:

- 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.

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.

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- drill cuttings and drilling fluids environmental impact assessment for relief well drilling
- presence of personnel on the shoreline
- additional stress or injury caused to wildlife

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 and 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 Drill cuttings and drilling fluids environmental impact assessment for relief well drilling

The identified potential impacts associated with the discharge of drill cuttings and fluids during a relief well drilling activity include a localised reduction in water and seabed sediment quality, and potential localised changes to benthic biota (habitats and communities).

A number of direct and indirect ecological impact pathways are identified for drill cuttings and drilling fluids as follows:

- Temporary increase in total suspended solids (TSS) in the water column.
- Attenuation of light penetration as an indirect consequence of the elevation of TSS and the rate of sedimentation.
- Sediment deposition to the seabed leading to the alteration of the physio-chemical composition of sediments, and burial and potential smothering effects to sessile benthic biota.
- Potential contamination and toxicity effects to benthic and in-water biota from drilling fluids.

Potential impacts from the discharge of cuttings range from the complete burial of benthic biota in the immediate vicinity of the well site due to sediment deposition, smothering effects from raised sedimentation concentrations as a result of elevated Total Suspended Solids (TSS), changes to the physico-chemical properties of the seabed sediments (particle size distribution and potential for reduction in oxygen levels within the surface sediments due to organic matter degradation by aerobic bacteria) and subsequent changes to the composition of infauna communities to minor sediment loading above background and no associated ecological effects. Predicted impacts are generally confined to within a few hundred metres of the discharge point (IOGP, 2016) (i.e. within the EMBA for a hydrocarbon spill event).

The discharge of drill cuttings and unrecoverable fluids from relief well drilling is expected to increase turbidity and TSS levels in the water column, leading to an increased sedimentation rate above ambient levels associated with the settlement of suspended sediment particles in close proximity to the seabed or below sea surface, depending on location of discharge. Cuttings with retained (unrecoverable) drilling fluids are discharged below the water line at the MODU location, resulting in drill cuttings and drilling fluids rapidly diluting, as they disperse and settle through the water column. The dispersion and fate of the cuttings is determined by particle size and density of the retained (unrecoverable) drilling fluids; therefore, the sediment particles will primarily settle in proximity to the well locations with potential for localised spread downstream (depending on the speed of currents throughout the water column and seabed) (IOGP, 2016). The finer particles will remain in suspension and will be transported further before settling on the seabed.

These conclusions were supported by discharge modelling which was undertaken by Woodside in support of the Greater Enfield Development Environment Plan (Link). Modelling results indicating that the TSS plume of suspended cuttings will typically disperse to the south-west while oscillating with the tide and diminish rapidly with increasing distance from the well locations. Maximum TSS concentrations predicted for 100 m; 250 m and 1 km distances from the wellsite were 7, 5 and 1 mg/L, respectively. Furthermore, water column concentrations below 10 mg/L remain within 235 m of the discharge location for each modelled well. For all well discharge locations (outside of direct discharge sites), TSS concentration did not exceed 10 mg/l. Nelson *et al.* (2016) identified < 10 mg/L as a no effect or sub-lethal minimal effect concentration.

The low sensitivity of the deep-water benthic communities/habitats within and in the vicinity of relief well locations, combined with the relatively low toxicity of WBM and NWBMs, no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota indicate that any localised impact would likely be of a slight magnitude (especially when considering the broader consequence of the LOC event a relief well drilling activity would be responding too).

7.3.2 Presence of personnel on the shoreline

Presence of personnel on the shoreline during shoreline assessment operations could potentially result in disturbance to wildlife and habitats. During the implementation of response techniques, it is possible that personnel may have minimal, localised impacts on habitats, wildlife and coastlines. The impacts associated with human presence on shorelines during shoreline surveys may include:

- damage to vegetation/habitat, especially in sensitive locations such as mangroves and turtle nesting beaches, to gain access to areas of shoreline oiling
- damage or disturbance to wildlife during shoreline surveys

However, any impacts are expected to be localised with full recovery expected.

7.3.3 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, Tactical Response Plans, and/or First Strike Plans.

7.4.1 Presence of personnel on the shoreline

- 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).

7.4.2 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 and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan (PS 13.3).

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 that the capability in place is sufficient for all other scenarios 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 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 EPBC Act.
- 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). In addition to these, other non-legislative requirements met include:
  - Australian IUCN 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.
Environment that may be affected	The summary of quantitative modelling where the marine environment could be exposed to hydrocarbons levels exceeding hydrocarbon threshold concentrations.
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.
Major Environment Event	The events with potential environment, reputation, social or cultural consequences of category C or higher (as per Woodside's operational risk matrix) which are evaluated against credible worst-case scenarios which may occur when all controls are absent or have failed.
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 is 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 technique	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/m², dissolved – ≥100 ppb and entrained hydrocarbon concentrations – ≥500 ppb.
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
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
APASA	Asia Pacific ASA
AUV	Autonomous Underwater Vehicle
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blowout Preventer
C&R	Containment and Recovery
cST	Centistokes
CICC	Corporate Incident Coordination Centre
COP	Common Operating Picture
DM	Duty Manager
DoT	Western Australia Department of Transport
DBCA	Western Australia Department of Biodiversity, Conservation and Attractions (former Western Australian Department of Parks and Wildlife)
EMBA	Environment that May Be Affected
EMSA	European Maritime Safety Agency
EP	Environment Plan
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
ESI	Environmental Sensitivity Index
ESD	Emergency Shut Down
ESP	Environmental Services Panel
FPSO	Floating Production Storage Offloading
FSP	First Strike Plan
GIS	Geographic Information System
GPS	Global Positioning System
HSP	Hydrocarbon Spill Preparedness
IAP	Incident Action Plan
ICC	Incident Coordination Centre
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environment Conservation Association
ITOPF	International Tanker Owners Pollution Federation
IUCN	International Union for Conservation of Nature
KBSF	King Bay Supply Facility

Abbreviation	Meaning
KICC	Karratha Incident Coordination Centre
KSAT	Kongsberg Satellite
ME	Monitor and Evaluate
MEE	Major Environmental Event
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
NEBA	Net Environmental Benefit Analysis
NOAA	National Oceanic and Atmospheric Administration
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
OSMP	Operational and Scientific Monitoring Program
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisations
OSTM	Oil Spill Trajectory Modelling
OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
OWROP	Regional Oiled Wildlife Response Operational Plan
PAP	Petroleum Activities Program
PEARLS	People, Environment, Asset, Reputation, Livelihood and Services
PBA	Pre-emptive Baseline Areas
PPA	Priority Protection Area
PPB	Parts per billion
PPM	Parts per million
ROV	Remotely Operated Vehicle(s)
RPA	Response Protection Area
SCAT	Shoreline Contamination Assessment Techniques
SDA	Surface Dispersant Application
SHC	Shoreline Clean-up
SIMAP	Integrated Oil Spill Impact Model System
SSDI	Subsea Dispersant Injection
SFRT	Subsea First Response Toolkit
SMP	Scientific monitoring program
SOP	Standard Operating Procedure
TRP	Tactical Response Plan
TOA	Testing of Arrangements

Abbreviation	Meaning
TRSV	Tubing Retrievable Safety Valve
WHA	World Heritage Area
Woodside / Woodside	Woodside Energy Limited
WCC	Woodside Communication Centre
WWCI	Wild Well Control Inc
WCCS	Worst Case Credible Scenario
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 PAP for loss of well containment of Brunello Condensate from the BRUA-2 well during Julimar Operations. The complete list of potential receptor locations within the EMBA within the PAP is included in Section 4 of the EP.

The locations utilised for the NEBA were limited to the identified RPAs of the PAP 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 (100g/m²) at any time

The detailed NEBA assessment outcomes are shown below.

The full NEBA assessments are available at (Link and Link)

Table A-1: NEBA assessment technique recommendations for Brunello Condensate

Receptor	Monitor and Evaluate	Containment and Recovery	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response	In situ burning	Mechanical dispersion	Well control and intervention
Montebello Marine Reserve	Yes	No	No	No	No	No	No	No	Potentially	No	No	Yes
Open Ocean	Yes	No	No	No	No	No	No	No	Potentially	No	No	Yes

Overall assessment

Sensitive receptor (Sites identified in EP)	Monitor and Evaluate	Containment and Recovery	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response	In situ burning	Mechanical dispersion	Well control and intervention
Is this response Practicable?	Yes	No	No	No	No	No	No	No	Potentially	No	No	Yes
NEBA identifies Response potentially of Net Environmental Benefit?	Yes	No	No	No	No	No	No	No	Potentially	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:

			Degree of impact	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. **[Note 1]**	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))

NOTE: 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 <u>Operational Plan</u>	Objectives	Activation triggers	Termination criteria
<u>Operational Monitoring Operational Plan 1 (OM01)</u> 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 (1–3 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	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 2 (OM02) Surveillance and reconnaissance to detect hydrocarbons and resources at risk	OM02 aims to provide regular, on-going 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 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 <u>Operational Plan</u>	Objectives	Activation triggers	Termination criteria
<u>Operational Monitoring Operational Plan 4 (OM04)</u> 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)
<u>Operational monitoring operational plan 5 (OM05)</u> 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 is 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 Incident Control Centre (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 Standby contractor who hold a standby contract for SMP via the Woodside Environmental Services Panel (ESP). In the event that additional resources are required other consultancy capacity within the Woodside ESP will be utilised (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 Service 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.

Role	Location	Responsibility
Environmental Service Provider Roles		
SMP standby contractor SMP Duty Manager/Project Manager	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. • Provides 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).

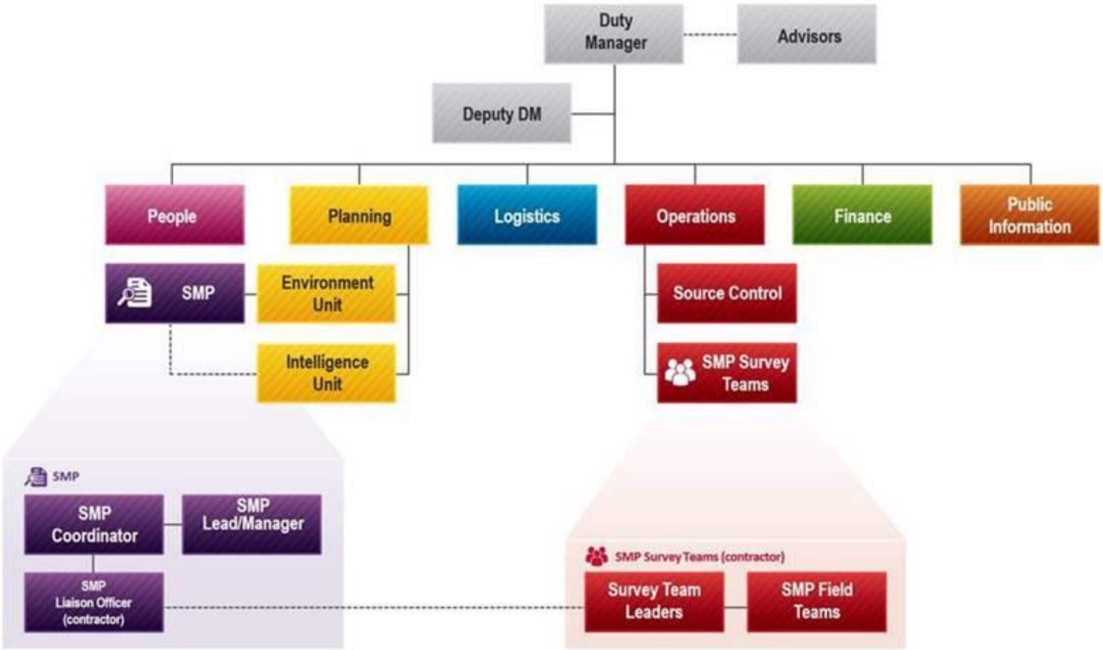

Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to Incident Control Centre (ICC) organisational structure.

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 (Link)**	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; and • 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; and • 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[8]) concentrations of 1 g/m^2 for floating, 10 ppb for entrained and dissolved; and • 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 (Link)**	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; and • 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; and • 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, 5 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[9]) sediment quality guideline values (SQGVs) for biological disturbance; and • 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 (Link)**	The objectives of SM03 are: • Characterize 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; and • 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; and • 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.
Scientific monitoring program 4 (SM04) **Assessment of Impacts and Recovery of Mangroves / Saltmarsh (Link)**	The objectives of SM04 are: • Characterize 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; and • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options).	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; and	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.

[8] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf

[9] 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
	SM03 will be supported by sediment sampling undertaken in SM02 and characteristics of the spill derived from OMPs.	• 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 mangrove/saltmarsh habitat.	• 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 (Link)**	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; and • 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 (Link)**	The objectives of SM06 are to: • 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); and • 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, 5 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 (Link)**	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) **Desk-Based Assessment of Impacts to Other Non-Avian Marine Megafauna (Link)**	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: • Cetaceans; • Dugongs; • Whale sharks and other shark and ray populations; • Sea snakes; and • Crocodiles.	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 reports records of dead, oiled or injured non-avian marine megafauna during the spill/ response phase.	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 and/or that observed impacts can no longer be attributed to the spill.

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
	The desk-based assessment will include population analysis to infer potential impacts to marine megafauna species populations.		
Scientific monitoring program 9 (SM09) **Assessment of Impacts and Recovery of Marine Fish associated with SM03 habitats (Link)**	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); and • 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 important fish and shellfish species (fish health and seafood quality/safety) and recovery (Link)**	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 (EROD activity) • PAH Biliary Metabolites • Oxidative DNA Damage • Serum SDH • Other physiological parameters, such as condition factor (CF), liver somatic index (LSI), gonado-somatic 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); and • 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 on 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 first strike plan for the petroleum activity programme. 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), CMRs, 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. Within the first 24-48 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 (Link).

The starting point for decision-making on which SMPs are activated and spatial extent of monitoring activities will be based on the predictive modelling results (OM01) in the first 24-48 hours until more information is made available from other operational monitoring activities such as aerial surveillance and shoreline surveys. Pre-emptive Baseline Areas (WHA, CMRs 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 1-10) 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 (Link) 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 (Link). 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 World Heritage Area (WHA), CMRs, 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).

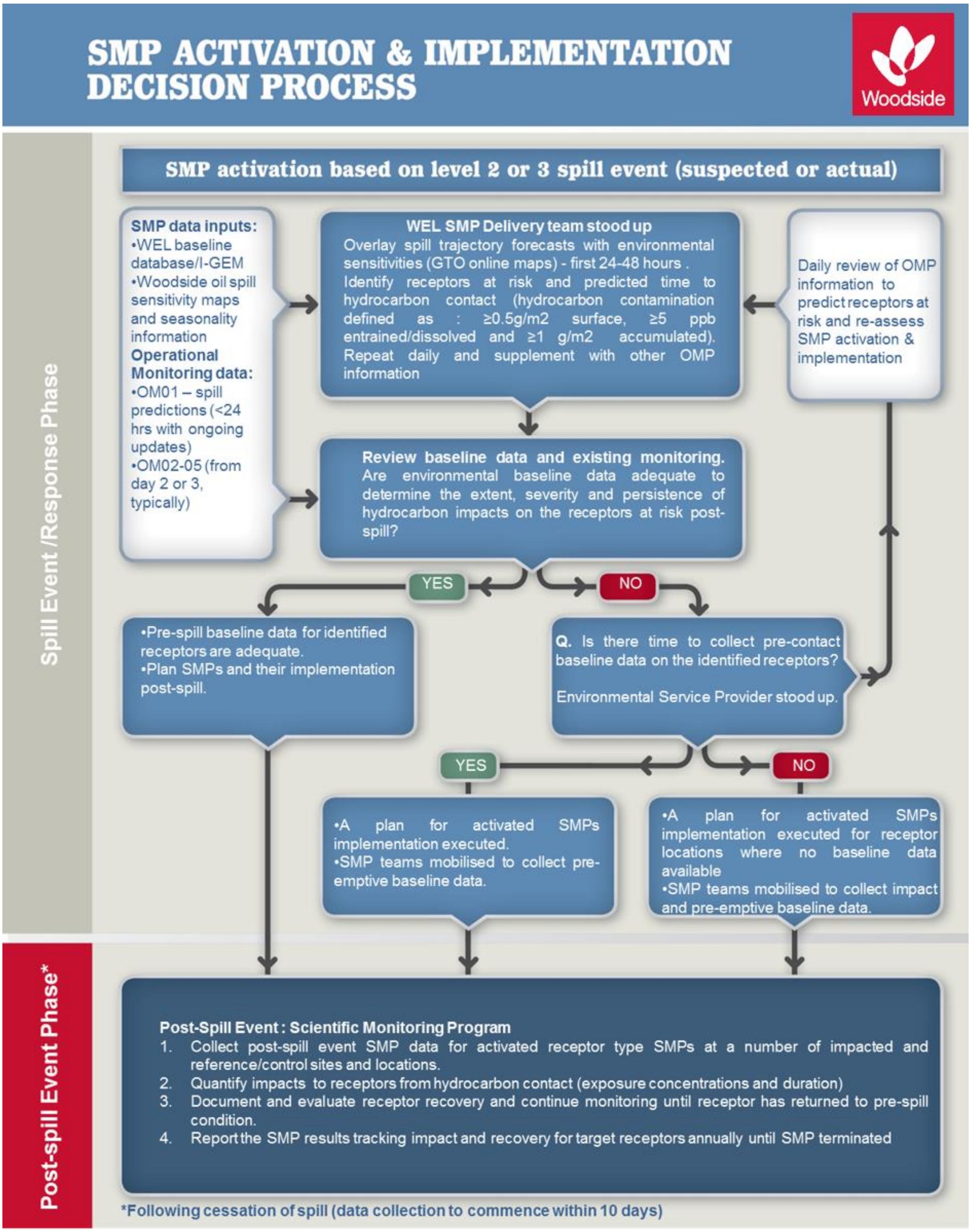

Figure C-2: Activation and Implementation Decision-tree for Oil Spill Environmental Monitoring

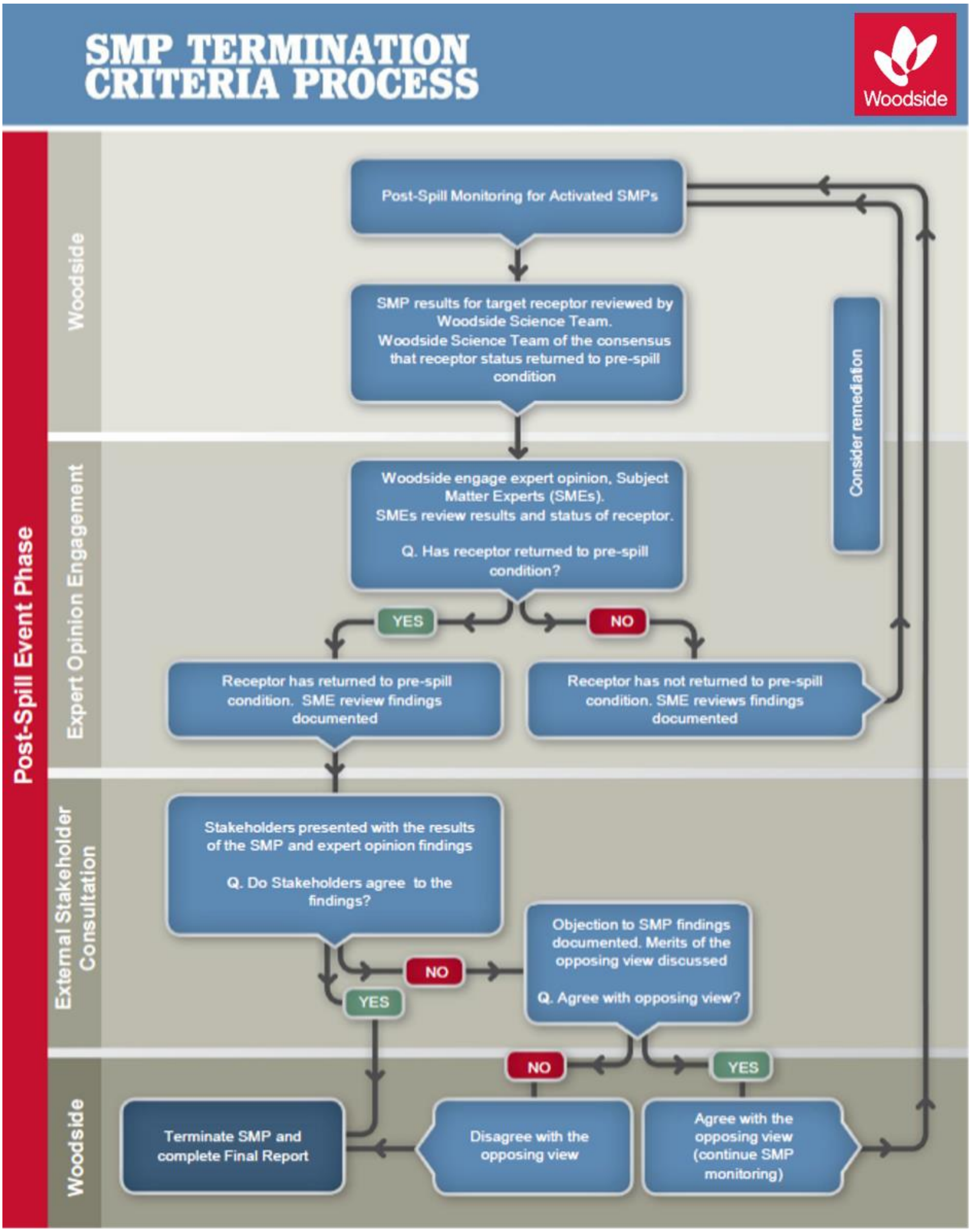

Figure C-3: Termination Criteria Decision-tree for Oil Spill Environmental Monitoring

Receptors at Risk and Baseline Knowledge

In order to assess the baseline studies availabilitiy 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 SMP standby contract. This database is accessed pre-PAP to identify Pre-emptive Baseline Areas (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. I-GEM was a collaboration comprising oil and gas operators (including Woodside), government and research agencies and other organisations. I-GEM held data was integrated into the Department of of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA[10]) in 2020. The Index of Marine Surveys for Assessments (IMSA) is an online portal for information about marine-based environmental surveys in Western Australia. IMSA is a project of the Department of Water and Environmental Regulation (the department) for 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, IMSA and other sources of existing baseline data) to identify Pre-emptive Baseline Areas (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; and
- 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.

[10] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

ANNEX D: MONITORING PROGRAM AND BASELINE STUDIES FOR THE PETROLEUM ACTIVITIES PROGRAM

Table D-1: Oil Spill Environmental Monitoring – scientific monitoring program scope for the Petroleum Activities Program based on Spill EMBA for MEE-01 (loss of well containment)

Receptor Areas - Potential Impact and Reference Scientific Monitoring Sites (marked X)

Receptors to be Monitored	Applicable SMP	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
Habitat																					
Water Quality	SM01	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
Coral Reef	SM03	X		X												X	X	X	X	X	X
Seagrass / Macro-Algae	SM03	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
Mangroves and Saltmarsh	SM04																				
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
Marine Turtles (significant nesting beaches)	SM06	X	X	X	X		X	X	X							X	X	X	X	X	X
Pinnipeds (significant colonies / haul-out sites)	SM07									X	X	X			X						
Cetaceans - Migratory Whales	SM08	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
Dugongs	SM08	X							X							X					
Sea Snakes	SM08	X		X	X			X	X	X						X	X	X	X	X	X
Whale Sharks	SM08			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
Fish Assemblages	SM09	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									
Fisheries - Traditional	SM10															X	X	X			
Tourism (incl. recreational fishing)	SM10	X		X			X	X	X		X			X	X	X	X	X	X	X	X

Receptors to be Monitored	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	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Sediment Quality	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Coral Reef	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	
Seagrass / Macro-Algae						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deeper Water Filter Feeders	X	X	X	X						X							X			
Mangroves and Saltmarsh							X						X	X	X	X	X		X	
Species																				
Sea Birds and Migratory Shorebirds (significant colonies / staging sites / coastal wetlands)					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Turtles (significant nesting beaches)						X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Pinnipeds (significant colonies / haul-out sites)																				X
Cetaceans - Migratory Whales						X	X	X	X	X			X	X	X		X		X	X
Oceanic and Coastal Cetaceans	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dugongs							X	X	X	X	X	X		X	X	X	X	X	X	
Sea Snakes	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Whale Sharks							X	X	X	X							X			
Other Shark and Ray Populations	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Assemblages	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Socio-economic																				
Fisheries - Commercial	X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	X	X
Fisheries - Traditional						X													X	
Tourism (incl. recreational fishing)	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X

(dark red)	Receptor areas identified as Pre-emptive Baseline Areas (based on criteria of surface contact and/or entrained hydrocarbon contact ≤10 days)
(light red)	Receptor areas identified as Pre-Emptive Baseline Areas in the response phase >10 days (based on criteria of surface and/or entrained hydrocarbon contact between >10 days and 20 days)
(white)	Receptor areas identified as impact sites (based on criteria of hydrocarbon contact >20 days) or reference sites which would be identified as part of the SMP planning process

Table D-2: Baseline Studies for the SMPs applicable to identified Pre-emptive Baseline Areas for the Petroleum Activities Program

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
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. 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. The study utilised industry-collected ROV video to assess fish species richness and abundance, and marine growth type, extent and complexity along sections of a subsea gas pipeline, in 56–82 m depth, that traverses the Australian Commonwealth Montebello Marine Park (MMP).	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). 5. Pilbara Marine Conservation Partnership (2017) Final Report - Volume 2. This final report consolidates several articles covering various topics on coral reef health in the Pilbara region. Changes in reef cover over time is described in the study titled "10-year declines in Acropora and Turbinaria corals and a shift toward more generalist life-history traits at northern Ningaloo Reef, Western Australia." Records of coral cover at the Montebello Islands extend back only as far as 2005 but have been continuous since then. 6. In situ surveys assessing coral health and disease on the reefs of the Montebello and Barrow Islands during December 2011. 7. Gorgon Dredge Offset Monitoring Evaluation and Reporting Project: Final Report. The study investigated the influence of dredging and environment on the variability of coral communities at the Montebello and Barrow Islands. Survey periods: 2009, 2010, 2011, 2012	1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. 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 Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018.
		Methods:		
		1. ROV Transects. 2. Benthic habitat mapping, multibeam acoustic swathing. 3. ROV	1. Habitat mapping. 2. Quantitative assessment details not available. 3. Drop camera. (not in the hardcopy). 4. Fixed long term monitoring sites. Diver video transect. 5. Towed video, benthic trawl and sled. 5. Diver video transects, still photography, video and in situ visual estimates from transects, quadrats, manta-tows, towed video and ROV 6. Photographs 7. Digital imagery of benthic assemblages	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.
		References and Data:		

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
		1. Advisian 2019. 2. Keesing 2019. 3. McLean et al. 2019	1. DBCA 2007. DATAHOLDER: DBCA. 2. RPS, 2012. DATAHOLDER: Santos. 3. DATAHOLDER: DBCA. 4. Pitcher et al. (2016). DATAHOLDER: CSIRO. 5a. Babcock et al. (2017). DATAHOLDER: CSIRO. 6. Page et al. 2017 DATAHOLDER: Springer Nature 7. Evans et al. 2018 DATAHOLDER: DBCA (alan.kendrick@dbca.wa.gov.au)	1. AIMS 2013 DATAHOLDER: AIMS. AIMS (2014a) and Abdul Wahab et al (2018) 2. AIMS 2014. DATAHOLDER: AIMS. AIMS (2014b) 3. AIMS. 2018 DATAHOLDER: AIMS Curry-Randall et al (2019) 4. AIMS 2019. DATAHOLDER: AIMS Curry-Randall et al (2019)
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:**		
		N/A - see **Table D-1**	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 Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. 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 Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018.
		Methods:		
		N/A – See **Table D-1**	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.
		References and Data:		

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
		N/A – See **Table D-1**	1. RPS 2012. DATAHOLDER: Santos. 2. Pitcher et al. (2016). DATAHOLDER: CSIRO.	1. AIMS 2013 DATAHOLDER: AIMS. AIMS (2014a) and Abdul Wahab et al (2018) 2. AIMS 2014. DATAHOLDER: AIMS. AIMS (2014b) 3. AIMS. 2018 DATAHOLDER: AIMS Curry-Randall et al (2019) 4. AIMS 2019. DATAHOLDER: AIMS Curry-Randall et al (2019)
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**	N/A – See **Table D-1**	1. Glomar Shoals and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. 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 Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018.
		Methods:		
		N/A – See **Table D-1**	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. 4. Towed video transects, photo quadrats using towed video system.
		References and Data:		

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
		N/A – See Table D-1	N/A – See **Table D-1**	1. AIMS 2013 DATAHOLDER: AIMS. AIMS (2014a) and Abdul Wahab et al (2018) 2. AIMS 2014. DATAHOLDER: AIMS. AIMS (2014b) 3. AIMS. 2018 DATAHOLDER: AIMS Curry-Randall et al (2019) 4. AIMS 2019. DATAHOLDER: AIMS Curry-Randall et al (2019)
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:**		
		N/A – See Table D-1	1. 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. 2. Ground truthing aerial photography to map the spatial extent of mangroves on the Montebello Islands. 3. Mangrove monitoring as part of DBCA Western Australian Marine Monitoring Program (ongoing). 4. Mangrove baseline data - Woodside has acquired new satellite imagery of coastal areas of mainland and offshore islands from Geraldton and the Abrolhos Islands (in the south) to Dampier Archipelago (out to the Montebello Islands in the north), land classification completed and mangrove habitats identified and mapped	N/A (Habitat not found in this area).
		Methods:		
		N/A – See Table D-1	1. ALOS and Digital aerial photos, ground truthing, for Mangrove extent and mangrove relative canopy density. 2. Species Composition, LUX, canopy density. 3. Methods unknown. 4. Land cover classification was performed based on atmospherically corrected Sentinel-2 data	N/A – See Table D-1
		References and Data:		
		N/A – See Table D-1	1. DBCA unpublished data. DATAHOLDER: DBCA. 2. Voga unpublish data DATAHOLDER: Voga Contact: voga.envrironment@vermilionenergy.com 3. DBCA. DATAHOLDER DBCA. 4. EOMAP (2017). SOURCE: http://dmslink/link/link.aspx?dmsn=1400609101	N/A – See Table D-1
Seabirds and shorebirds	**SM05** Visual counts of breeding seabirds, nest counts, intertidal bird	**Studies:**		
		Present, in open water, no breeding habitat.	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
		Methods:		

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
	counts at high tide.	N/A – See Table D-1	Bird observations and counts	N/A – See Table D-1
		References and Data:		
		N/A – See Table D-1	DBCA/WAM - Burbidge et al 2000	N/A – See Table D-1
Turtles	**SM06** Beach surveys (recording species, nest counts, false crawls)	**Studies:**		
		Present, in open water, no nesting habitats.	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). 3. Marine turtle nesting surveys 1992-2012 at Barrow Island Group	N/A (Habitat for turtles not recorded in this area).
		Methods:		
		N/A – See Table D-1	1 and 2. Nesting demographics (composition, spatial variability, seasonal distribution, post-nesting dispersion). 3. Track census (ground), snapshot (ground), and/or aerial survey	N/A – See Table D-1
		References and Data:		
		N/A – See Table D-1	1. AMOSC/DPaW 2014. DATAHOLDER: Chevron. 2.DBCA. 3. Pendoley 2016 DATAHOLDER: Pendoley Environmental	N/A – See Table D-1
Fish	**SM09** Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV).	**Studies:**		
		1. CSIRO - Fish diversity. 2. Fish species richness and abundance.	1. DBCA diver surveys 2009-2012. 2. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~8-20m) in 2014 and deeper (20-60m) 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 Shoals and Rankin Bank Environmental Survey Report, 2013, 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoals and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoals, 2018.
		Methods:		
		1. Semi V Wing trawl net or an epibenthic sled. 2. ROV Video.	1. Diver Operated Video - species richness, community composition, and biomass were recorded from 2009-2012. 2. Stereo BRUVS 3. Diver UVS	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.
		References/Data:		

SMP	Proposed Scientific monitoring operational plan and Methodology	Montebello Australian Marine Park	Montebello Islands (including State Marine Park)	Rankin Bank
		1. Keesing 2019. 2. McLean et al. 2019.	1. DBCA data. DATAHOLDER: DBCA 2. CSIRO Data DATAHOLDER: CSIRO Data centre (data-requests-hf@csiro.au) 3. DBCA.	1. AIMS 2013 DATAHOLDER: AIMS. AIMS (2014a) and Abdul Wahab et al (2018) 2. AIMS 2014. DATAHOLDER: AIMS. AIMS (2014b) 3. AIMS. 2018 DATAHOLDER: AIMS Curry-Randall et al (2019) 4. AIMS 2019. DATAHOLDER: AIMS Curry-Randall et al (2019)

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ANNEX E: TACTICAL RESPONSE PLANS

TACTICAL RESPONSE PLANS	Links
Exmouth	
Mangrove Bay	Link
Turquoise Bay	Link
Yardie Creek	Link
Muiron Islands	Link
Jurabi to Lighthouse Beaches Exmouth	Link
Ningaloo Reef - Refer to Mangrove/Turquoise bay and Yardie Creek	Link
Exmouth Gulf	Link
Shark Bay Area 1: Carnarvon to Wooramel	Link
Shark Bay Area 2: Wooramel to Petite Point	Link
Shark Bay Area 3: Petite Point to Dubaut Point	Link
Shark Bay Area 4: Dubaut Point to Herald Bight	Link
Shark Bay Area 5: Herald Bight to Eagle Bluff	Link
Shark Bay Area 6: Eagle Bluff to Useless Loop	Link
Shark Bay Area 7: Useless Loop to Cape Bellefin	Link
Shark Bay Area 8: Cape Bellefin to Steep Point	Link
Shark Bay Area 9: Western Shores of Edel Land	Link
Shark Bay Area 10: Dirk Hartog Island	Link
Shark Bay Area 11: Bernier and Dorre Islands	Link
Abrolhlos Islands: Pelseart Group	Link
Abrolhlos Islands: Wallabi Group	Link
Abrolhlos Islands: Easter Group	Link
Dampier	
Rankin Bank and Glomar Shoals	Link
Barrow and Lowendal Islands	Link
Pilbara Islands - Southern Island Group	Link
Montebello Is - Stephenson Channel Nth	Link
Montebello Is Champagne Bay and Chippendale channel	Link
Montebello Is - Claret Bay	Link
Montebello Is - Hermite/Delta Is Channel	Link
Montebello Is - Hock Bay	Link
Montebello Is - North and Kelvin Channel	Link
Montebello Is - Sherry Lagoon Entrance	Link
Withnell Bay	Link
Holden Bay	Link
King Bay	Link
No Name Bay / No Name Beach	Link
Enderby Is -Dampier	Link
Rosemary Island - Dampier	Link

Legendre Is - Dampier	Link
Karratha Gas Plant	
KGP to Whitnell Creek	Link
KGP to Northern Shore	Link
KGP Fire Pond and Estuary	Link
KGP to No Name Creek	Link
Broome	
Sahul Shelf Submerged Banks and Shoals	Link
Clerke Reef (Rowley Shoals)	Link
Imperieuse Island (Rowley Shoals)	Link
Mermaid Reef (Rowley Shoals)	Link
Scott Reef	Link
Oiled Wildlife Response	
Exmouth	Link
Dampier region	Link
Shark Bay	Link

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/N-03000-FM0831-Report-of-an-Accident-Dangerous-Occurrence-or-Environmental-Incident-Rev-8-Jan-2015-MS-Word-2010.docx

APPENDIX F STAKEHOLDER CONSULTATION

Appendix F
Julimar Operations Environment Plan

January 2021
Revision: 2

TABLE OF CONTENTS

<u>Woodside Consultation Material</u>

1.1 Email sent to relevant stakeholders – 7 July 2020

Woodside sent the email below and Consultation Information Sheet below to:

- *Australian Customs Service – Border Protection Command*
- *Department of Industry, Science, Energy and Resources*
- *Department of Mines, Industry Regulation and Safety*
- *Australian Petroleum Production and Exploration Association*
- *Recfishwest*
- *Marine Tourism Association of Western Australia*
- *Charter boat, tourism and dive operators*

Dear Stakeholder

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.

Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:
The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.2 Woodside Consultation Information Sheet

Woodside

STAKEHOLDER CONSULTATION
INFORMATION SHEET

July 2020

JULIMAR OPERATIONS ENVIRONMENT PLAN

BARROW SUB-BASIN, NORTH-WEST AUSTRALIA

Woodside is submitting a revised Julimar Operations Environment Plan, in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations).

Environment Plans for operational facilities are required to be revised at least every five years.

The Environment Plan covers the existing Julimar Field Production System, which is operated by Woodside on behalf of a joint venture between Woodside Energy Julimar Pty Ltd (Woodside) as Operator (65%) and KUFPEC Australia (Julimar) Pty Ltd (35%).

The system supplies gas and condensate to the Chevron-operated Wheatstone Platform, which is covered under a separate Environment Plan.

The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

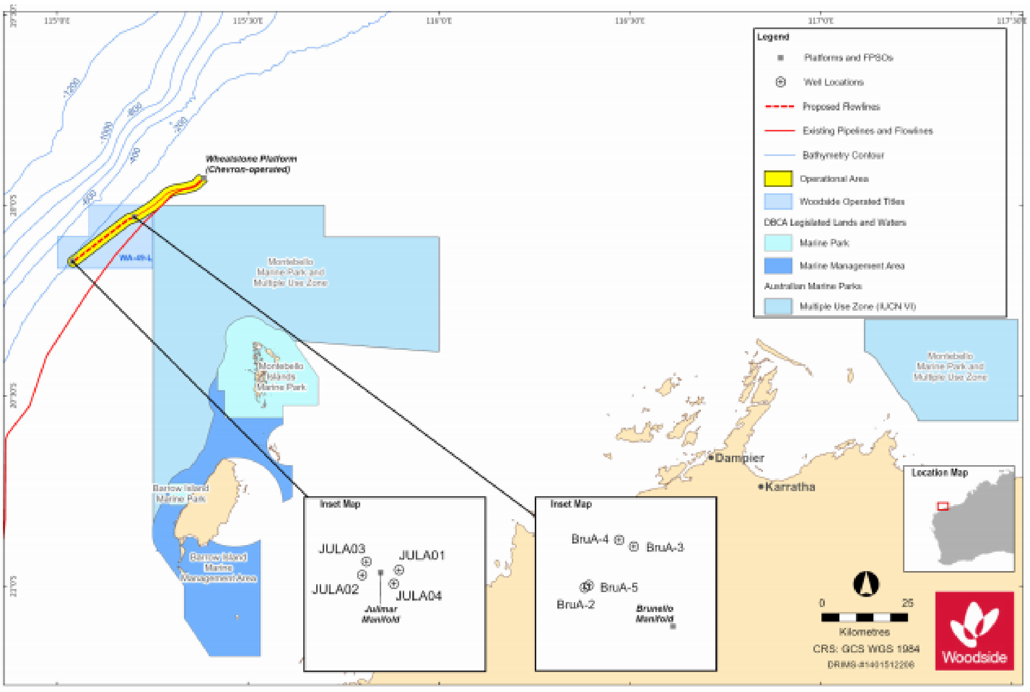


Figure 1. Petroleum Activity Program Operational Area

Table 1. Activity Summary

Julimar Field Production System	
Subsea infrastructure	The Julimar Field Production System comprises: + Up to fourteen Julimar and Brunello production wells + Three Julimar and Brunello production manifolds + One suspended Julimar field exploration well + Xmas trees, flowlines/pipeline and umbilicals
Distance to the nearest port	+ 160 km north-west of Dampier
Distance to the nearest marine park	+ Overlaps the Montebello Marine Park – Multiple Use Zone (Cth) + 41.5 km north-west of the Montebello Islands Marine Park (WA)
Water depth at Field Production System	+ 71 m – 174 m
Field Production System Commissioned	+ 2016

Table 2. Approximate Locations

Structure	Water Depth (m)	Longitude	Latitude	Permit Area
		Production Wells		
BruA-2	149 m	20°01'49.16" S	115°12'05.64" E	WA-49-L
BruA-3	149 m	20°01'47.87" S	115°12'07.05" E	WA-49-L
BruA-4	149 m	20°01'48.12" S	115°12'07.60" E	WA-49-L
BruA-5	149 m	20°01'49.66" S	115°12'05.76" E	WA-49-L
BruA-6	149 m	20°01'48.50" S	115°12'07.89" E	WA-49-L
JULA01	174 m	20° 08' 52.97" S	115° 02' 28.38" E	WA-49-L
JULA02	174 m	20° 08' 52.22" S	115° 02' 26.44" E	WA-49-L
JULA04	174 m	20° 08' 53.55" S	115° 02' 28.08" E	WA-49-L
JULA03	149 m	20° 08' 51.86" S	115° 02' 27.01 E	WA-49-L
		Exploration Well		
Julimar East – 1	171 m	20° 07 '09.07" S	115° 05 '48.45" E	WA-49-L
		Manifold		
BruA Crossover manifold	149 m	20°01'51.11" S	115°12'09.065" E	WA-49-L

Operations

The Julimar Field Production System consists of subsea wells, Xmas trees, manifolds, flowlines/pipelines and umbilicals.

The system produces gas and condensate from the Brunello field to the offshore Chevron-operated Wheatstone platform. It is proposed that the system will also produce from the Julimar field following the completion of start-up activities associated with phase two of the Julimar Development Project.

Gas and condensate from the Wheatstone Platform is then transported to the onshore Chevron-operated Wheatstone LNG facility for processing, storage and supply on LNG and condensate to customers.

The scope of this Environment Plan also includes the suspended exploration well Julimar East-1. The well is not tied-back and has no associated infrastructure. The well is managed under an accepted Well Operations Management Plan (WOMP) and is subject to a set inspection, monitoring, maintenance and repair activity schedule. Permanent plugging and abandonment of the well will be subject to a separate Environment Plan.

Activity Location

The Julimar Field Production System is located about 160 km north-west of Dampier, Western Australia, with petroleum activities undertaken in production licence areas WA-49-L, WA-26-PL and WA 29-PL. To support operations, vessel operations may also be undertaken within non-Julimar production licence areas WA-48-L and WA-34-L (see Figure 1).

The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipelines.

A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East-1.

A 250 m radius PSZ permanent exclusion zone will be in place around each of the Julimar Field Production System wells and crossover manifold.

Proposed Activities

The Julimar Field Production System normally operates 24 hours per day, 365 days per year. To ensure the integrity of the flowlines, a variety of different subsea activities may be undertaken.

Subsea Inspection

Inspection of subsea infrastructure is the process of physical verification and assessment of subsea components in order to detect changes compared to its installed state. Typical site inspection activities include visual surveys via a remotely-operated vehicle, side scan sonar surveillance, cathodic protection measurements and ultrasonic pipe condition checks.

Monitoring

Monitoring is the surveillance of the physical and chemical environment around subsea infrastructure. Monitoring activities may include process composition, corrosion probes, corrosion mitigation checks, and metocean and geological monitoring.

Repair

Repair activities are those required when a subsea system or component is degraded or damaged as defined by design codes.

Maintenance

Maintenance of subsea infrastructure is required at regular and/or planned intervals to maintain performance reliability and prevent deterioration or failure of equipment. Maintenance activities may include cycling of valves and leak pressure testing.

Julimar Development Phase 2 – Commissioning

The Julimar Development Phase 2 involves the tie-back of the Julimar field to existing Brunello subsea infrastructure connected to the offshore Chevron-Operated Wheatstone platform.

Commissioning activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons, will also be covered under the Environment Plan. Commissioning activities are scheduled to commence in 2021, subject to obtaining all relevant approvals, vessel availability and weather constraints.

Activity Vessels

Operations support vessels will be used to undertake inspection, maintenance and repair of subsea infrastructure. The vessel size and type will be dependent on the work scope.

Implications for Stakeholders

Woodside is consulting relevant shareholders whose functions, interests or activities may be affected by the proposed activities. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant stakeholders, considering timing, duration, location and potential impacts arising from petroleum activities.

A number of mitigation and management measures will be implemented and are summarised in Table 3. Further details will be provided in the Environment Plan.

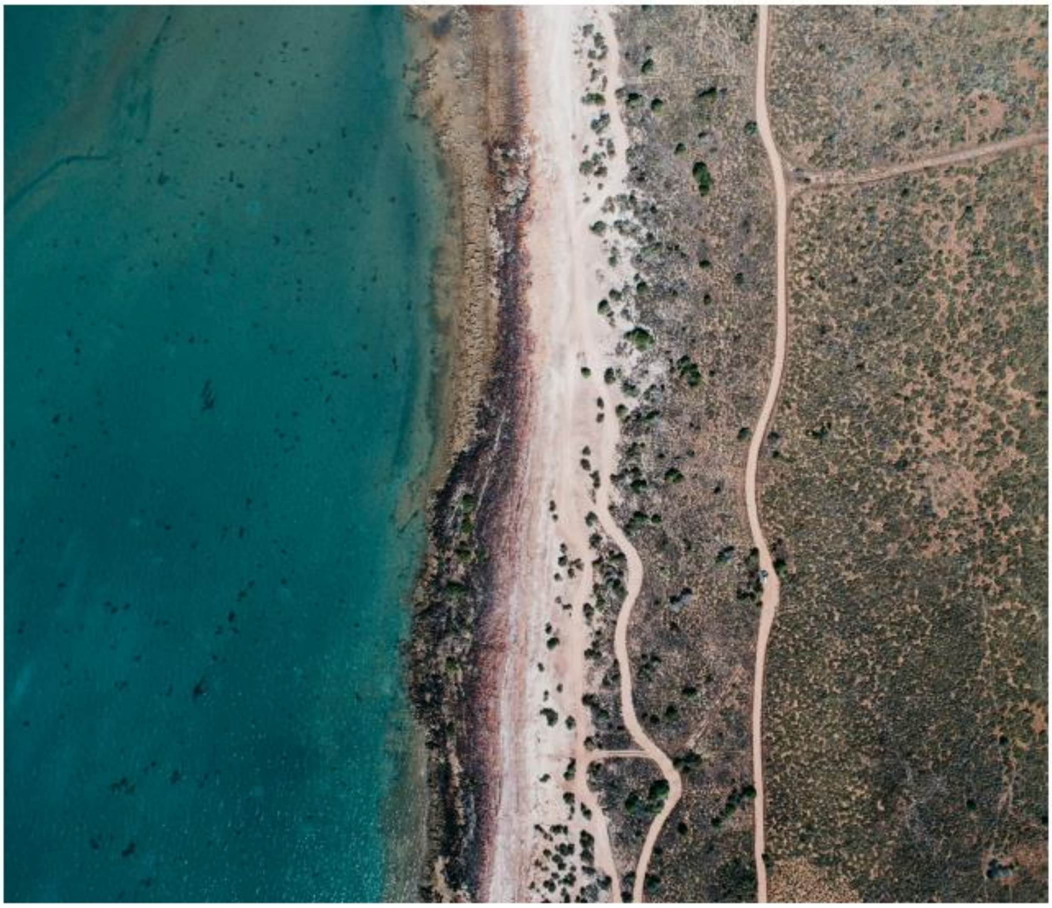


Table 3. Summary of key risks and/or impacts and management measures

Potential Risk and/or Impact	Mitigation and/or Management Measure
Planned	
Chemical use	+ Chemical use will be managed in accordance with Woodside chemical selection and approval procedures.
Interests of relevant stakeholders including: + Defense activities + Petroleum activities + Commercial and recreational fishing activities + Shipping activities	+ Consultation with relevant petroleum titleholders, commercial fishers and their representative organisations, and government departments and agencies will be conducted to inform decision making for the proposed activity and revision of the Environment Plan. + All vessels within the Operational Area will be required to adhere to the navigation safety requirements including the *Navigation Act 2012 (Cth)* and any subsequent Marine Orders.
Marine fauna interactions	+ Vessel masters will implement interaction management actions in accordance with the *Environment Protection and Biodiversity Conservation Regulations 2000 (Cth).*
Marine discharges	+ All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Physical presence of infrastructure on seafloor causing interference/displacement	+ Flowline locations will be marked on nautical charts, which state that vessels should avoid anchoring, trawling or conducting other underwater operations in the vicinity of the pipelines.
Vessel interaction	+ Navigational aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. + A 1500 m Operational Area will be implemented around the Julimar Field Production System subsea infrastructure, including wells and flowlines/ pipeline. + Commercial fishers and other marine users will be permitted to use but should take care when entering the Operational Area. + A 500 m radius PSZ will be implemented around the suspended exploration well Julimar East-1. + A 250 m radius PSZ will be implemented around each of the Julimar Field Production system wells and crossover manifold. + Stakeholder engagement activities will be conducted as part of the Environment Plan.
Waste generation	+ Waste generated on the vessels will be managed in accordance with applicable legislative requirements and a Waste Management Plan. + Waste will be managed and disposed of in a safe and environmentally responsible manner that aims to prevent accidental loss to the environment. + Waste transported onshore will be sent to appropriate recycling or disposal facilities by a licensed waste contractor.
Underwater Noise	+ Noise will be generated by support vessels. Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning.
Unplanned	
Hydrocarbon release	+ Appropriate spill response plans, equipment and materials will be in place and maintained. + Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of invasive marine species	+ All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species. + Australian biosecurity requirements and guidance will be complied with.

Providing feedback

Our intent is to minimise environmental and social impacts associated with the proposed activities, and we are seeking any interest or comments you may have to inform our decision making.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **Monday, 10 August 2020.**

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, 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).*

www.woodside.com.au

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.

Ben Bin Sali Grant, Corporate Affairs, Woodside Energy Ltd

E: Feedback@woodside.com.au | Toll free: 1800 442 977

Please note that stakeholder feedback will be communicated to NOPSEMA as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

Woodside

1.3 Email sent to AHO, AMSA – Marine Safety (7 July 2020)

Dear stakeholder

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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. Given the location of the operational area, a state shipping channel map is also attached.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1.

	A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Permit Area
Production Wells			
BruA-2	149m	20°01’49.16”S 115°12’05.64”E	WA-49-L
BruA-3	149m	20°01’47.87”S 115°12’07.05”E	WA-49-L
BruA-4	149m	20°01’48.12”S 115°12’07.60”E	WA-49-L
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	WA-49-L
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	WA-49-L
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	WA-49-L
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	WA-49-L
JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	WA-49-L
JULA03	149m	20° 08’ 51.86”S 115° 02’ 27.01E	WA-49-L
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	WA-49-L
Manifold			
BruA Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	WA-49-L

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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).

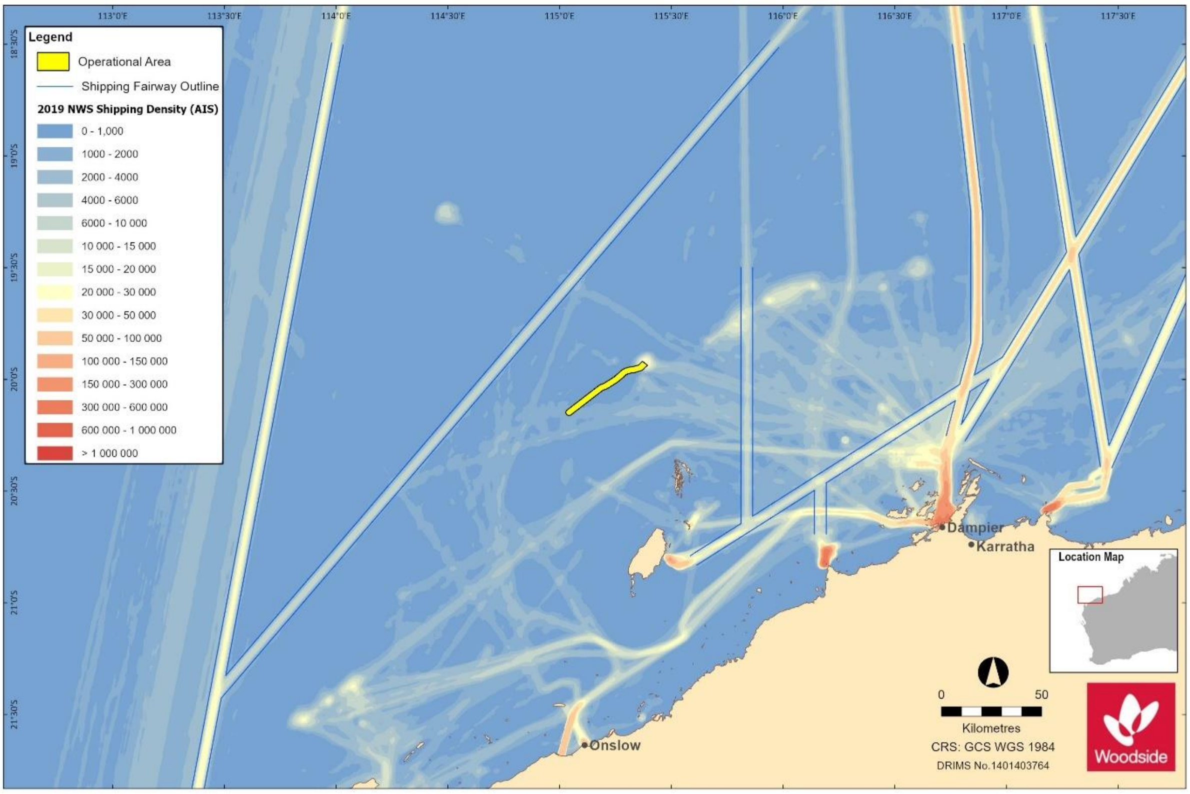
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.4 Shipping Lanes map sent to AHO, AMSA – Marine Safety (7 July 2020)



1.5 Email sent to AMSA Marine Pollution (7 July 2020)

Dear *[Redacted]*

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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.

We are currently developing our First Strike Response Plan for the planned activity, and will provide a final copy of this Plan to you if relevant to the proposed activity.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.6 Email sent to AMSA Marine Pollution (1 September 2020)

Dear *[Redacted]*

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise Australian Maritime Safety Authority (AMSA) that Woodside are preparing the *Julimar Operations Environment Plan* (five yearly update) and would like to offer AMSA the opportunity to review or provide comment on the activity.

Information is presented as follows:

- A Consultation Information Sheet is available on our website here, providing information on the proposed petroleum activities program.

- The revised *Nganhurra Cessation of Operations Oil Pollution 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 on 23rd October 2020 to support these activities.

Should you require additional information or have a comment to make about the proposed activity, please contact myself by close of business 6th October 2020 to allow us sufficient time to inform our activity planning and EP development.

Comments can be made by email, letter or by phone.

Please be aware that your feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under legislation.

We look forward to hearing from you.

Kind regards,

[Redacted]
Hydrocarbon Spill Adviser | Assessments & Plans | Security & Emergency Management

1.7 Email sent to DAWE (7 July 2020)

Dear Department of Agriculture, Water and the Environment,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

We have identified and assessed potential risks and impacts to active Commonwealth commercial fishers, biosecurity matters, and the marine environment that overlap the proposed Operational Area in the development of the proposed Environment Plan for this activity. These risks are summarised below.

Woodside has endeavoured to reduce these risks to an as low as reasonably practicable (ALARP) level.

An information sheet of is attached, which is also available on our website.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.

Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:
The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Commercial fishing:
Whilst three Commonwealth-managed fisheries overlap the proposed Operational Area, it is our assessment that licence holders will not be impacted based on ABARES fishing data. These fisheries are the Australian Southern Bluefin Tuna Fishery, the Western Skipjack Tuna Fishery and the Western Tuna and Billfish Fishery.

Fisheries were assessed for relevance on the basis of fishing licence overlap with the Operational Area, as well as consideration of government fishing effort data from recent years, fishing methods, and water depth.

Biosecurity:
With respect to the biosecurity matters, please note the following information below.

Environment description:	
The Operational Area is located on the middle continental shelf and the seabed is relatively flat and featureless, comprised of soft sediments. However it is noted that a large ridgeline intersect the North-west end of the Operational Area and the same area also contains small areas of calcernite outcroppings.	
Potential IMS risk	***IMS mitigation management***
Introduction or translocation and establishment of invasive marine species to the area via biofouling on vessels or within vessels ballast water systems.	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 issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.8 Email sent to Director of National Parks (3 August 2020)

Dear Director of National Parks,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters. The Environment Plan is being submitted in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

Proposed activities will run within Woodside-operated permit areas WA-49-L, WA-26-PL and WA-29-PL. To support operations, vessel operations may also be undertaken within non-Julimar production licence areas WA-48-L and WA-34-L.

The Julimar Field Production System normally operates 24 hours per day, 365 days per year.

We note Australian Government Guidance on consultation activities with respect to the proposed activities and confirm that:

- The proposed activities are within the boundaries of a proclaimed Commonwealth marine park, the Montebello Marine Park (Commonwealth).

- We have assessed potential risks to Commonwealth marine parks in the development of the proposed Environment Plan for this activity and believe that there are no credible risks as part of planned activities that have potential to impact marine park values.

- In the unlikely event of a loss of hydrocarbons, the worst case credible spill scenario assessed for this activity a loss of well integrity. For this consequence to occur, there must be a failure of multiple physical and procedural barriers within the well relevant to the activity. Given the controls in place to prevent and control loss of well control events and mitigate their consequences, it is considered that the risk associated with a loss of well integrity is managed to as low as reasonably practical. In the unlikely event of a loss of well integrity there is a risk of condensate entering the:
    - Montebello AMP
    - Argo – Rowley Terrace AMP
    - Gascoyne AMP
    - Ningaloo AMP and Ningaloo Coast WHA
    - Abrolhos AMP
    - Shark Bay AMP

- A Commonwealth Government approved oil spill response plan will be in place for the duration of the activities, which includes 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 a marine parks.

- The existing pipeline is within the Montebello AMP. The natural values of this AMP include:
    - foraging areas for Vulnerable and Migratory whale sharks
    - foraging areas adjacent to important nesting sites for marine turtle
    - part of the migratory pathway and resting area of the protected humpback whale
    - part of the Ancient coastline at 125 m depth contour KEF.

A Consultation Information Sheet about the planned activity is attached, which provides background on the activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

In line with Australian Government guidance on consultation with government agencies, can you please advise within 10 business days if you have any feedback on the proposed activity, noting that your feedback and our response will be included in an Environment Plan for consideration by the National Offshore Petroleum Safety and Environmental

Management Authority, as is required under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Comments can be made by email, letter or by phone.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.9 Email sent to DBCA (3 August 2020)

Dear Department of Biodiversity, Conservation and Attractions,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.

Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Permit Area
Production Wells			
BruA-2	149m	20°01’49.16”S 115°12’05.64”E	WA-49-L
BruA-3	149m	20°01’47.87”S 115°12’07.05”E	WA-49-L
BruA-4	149m	20°01’48.12”S 115°12’07.60”E	WA-49-L
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	WA-49-L
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	WA-49-L
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	WA-49-L
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	WA-49-L
JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	WA-49-L
JULA03	149m	20° 08’ 51.86”S 115° 02’ 27.01E	WA-49-L
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	WA-49-L
Manifold			

BruA Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	WA-49-L

With respect to the proposed activities Woodside confirms that:

- The proposed activities overlap the boundaries of a proclaimed Australian Marine Park, the Montebello Marine Park. The Montebello Marine Park is a Multiple Use Zone (IUCN VI) and ‘Mining operations’ are allowed subject to class approvals. The class approvals authorise activities undertaken in accordance with an Environment Plan accepted by NOPSEMA.
- The proposed activities are outside the boundaries of proclaimed State Marine Parks, the nearest being the Montebello Islands Marine Park, approximately 41.5 km to the south-east of the Operational Area.
- We have assessed potential risks to Australian Marine Parks and State Marine Parks in the development of the proposed Environment Plan for this activity 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 the remote likelihood event of a loss of well containment with a subsea condensate release. Given the controls in place to prevent and control a loss of well containment and mitigate their consequences, it is considered that the risk associated with loss of well containment and condensate release is managed to as low as reasonably practical (ALARP).
- In the unlikely event of a trunkline rupture there is a risk of condensate entering the following State managed Marine Parks:

    - Muiron Islands MMA
    - Clerke Reef State MP
    - Montebello Islands MP
    - Barrow Island MP

An oil spill response plan will be in place for the duration of the activities, which includes notification to relevant agencies and organisations as to the nature and scale of the event, as soon as practicable following an occurrence.

DBCA will be advised if an environmental incident occurs that may impact on the values of State managed Marine Parks.

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 31 August 2020.

Regards

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.10 Email sent to DPIRD (13 December 2019)

Dear *[Redacted]*

Woodside is submitting a revision of the Environment Plan for the existing operational Julimar Field Production System in Commonwealth waters (Permits WA-49-L, WA-26-PL and WA 29-PL.). Existing permanent exclusion zones for the Production System will be maintained (further details below on the location of these zones).

Operational plans like this are required to be revised every 5 years meaning, subject to approval, operations can continue. Start-up and ongoing hydrocarbon production activities from a separate activity called "*Julimar Development Phase 2"* will also be included in this Environment Plan.

An Information Sheet (available on our website) and a map of relevant fisheries are attached. Fisheries have been identified as being relevant based on fishing licence overlap, assessment of government fishing effort data (including Fishcube), fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment and have endeavoured to reduce these risks to an as low as reasonably practicable level.

Activity:

Summary:	Maintaining the existing operations for Julimar Field Production System, initially commissioned in 2016. Start-up and the introduction of hydrocarbons from a separate project called "Julimar Development Phase 2"
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	Activities occur 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area is 1500 m around the Julimar Field Production System subsea infrastructure, including wells,

	manifolds and flowlines/pipeline. Other marine users are able to access this area if safe to do so. A 500 m radius permanent exclusion zone will be in place around exploration well Julimar East – 1. A 250 m radius permanent exclusion zone will be in place around each of the production wells and the Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Production Wells			
BruA-2	149m	20°01’49.16”S 115°12’05.64”E	250 m radius
BruA-3	149m	20°01’47.87”S 115°12’07.05”E	250 m radius
BruA-4	149m	20°01’48.12”S 115°12’07.60”E	250 m radius
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	250 m radius
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	250 m radius
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	250 m radius
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	250 m radius
JULA03	149m	20° 08’ 51.86”S 115° 02’ 27.01E	250 m radius
JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	250 m radius
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	500 m radius
Manifold			
Brunello (BruA) Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	250 m radius

Potential risks to commercial fishing and proposed mitigation measures:

POTENTIAL RISK	RISK DESCRIPTION	MITIGATION AND/OR MANAGEMENT MEASURES
Planned		
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users. A 1500 m Operational Area around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East - 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and the Brunello (BruA) crossover manifold. Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. Stakeholder engagement activities will be conducted as part of the Environment Plan.
Underwater Noise	Noise will be generated by support vessels	Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning
Marine Discharges	Discharges from the operation of support 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 applicable legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable.
Unplanned		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of 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:

Should you have any feedback on the ongoing activity please provide your views by 24 August 2020. Comments can be made via email Feedback@woodside.com.au or by calling [redacted].

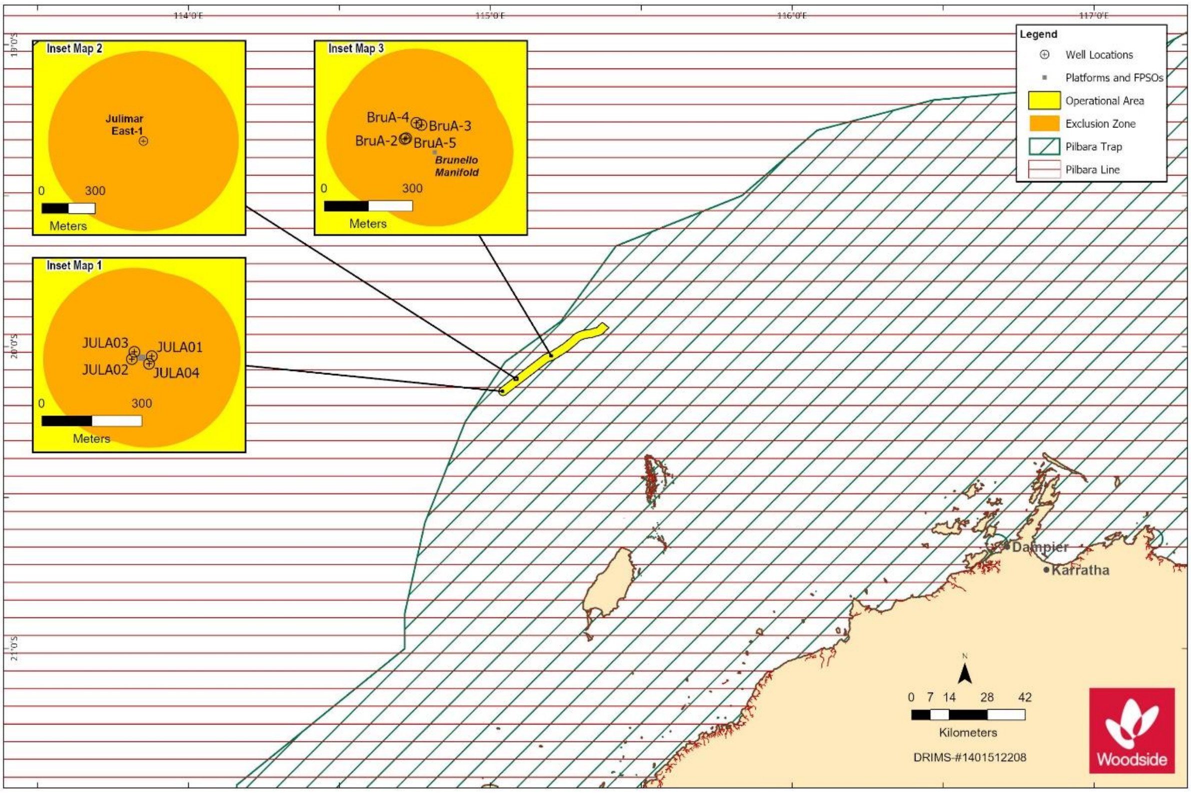
Your feedback and our response will be included in our Environment Plan, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). Please let us know if your feedback for this activity is sensitive as it will then remain confidential to NOPSEMA.

The Environment Plan is being submitted in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.11 State Fisheries map sent to PPA, DPIRD, WAFIC, Pilbara Line Fishery and Pilbara Trap Fishery licence holders (13 July 2020; 15 July 2020; 20 July 2020))



1.12 Email sent to DoT (7 July 2020)

Dear Department of Transport,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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.

We are currently developing our First Strike Response Plan for the planned activity, and will provide a final copy of this Plan to you if relevant to the proposed activity.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.

Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:
The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.13 Email sent to DoT (1 September 2020)

Good Morning *[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 are preparing the *Julimar Operations Environment Plan* (five yearly update) and would like to offer DoT the opportunity to review or provide comment on the activity.

Information is presented as follows:

- A Consultation Information Sheet is available on our website here providing information on the proposed petroleum activities program.
- The revised Julimar Operations Oil Pollution 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)*.
- In the table below, as requested in the Offshore Petroleum Industry Guidance Note (July 2020) and from recent engagement activities between DoT-Woodside, responses to the information requirements in a succinct summary and source of information.

Woodside propose to submit an EP on 23rd October 2020 to support these activities.

Should you require additional information or have a comment to make about the proposed activity, please contact myself by close of business 6th October 2020 to allow us sufficient time to inform our activity planning and EP development.

Comments can be made by email, letter or by phone.

Please be aware that your feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), as is required under legislation.

We look forward to hearing from you.

Kind regards,
[Redacted]

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
Amenability of oil to dispersants and window of opportunity for dispersant efficacy.	No dispersant testing on Brunello Condensate undertaken. All WCCS' result in surface concentrations below thresholds suitable for dispersants. Spreading and weathering of surface oil occurs rapidly due to loss of light, volatile compounds.
Description of existing environment and protection priorities.	Hydrocarbon spill modelling confirmed no sensitive receptors predicted to be contacted above threshold levels – Section 4 of First Strike Plan
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).	Unplanned loss of containment events from the Petroleum Activities Program have been identified during the risk assessment process (presented in 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. Three unplanned events or credible spill scenarios for the Petroleum Activities Program have 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. Three WCCS for the activity have been used for response planning purposes 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.
Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines.	Hydrocarbon spill modelling confirmed no sensitive receptors predicted to be contacted above threshold levels under any WCCS.
Details on initial response actions and key activation timeframes.	Included in Section 2 and 3 of the First Strike Plan
Potential Incident Control Centre arrangements.	Included in Appendix F and G 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 F and G of the First Strike Plan
Details on testing of arrangements of OPEP/OSCP.	**Summary of Exercises Relating to Julimar Operations** **Exercise** | **Timing** | **Relevant Document**

Woodside: Vessel based (at-site initial actions)	Within two weeks of arriving on location to commence activities (only required if vessel is in the Operational Area for >2 weeks). There is no need to re-test with the same vessel returns to the Operational Area within 12 months.	Woodside *Julimar Operations Oil Pollution First Strike Plan* (JU-00-R1-10005).
Chevron and Woodside Desktop Wheatstone Platform/Julimar incident.	Chevron platform to conduct a level one, facility based exercise within the first two weeks of introduction of hydrocarbons to the Julimar Field Production System.	Chevron *Wheatstone Platform ERP* (Chevron Doc. WS2-COP-00046) for initial response actions and control. Woodside *Julimar Operations Oil Pollution First Strike Plan* (JU-00-R1-10005).
	Within 6 months of the introduction of hydrocarbons to the Julimar Field Production System, involving the CICC and.	
Chevron or Woodside	Annually, after the initial 6 month period, involving the CICC and, defined above, ongoing.	

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 Doc No. 10058092).

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 (Woodside Doc No. 10058092) 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	1. A summary of the Julimar subsea infrastructure (well names/reservoirs) will be included in the final OPEP to assist with initial actions. 2. The emergency response exercise commitments are being formally reviewed by Chevron to ensure alignment with current arrangements.

Regards,

[Redacted]
Hydrocarbon Spill Adviser | Assessments & Plans | Security & Emergency Management
Woodside Energy Ltd

1.14 Email sent to Pilbara Demersal Scalefish Fishery – Pilbara Trap Fishery Licence Holders (20 July 2020)

Dear Pilbara Trap Licence Holder,

Woodside is submitting a revision of the Environment Plan for the existing operational Julimar Field Production System in Commonwealth waters (Permits WA-49-L, WA-26-PL and WA 29-PL.). Existing permanent exclusion zones for the Production System will be maintained (further details below on the location of these zones).

Operational plans like this are required to be revised every 5 years meaning, subject to approval, operations can continue. Start-up and ongoing hydrocarbon production activities from a separate activity called "*Julimar Development Phase 2"* will also be included in this Environment Plan.

An Information Sheet (available on our website) and a map of relevant fisheries are attached. Fisheries have been identified as being relevant based on fishing licence overlap, assessment of government fishing effort data (including Fishcube), fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment and have endeavoured to reduce these risks to an as low as reasonably practicable level.

Activity:

Summary:	Maintaining the existing operations for Julimar Field Production System, initially commissioned in 2016. Start-up and the introduction of hydrocarbons from a separate project called "Julimar Development Phase 2"
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	Activities occur 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. Other marine users are able to access this area if safe to do so.

	A 500 m radius permanent exclusion zone will be in place around exploration well Julimar East – 1. A 250 m radius permanent exclusion zone will be in place around each of the production wells and the Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Production Wells			
BruA-2	149m	20°01'49.16"S 115°12'05.64"E	250 m radius
BruA-3	149m	20°01'47.87"S 115°12'07.05"E	250 m radius
BruA-4	149m	20°01'48.12"S 115°12'07.60"E	250 m radius
BruA-5	149m	20°01'49.66"S 115°12'05.76"E	250 m radius
BruA-6	149m	20°01'48.50"S 115°12'07.89"E	250 m radius
JULA01	174 m	20° 08' 52.97"S 115° 02' 28.38"E	250 m radius
JULA02	174 m	20° 08' 52.22"S 115° 02' 26.44"E	250 m radius
JULA03	149m	20° 08' 51.86"S 115° 02' 27.01E	250 m radius
JULA04	174 m	20° 08' 53.55"S 115° 02' 28.08"E	250 m radius
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07"S 115° 05 '48.45"E	500 m radius
Manifold			
Brunello (BruA) Crossover manifold	149m	20°01'51.11"S 115°12'09.065"E	250 m radius

Potential risks to commercial fishing and proposed mitigation measures:

POTENTIAL RISK	RISK DESCRIPTION	MITIGATION AND/OR MANAGEMENT MEASURES
Planned		
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users. A 1500 m Operational Area around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East - 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and the Brunello (BruA) crossover manifold. Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. Stakeholder engagement activities will be conducted as part of the Environment Plan.
Underwater Noise	Noise will be generated by support vessels	Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning
Marine Discharges	Discharges from the operation of support 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 applicable legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Unplanned		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of 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:
Should you have any feedback on the ongoing activity please provide your views by 24 August 2020. Comments can be made via email Feedback@woodside.com.au or by calling [redacted]

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). Please let us know if your feedback for this activity is sensitive as it will then remain confidential to NOPSEMA.

The Environment Plan is being submitted in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.15 Email sent to Pilbara Demersal Scalefish Fishery – Pilbara Line Fishery Licence Holders (20 July 2020)

Dear Pilbara Line Licence Holder,

Woodside is submitting a revision of the Environment Plan for the existing operational Julimar Field Production System in Commonwealth waters (Permits WA-49-L, WA-26-PL and WA 29-PL.). Existing permanent exclusion zones for the Production System will be maintained (further details below on the location of these zones).

Operational plans like this are required to be revised every 5 years meaning, subject to approval, operations can continue. Start-up and ongoing hydrocarbon production activities from a separate activity called "*Julimar Development Phase 2"* will also be included in this Environment Plan.

An Information Sheet (available on our website) and a map of relevant fisheries are attached. Fisheries have been identified as being relevant based on fishing licence overlap, assessment of government fishing effort data (including Fishcube), fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment and have endeavoured to reduce these risks to an as low as reasonably practicable level.

Activity:

Summary:	Maintaining the existing operations for Julimar Field Production System, initially commissioned in 2016. Start-up and the introduction of hydrocarbons from a separate project called "Julimar Development Phase 2"
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m

Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	Activities occur 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. Other marine users are able to access this area if safe to do so. A 500 m radius permanent exclusion zone will be in place around exploration well Julimar East – 1. A 250 m radius permanent exclusion zone will be in place around each of the production wells and the Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Production Wells			
BruA-2	149m	20°01’49.16”S 115°12’05.64”E	250 m radius
BruA-3	149m	20°01’47.87”S 115°12’07.05”E	250 m radius
BruA-4	149m	20°01’48.12”S 115°12’07.60”E	250 m radius
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	250 m radius
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	250 m radius
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	250 m radius
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	250 m radius

JULA03	149m	20° 08’ 51.86”S 115° 02’ 27.01E	250 m radius
JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	250 m radius
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	500 m radius
Manifold			
Brunello (BruA) Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	250 m radius

Potential risks to commercial fishing and proposed mitigation measures:

POTENTIAL RISK	RISK DESCRIPTION	MITIGATION AND/OR MANAGEMENT MEASURES
Planned		
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users. A 1500 m Operational Area around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East - 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and the Brunello (BruA) crossover manifold. Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. Stakeholder engagement activities will be conducted as part of the Environment Plan.
Underwater Noise	Noise will be generated by support vessels	Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning
Marine Discharges	Discharges from the operation of support 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 applicable legislative and regulatory requirements and Woodside’s Environmental Performance Standards where applicable.

Unplanned		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of 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:
Should you have any feedback on the ongoing activity please provide your views by 24 August 2020. Comments can be made via email Feedback@woodside.com.au or by calling [redacted]

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). Please let us know if your feedback for this activity is sensitive as it will then remain confidential to NOPSEMA.

The Environment Plan is being submitted in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.16 Email sent to adjacent titleholder, Chevron (7 July 2020)

Dear *[Redacted]*

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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. A map of adjacent titles relevant to the proposed activity is also attached.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction

	of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and crossover manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:
The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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).

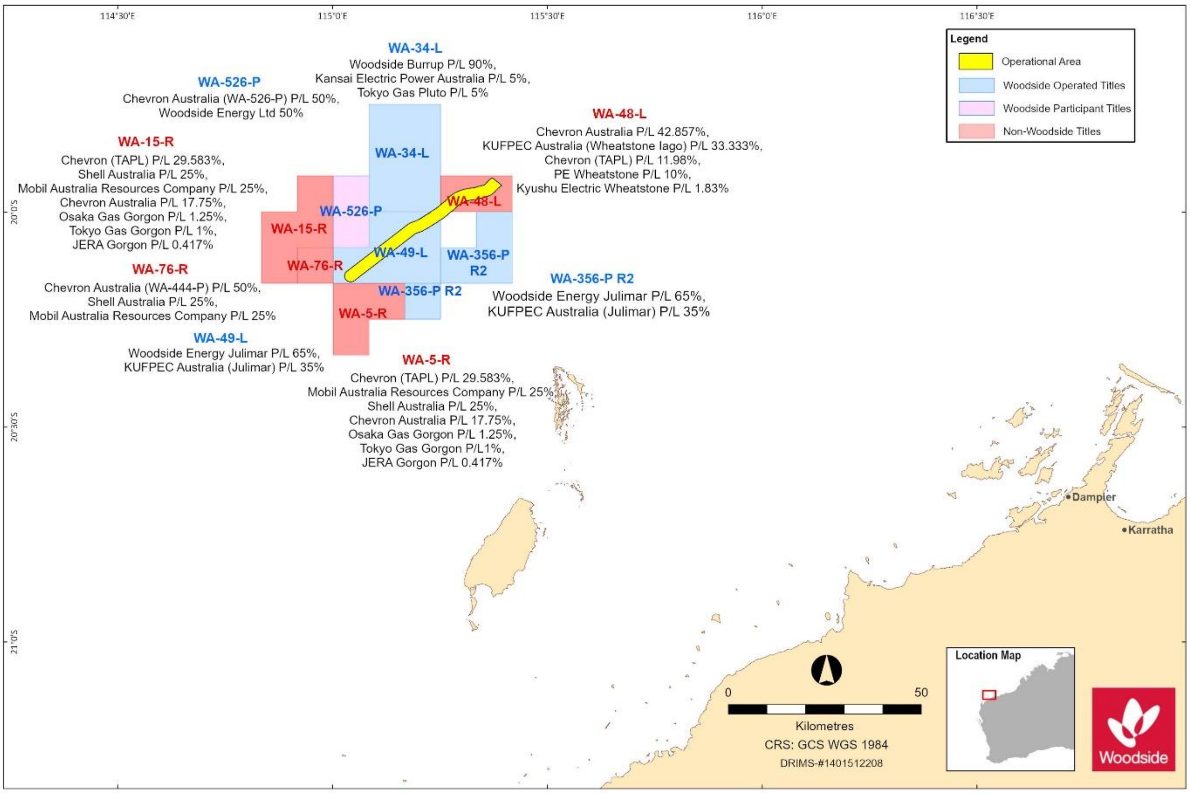
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.17 Titles map sent to adjacent titleholder, Chevron (7 July 2020)



1.18 Email sent to PPA (20 July 2020)

Dear *[Redacted]*

Woodside is submitting a revision of the Environment Plan for the existing operational Julimar Field Production System in Commonwealth waters (Permits WA-49-L, WA-26-PL and WA 29-PL.). Existing permanent exclusion zones for the Production System will be maintained (further details below on the location of these zones).

Operational plans like this are required to be revised every 5 years meaning, subject to approval, operations can continue. Start-up and ongoing hydrocarbon production activities from a separate activity called "*Julimar Development Phase 2*" will also be included in this Environment Plan.

An Information Sheet (available on our website) and a map of relevant fisheries are attached. Fisheries have been identified as being relevant based on fishing licence overlap, assessment of government fishing effort data (including Fishcube), fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment and have endeavoured to reduce these risks to an as low as reasonably practicable level.

Activity:

Summary:	Maintaining the existing operations for Julimar Field Production System, initially commissioned in 2016. Start-up and the introduction of hydrocarbons from a separate project called "Julimar Development Phase 2"
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	Activities occur 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. Other marine users are able to access this area if safe to do so. A 500 m radius permanent exclusion zone will be in place around exploration well Julimar East – 1. A 250 m radius permanent exclusion zone will be in place around each of the production wells and the Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Production Wells			
BruA-2	149m	20°01'49.16"S 115°12'05.64"E	250 m radius
BruA-3	149m	20°01'47.87"S 115°12'07.05"E	250 m radius
BruA-4	149m	20°01'48.12"S	250 m radius

		115°12’07.60”E	
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	250 m radius
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	250 m radius
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	250 m radius
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	250 m radius
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JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	250 m radius
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	500 m radius
Manifold			
Brunello (BruA) Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	250 m radius

Potential risks to commercial fishing and proposed mitigation measures:

POTENTIAL RISK	RISK DESCRIPTION	MITIGATION AND/OR MANAGEMENT MEASURES
Planned		
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users. A 1500 m Operational Area around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East - 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and the Brunello (BruA) crossover manifold. Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. Stakeholder engagement activities will be conducted as part of the Environment Plan.
Underwater Noise	Noise will be generated by support vessels	Due to the low acoustic source levels associated with vessel operations there is not

		likely to be any interaction or potential impact to fish hearing, feeding or spawning
Marine Discharges	Discharges from the operation of support 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 applicable legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Unplanned		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of 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:

Should you have any feedback on the ongoing activity please provide your views by 24 August 2020. Comments can be made via email Feedback@woodside.com.au or by calling [redacted].

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). Please let us know if your feedback for this activity is sensitive as it will then remain confidential to NOPSEMA.

The Environment Plan is being submitted in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.19 Email sent to WAFIC (13 July 2020)

Dear *[Redacted]*,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

We have identified potential impacts to active commercial fishers and the environment and have endeavoured to reduce these risks to an as low as reasonably practicable level. Further information is below.

An Information Sheet (available on our website) and a map of relevant fisheries are attached.

Fisheries have been identified as being relevant based on fishing licence overlap, assessment of government fishing effort data (including Fishcube), fishing methods and water depth.

Individual licence holders will be advised following your consideration of this information.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.
Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1.

	A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Permit Area
Production Wells			
BruA-2	149m	20°01’49.16”S 115°12’05.64”E	WA-49-L
BruA-3	149m	20°01’47.87”S 115°12’07.05”E	WA-49-L
BruA-4	149m	20°01’48.12”S 115°12’07.60”E	WA-49-L
BruA-5	149m	20°01’49.66”S 115°12’05.76”E	WA-49-L
BruA-6	149m	20°01’48.50”S 115°12’07.89”E	WA-49-L
JULA01	174 m	20° 08’ 52.97”S 115° 02’ 28.38”E	WA-49-L
JULA02	174 m	20° 08’ 52.22”S 115° 02’ 26.44”E	WA-49-L
JULA03	149m	20° 08’ 51.86”S 115° 02’ 27.01E	WA-49-L
JULA04	174 m	20° 08’ 53.55”S 115° 02’ 28.08”E	WA-49-L
Exploration Well			
Julimar East – 1	171m	20° 07 '09.07”S 115° 05 '48.45”E	WA-49-L
Manifold			
Brunello (BruA) Crossover manifold	149m	20°01’51.11”S 115°12’09.065”E	WA-49-L

Potential risks to commercial fishing and proposed mitigation measures:

POTENTIAL RISK	RISK DESCRIPTION	MITIGATION AND/OR MANAGEMENT MEASURES
Planned		
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Use of navigational aids and practices as required by Maritime Regulations to minimise impact on other marine users. A 1500 m Operational Area around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East - 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and the Brunello (BruA) crossover manifold. Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. Stakeholder engagement activities will be conducted as part of the Environment Plan.
Underwater Noise	Noise will be generated by support vessels	Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning
Marine Discharges	Discharges from the operation of support 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 applicable legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Unplanned		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained. Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of 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:
Should you require further information as part of the WAFIC fee-for-service, as outlined in our letter of 12 September 2019, please let me know.

We would appreciate any feedback by **20 July 2020** and subject to any comments, we would then consult individual Licence Holders (noting we will provide the Licence Holders with up to 30 days to respond).

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.

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

Woodside Energy Ltd

1.20 Email sent to Department of Defence (7 July 2020)

Dear *[Redacted]*,

Dear Department of Defence,

Woodside is submitting a revision of the Operational Environment Plan for the existing Julimar Field Production System in Commonwealth waters.

The Environment Plan is being submitted in accordance with the the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth), which require Operational Environment Plans to be revised every five years. The Environment Plan also covers activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons.

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. A map of practice and training defence areas is also attached.
.

Activity:

Summary:	To maintain operations there is a need to ensure the integrity of the Julimar Field Production System via a variety of different subsea activities, including subsea inspection, monitoring, maintenance and repairs. Commissioning activities for Julimar Development Phase 2 starting from when the system is ready for the introduction of hydrocarbons will also be covered under the Environment Plan.

Location:	160 km north-west of Dampier
Approximate Water Depth (m)	71 m – 174 m
Schedule:	Ongoing operations for the duration of the five-year Environment Plan. Commissioning activities for Julimar Development Phase 2 are scheduled to commence in mid-2021, subject to subject to approvals, vessel availability and weather constraints.
Duration:	The Julimar Field Production System normally operate 24 hours per day, 365 days per year.
Relevant State Fisheries	Pilbara Demersal Scalefish Fisheries – Pilbara Trap and Pilbara Line
Exclusionary/Cautionary Zone:	The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells, manifolds and flowlines/pipeline. A 500 m radius Petroleum Safety Zone (PSZ) permanent exclusion zone, will be in place around the suspended exploration well Julimar East – 1. A 250 m radius PSZ permanent exclusion zone, will be in place around each of the Julimar Field Production system wells and Brunello crossover manifold. There is no permanent exclusion zone around the Julimar manifold.
Vessels:	Operations support vessel(s) will be used, with the number, size and type of vessel(s) dependent on the work scope and water depth.

Activity locations:

The location and water depth of the production wells, exploration well, and manifold can be found in the attached Consultation Information Sheet.

Feedback:

If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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).

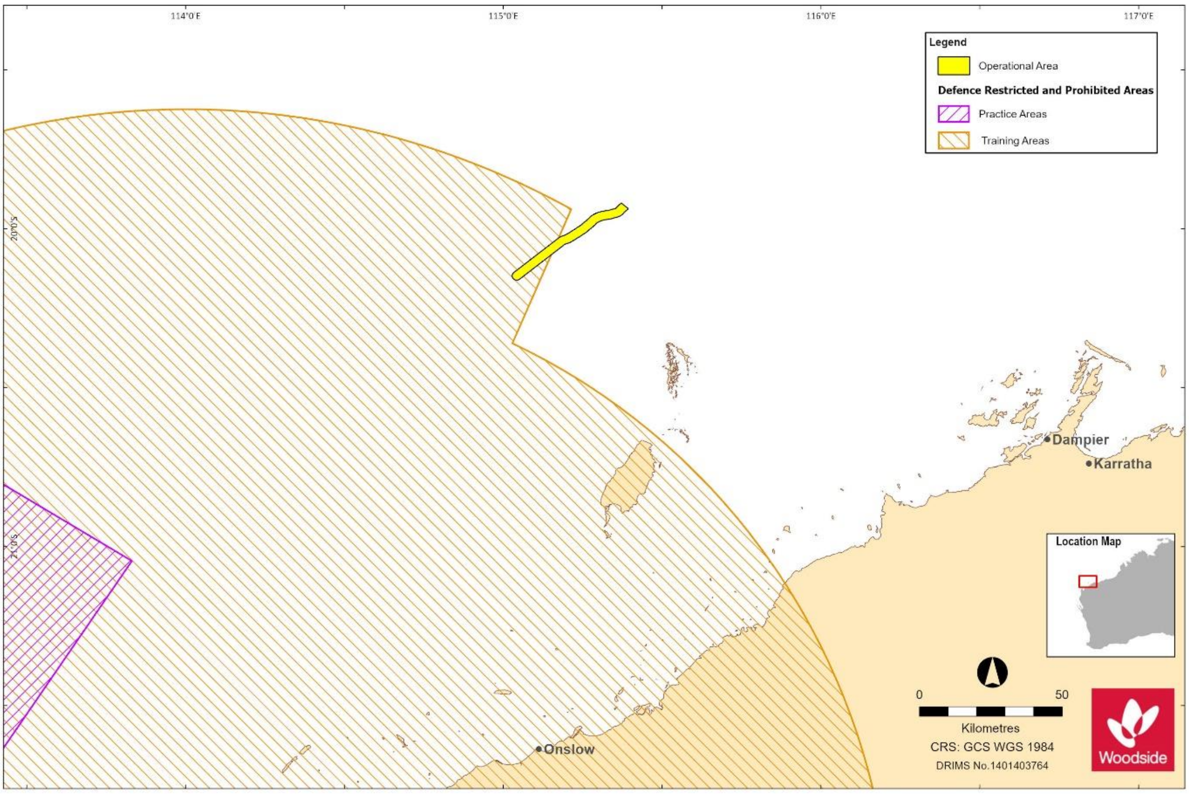
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 10 August 2020.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.21 Defence areas map sent to Department of Defence (7 July 2020)



1.22 Email to relevant stakeholders – 6 January 2021

Woodside sent the email below and Consultation Information Sheet – Additional Information below to:

- *Australian Customs Service – Border Protection Command*
- *Department of Industry, Science, Energy and Resources*
- *Department of Mines, Industry Regulation and Safety*
- *Australian Petroleum Production and Exploration Association*
- *Recfishwest*
- *Marine Tourism Association of Western Australia*
- *Charter boat, tourism and dive operators*
- *Department of Agriculture, Water and the Environment*
- *AMSA – Marine Pollution*
- *Department of Biodiversity, Conservation and Attractions*
- *Director of National Parks*
- *Department of Transport*

Dear Stakeholder,

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

In addition, the permanent exclusion zones for the production wells (as previously advised and listed in the email below) will now not apply. Permanent exclusions zone will only apply around the Brunello and Julimar manifolds as listed in the table below.

Our consultation Information Sheet has also been updated to include these changes.

No change to environmental risks has resulted from the inclusion of the additional exploration wells within the scope of the Environment Plan.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Exploration Well			
Julimar Southeast – 1	156 m	20°9'7.05" S 115°3'58.89" E	None will apply
Grange – 1 – WA	177 m	20°5'8.37" S 115°5'40.74" E	
Brulimar – 1	171 m	20°0'18.26" S 115°11'4.99" E	
Brunello – 1ST1	151 m	20°3'1.96" S 115°10'25.36" E	
Balnaves Deep – 1	135 m	20°4'58.21" S 115°10'34.19" E	
Julimar East - 1	171 m	20°6'23.21" S 115°5'7.97" E	
Manifold			
Brunello manifold	149 m	20°01’49.0788” S 115°12’06.8670” E	250 m radius

Julimar manifold	174 m	20° 08 '52.917" S 115° 02 '27.23" E	250 m radius

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.23 Woodside Consultation Information Sheet – Additional Information

Woodside

STAKEHOLDER CONSULTATION

INFORMATION SHEET

ADDITIONAL INFORMATION

January 2021

JULIMAR OPERATIONS ENVIRONMENT PLAN

BARROW SUB-BASIN, NORTH-WEST AUSTRALIA

Woodside is submitting a revised Julimar Operations Environment Plan, in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (the regulations).

Environment Plans for operational facilities are required to be revised at least every five years.

The Environment Plan covers the existing Julimar Field Production System, which is operated by Woodside on behalf of a joint venture between Woodside Energy Julimar Pty Ltd (Woodside) as Operator (65%) and KUFPEC Australia (Julimar) Pty Ltd (35%).

The system supplies gas and condensate to the Chevron-operated Wheatstone Platform, which is covered under a separate Environment Plan.

The Environment Plan also covers activities for Julimar Development Phase 2 (JDP2), starting from when the system is ready for the introduction of hydrocarbons as well as six temporarily abandoned exploration wells.

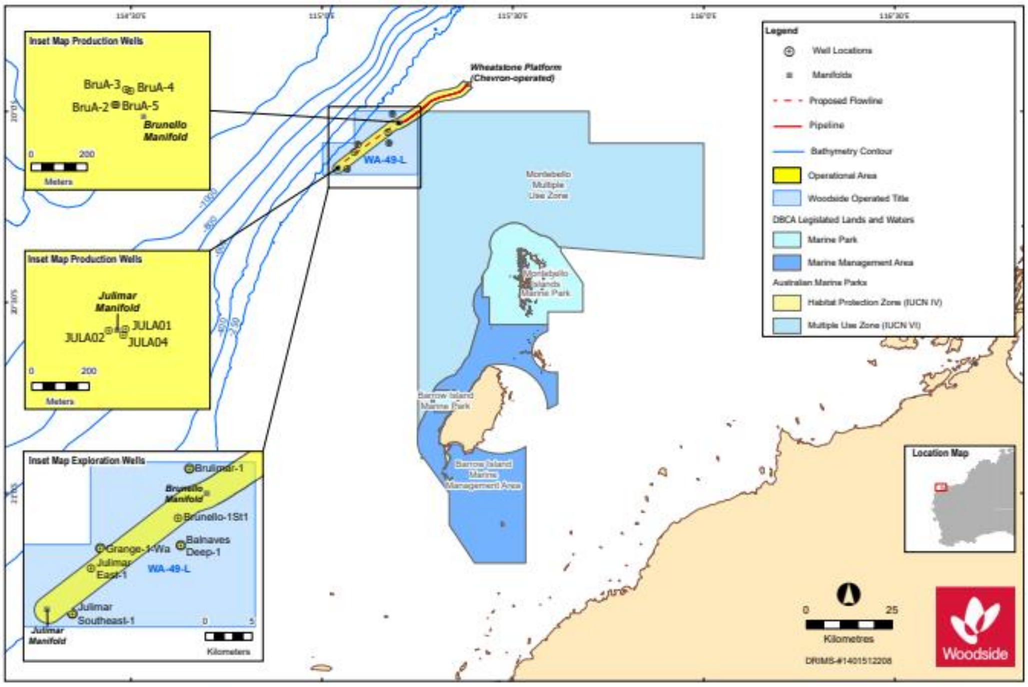


Figure 1. Petroleum Activity Program Operational Area

Table 1. Activity Summary

Julimar Operations Environment Plan	
Subsea infrastructure	+ Up to fourteen Julimar and Brunello production wells + Three Julimar and Brunello production manifolds + Xmas trees, flowlines/pipeline and umbilicals + Six Julimar and Brunello temporarily abandoned exploration wells
Distance to the nearest port	+ 160 km north-west of Dampier
Distance to the nearest marine park	+ Overlaps the Montebello Marine Park – Multiple Use Zone (Cth) + 38.4 km north-west of the Montebello Islands Marine Park (WA)
Water depth at Field Production System	+ 71 m – 177 m
Field Production System Commissioned	+ 2016

Table 2. Approximate Locations

Structure	Water Depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Production Wells					
BruA-2	149 m	20°01'49.16" S	115°12'05.64" E	None will apply	WA-49-L
BruA-3	149 m	20°01'47.87" S	115°12'07.05" E	None will apply	WA-49-L
BruA-4	149 m	20°01'48.12" S	115°12'07.60" E	None will apply	WA-49-L
BruA-5	149 m	20°01'49.66" S	115°12'05.76" E	None will apply	WA-49-L
BruA-6	149 m	20°01'48.50" S	115°12'07.89" E	None will apply	WA-49-L
JULA01	174 m	20° 08' 52.97" S	115° 02' 28.38" E	None will apply	WA-49-L
JULA02	174 m	20° 08' 52.22" S	115° 02' 26.44" E	None will apply	WA-49-L
JULA04	174 m	20° 08' 53.55" S	115° 02' 28.08" E	None will apply	WA-49-L
Exploration Wells					
Julimar Southeast – 1	156 m	20°9'7.05" S	115°3'58.89" E	None will apply	WA-49-L
Grange – 1 – WA	177 m	20°5'8.37" S	115°5'40.74" E	None will apply	WA-49-L
Brulimar – 1	171m	20°0'18.26" S	115°11'4.99" E	None will apply	WA-49-L
Brunello – 1ST1	151 m	20°3'1.96" S	115°10'25.36" E	None will apply	WA-49-L
Balnaves Deep – 1	135 m	20°4'58.21" S	115°10'34.19" E	None will apply	WA-49-L
Julimar East-1	171 m	20° 07 '09.07" S	115° 05 '48.45" E	None will apply	WA-49-L
Manifolds					
BruA manifold	149 m	20°01'51.11" S	115°12'09.065" E	A 250m radius around the manifold	WA-49-L
JULA manifold	174 m	20° 08 '52.917" S	115° 02 '27.23" E	A 250m radius around the manifold	WA-49-L
Pipelines and Flowlines					
Brunello, Julimar, MEG pipeline/ production flowline corridor	148 m (start) 71 m (end)	20°01'51.7586" S (start) 19°55'45.776" S (end)	115°12'11.3265" E (start) 115°23'02.215" E (end)	None will apply	WA-49-L
JDP2 Flowline / Umbilical Route	145 m (start) 174 m (end)	20° 01 '53.43" S (start) 20° 08 '52.917" S (end)	115° 12 '09.28" E (start) 115° 02 '27.23" E (end)	None will apply	WA-49-L

Operations

The Julimar Field Production System consists of subsea wells, Xmas trees, manifolds, flowlines/pipelines and umbilicals.

The system produces gas and condensate from the Brunello field to the offshore Chevron-Operated Wheatstone platform. It is proposed that the system will also produce from the Julimar field following the completion of start-up activities associated with phase two of the Julimar Development Project.

Gas and condensate from the Wheatstone Platform is then transported to the onshore Chevron-operated Wheatstone LNG facility for processing, storage and supply on LNG and condensate to customers.

Activity Location

The Julimar Field Production System is located about 160 km north-west of Dampier, Western Australia, with petroleum activities undertaken in production licence areas WA-49-L. To support operations, vessel operations may also be undertaken within non-Julimar production licence areas WA-356-P and WA-34-L.

The Operational Area for this Environment Plan is 1500 m around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline.

A 250m radius PSZ permanent exclusion zone, will be in place around the Julimar and Brunello manifolds.

Proposed Activities - Operations

The Julimar Field Production System normally operates 24 hours per day, 365 days per year. To ensure the integrity of the flowlines, a variety of different subsea activities may be undertaken.

Subsea Inspection

Inspection of subsea infrastructure is the process of physical verification and assessment of subsea components in order to detect changes compared to its installed state. Typical site inspection activities include visual surveys via a remotely operated vehicle, side scan sonar surveillance, cathodic protection measurements and ultrasonic pipe condition checks.

Monitoring

Monitoring is the surveillance of the physical and chemical environment around subsea infrastructure. Monitoring activities may include process composition, corrosion probes, corrosion mitigation checks, and metocean and geological monitoring.

Repair

Repair activities are those required when a subsea system or component is degraded or damaged as defined by design codes.

Maintenance

Maintenance of subsea infrastructure is required at regular and/or planned intervals to maintain performance reliability and prevent deterioration or failure of equipment. Maintenance activities may include cycling of valves and leak pressure testing.

Proposed Activities - Julimar Development Phase 2 – Commissioning

The Julimar Development Phase 2 involves the tie-back of the Julimar field to existing Brunello subsea infrastructure connected to the offshore Chevron-Operated Wheatstone platform.

Commissioning activities for Julimar Development Phase 2, starting from when the system is ready for the introduction of hydrocarbons, will also be covered under the Environment Plan. Commissioning activities are scheduled to commence in 2021, subject to obtaining all relevant approvals, vessel availability and weather constraints.

Proposed Activities - Exploration wells

The scope of this Environment Plan also includes five temporarily abandoned exploration wells. These wells are not tied-back and do not have any associated infrastructure. The wells are managed under accepted Well Operations Management Plans (WOMP) and are subject to a set inspection, monitoring, maintenance and repair activity schedules. Decommissioning of the wells will be subject to a separate Environment Plan.

Activity Vessels

Operations support vessels will be used to undertake inspection, maintenance and repair of subsea infrastructure. The vessel size and type will be dependent on the work scope.

Implications for Stakeholders

Woodside is consulting relevant shareholders whose functions, interests or activities may be affected by the proposed activities. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant stakeholders, considering timing, duration, location and potential impacts arising from petroleum activities.

A number of mitigation and management measures will be implemented and are summarised in Table 3. Further details will be provided in the Environment Plan.

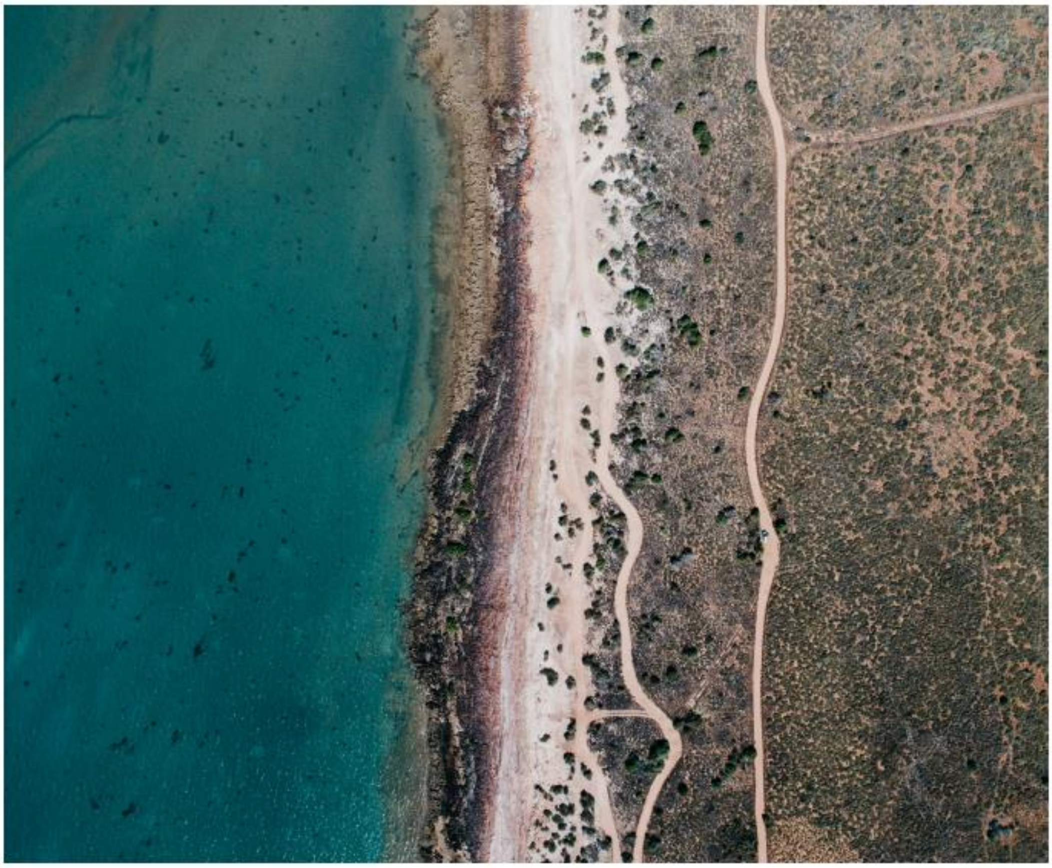


Table 3. Summary of key risks and/or impacts and management measures

Potential Risk and/or Impact	Mitigation and/or Management Measure
Planned	
Chemical use	+ Chemical use will be managed in accordance with Woodside chemical selection and approval procedures.
Interests of relevant stakeholders including: + Defense activities + Petroleum activities + Commercial and recreational fishing activities + Shipping activities	+ Consultation with relevant petroleum titleholders, commercial fishers and their representative organisations, and government departments and agencies will be conducted to inform decision making for the proposed activity and revision of the Environment Plan. + All vessels within the Operational Area will be required to adhere to the navigation safety requirements including the *Navigation Act 2012 (Cth)* and any subsequent Marine Orders.
Marine fauna interactions	+ Vessel masters will implement interaction management actions in accordance with the *Environment Protection and Biodiversity Conservation Regulations 2000 (Cth).*
Marine discharges	+ All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Physical presence of infrastructure on seafloor causing interference/displacement	+ Flowline and well locations will be marked on nautical charts, which state that vessels should avoid anchoring, trawling or conducting other underwater operations in the vicinity of the infrastructure.
Vessel interaction	+ Navigational aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. + A 1500 m Operational Area will be implemented around the Julimar Field Production System subsea infrastructure, including wells and flowlines/pipeline. + Commercial fishers and other marine users will be permitted to use but should take care when entering the Operational Area. + A 250 m radius PSZ permanent exclusion zone will be implemented around the Julimar and Brunello manifolds. + Stakeholder engagement activities will be conducted as part of the Environment Plan.
Waste generation	+ Waste generated on the vessels will be managed in accordance with applicable legislative requirements and a Waste Management Plan. + Waste will be managed and disposed of in a safe and environmentally responsible manner that aims to prevent accidental loss to the environment. + Waste transported onshore will be sent to appropriate recycling or disposal facilities by a licensed waste contractor.
Underwater Noise	+ Noise will be generated by support vessels. Due to the low acoustic source levels associated with vessel operations there is not likely to be any interaction or potential impact to fish hearing, feeding or spawning.
Unplanned	
Hydrocarbon release	+ Appropriate spill response plans, equipment and materials will be in place and maintained. + Appropriate equipment will be used to prevent spills to the marine environment.
Introduction of invasive marine species	+ All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species. + Australian biosecurity requirements and guidance will be complied with.

Providing feedback

Our intent is to minimise environmental and social impacts associated with the proposed activities, and we are seeking any interest or comments you may have to inform our decision making.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **Wednesday, 27 January 2021.**

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, 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.

Ben Bin Sali Grant, Corporate Affairs Woodside Energy Ltd
E: Feedback@woodside.com.au | Toll free: 1800 442 977

Please note that stakeholder feedback will be communicated to NOPSEMA as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

Woodside

www.woodside.com.au

1.24 Email sent to AHO, AMSA – Marine Safety (6 January 2021)

Dear *[Redacted]*

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

In addition, the permanent exclusion zones for the production wells (as previously advised and listed in the email below) will now not apply. Permanent exclusions zone will only apply around the Brunello and Julimar manifolds as listed in the table below.

Our consultation Information Sheet has also been updated to include these changes.

No change to environmental risks has resulted from the inclusion of the additional exploration wells within the scope of the Environment Plan.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Exploration Well			
Julimar Southeast – 1	156 m	20°9'7.05" S 115°3'58.89" E	
Grange – 1 – WA	177 m	20°5'8.37" S 115°5'40.74" E	
Brulimar – 1	171 m	20°0'18.26" S 115°11'4.99" E	None will apply
Brunello – 1ST1	151 m	20°3'1.96" S 115°10'25.36" E	
Balnaves Deep – 1	135 m	20°4'58.21" S 115°10'34.19" E	
Julimar East - 1	171 m	20°6'23.21" S 115°5'7.97" E	
Manifold			
Brunello manifold	149 m	20°01’49.0788” S 115°12’06.8670” E	250 m radius
Julimar manifold	174 m	20° 08 '52.917” S 115° 02 '27.23” E	250 m radius

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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).

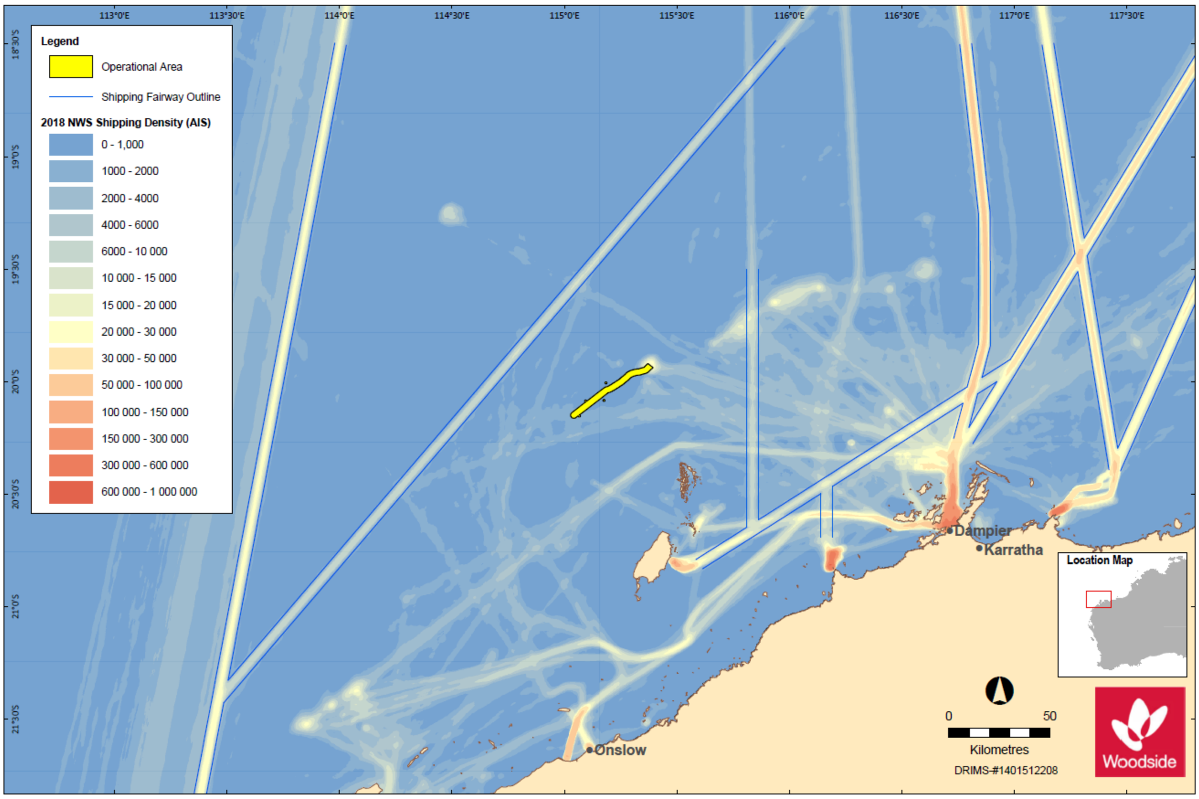
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.25 Updated shipping Lanes map sent to AHO, AMSA – Marine Safety (6 January 2021)



1.26 Email sent to DPIRD (6 January 2021)

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

In addition, the permanent exclusion zones for the production wells (as previously advised and listed in the email below) will now not apply. Permanent exclusions zone will only apply around the Brunello and Julimar manifolds as listed in the table below.

Our consultation Information Sheet has also been updated to include these changes.

No change to environmental risks has resulted from the inclusion of the additional exploration wells within the scope of the Environment Plan.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
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Julimar Southeast – 1	156 m	20°9'7.05" S 115°3'58.89" E	None will apply
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Brulimar – 1	171 m	20°0'18.26" S 115°11'4.99" E	
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Julimar manifold	174 m	20° 08 '52.917” S 115° 02 '27.23” E	250 m radius

Feedback:

If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.27 Email sent to WAFIC (6 January 2021)

Dear [Redacted],

Thank you for your earlier comments on the Julimar Operations Environment Plan. Your feedback was reflected in subsequent consultation with Pilbara Trap and Pilbara Line licence holders.

Please note that Woodside is re-consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

In addition, the permanent exclusion zones for the production wells (as previously advised and listed in the email below) will now not apply. Permanent exclusions zone will only apply around the Brunello and Julimar manifolds as listed in the table below.

Our consultation Information Sheet has also been updated to include these changes.

No change to environmental risks has resulted from the inclusion of the additional exploration wells within the scope of the Environment Plan.

Activity locations:

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Exploration Well			
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Julimar East - 1	171 m	20°6'23.21" S 115°5'7.97" E	
Manifold			
Brunello manifold	149 m	20°01'49.0788" S 115°12'06.8670" E	250 m radius
Julimar manifold	174 m	20° 08 '52.917" S 115° 02 '27.23" E	250 m radius

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 27 January 2021

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.28 Email sent to Pilbara Trap (6 January 2021)

Dear Pilbara Trap Licence Holder,

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

In addition, the permanent exclusion zones for the production wells (as previously advised and listed in the email below) will now not apply. Permanent exclusions zone will only apply around the Brunello and Julimar manifolds as listed in the table below.

Our consultation Information Sheet has also been updated to include these changes.

No change to environmental risks has resulted from the inclusion of the additional exploration wells within the scope of the Environment Plan.

Activity locations:

Structure	Approximate Water Depth (m)	Location	Size of the Permanent Exclusion zones
Exploration Well			
Julimar Southeast – 1	156 m	20°9'7.05" S 115°3'58.89" E	None will apply
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Brulimar – 1	171 m	20°0'18.26" S 115°11'4.99" E	
Brunello – 1ST1	151 m	20°3'1.96" S 115°10'25.36" E	
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Manifold			

Brunello manifold	149 m	20°01’49.0788” S 115°12’06.8670” E	250 m radius
Julimar manifold	174 m	20° 08 '52.917” S 115° 02 '27.23” E	250 m radius

Feedback:
If you have any issues or concerns with these activities, any other issues relevant to this location then please respond to Woodside at:

Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.29 Email sent to Pilbara Line (6 January 2021)

Dear Pilbara Line Licence Holder,

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

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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 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.30 Email sent to Pearl Producers Association (22 January 2021)

Dear [*Redacted*],

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

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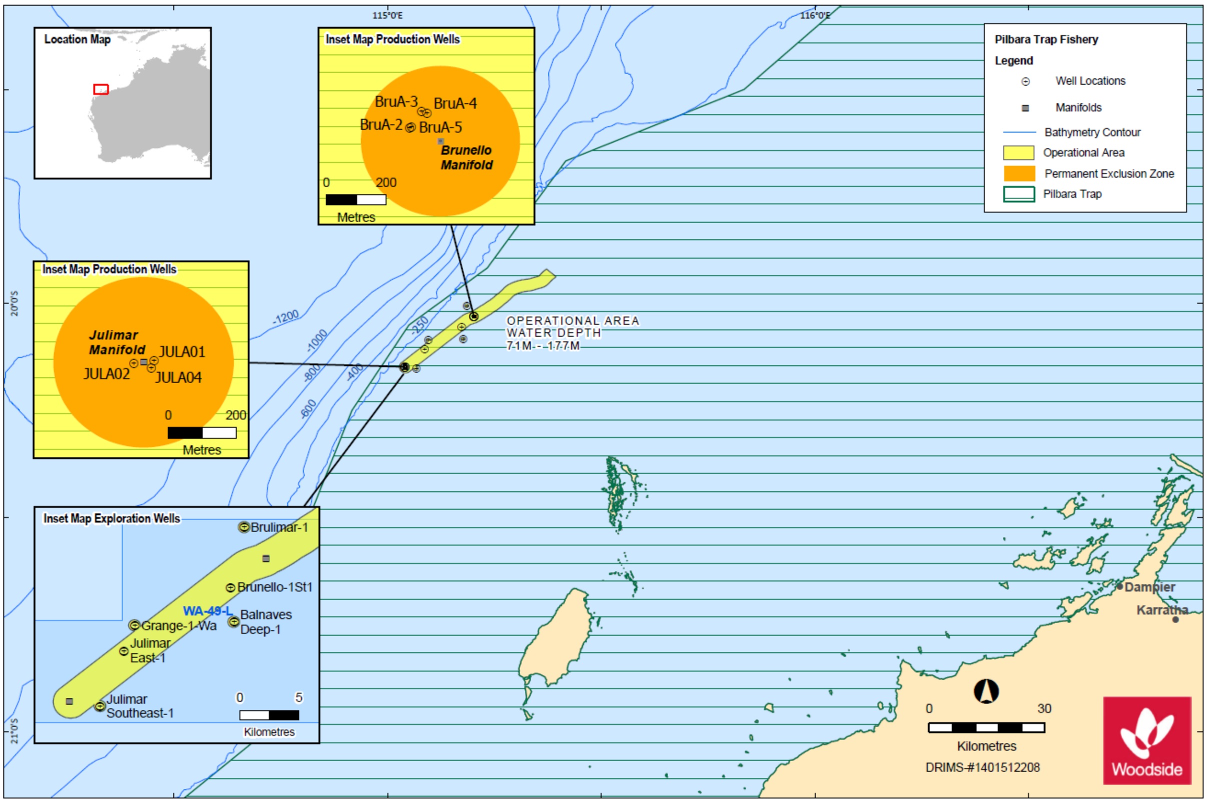
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 27 January 2021.

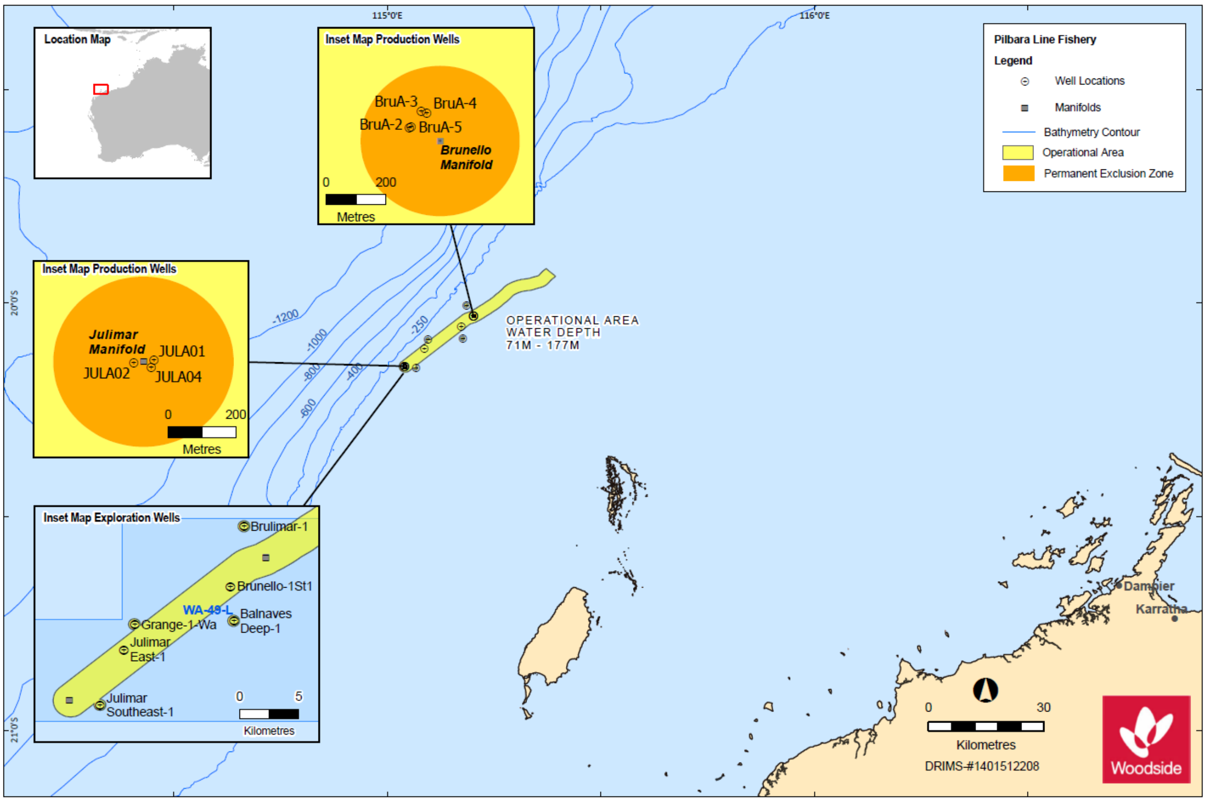
Regards,

[Redacted]
Graduate | Corporate Affairs
Woodside Energy Ltd

1.31 State fisheries map – Pilbara Trap sent to DPIRD, WAFIC, Pilbara Trap Fishery licence holders, PPA (6 January 2021; 6 January 2021; 6 January 2021; 22 January 2021)



1.32 State fisheries map – Pilbara Line sent to DPIRD, WAFIC, Pilbara Line Fishery licence holders, PPA (6 January 2021; 6 January 2021; 6 January 2021; 22 January 2021)



1.33 Email sent to adjacent titleholder, Chevron (6 January 2021)

Dear [Redacted],

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

The location of these exploration wells is listed below.

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Feedback:
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Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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.

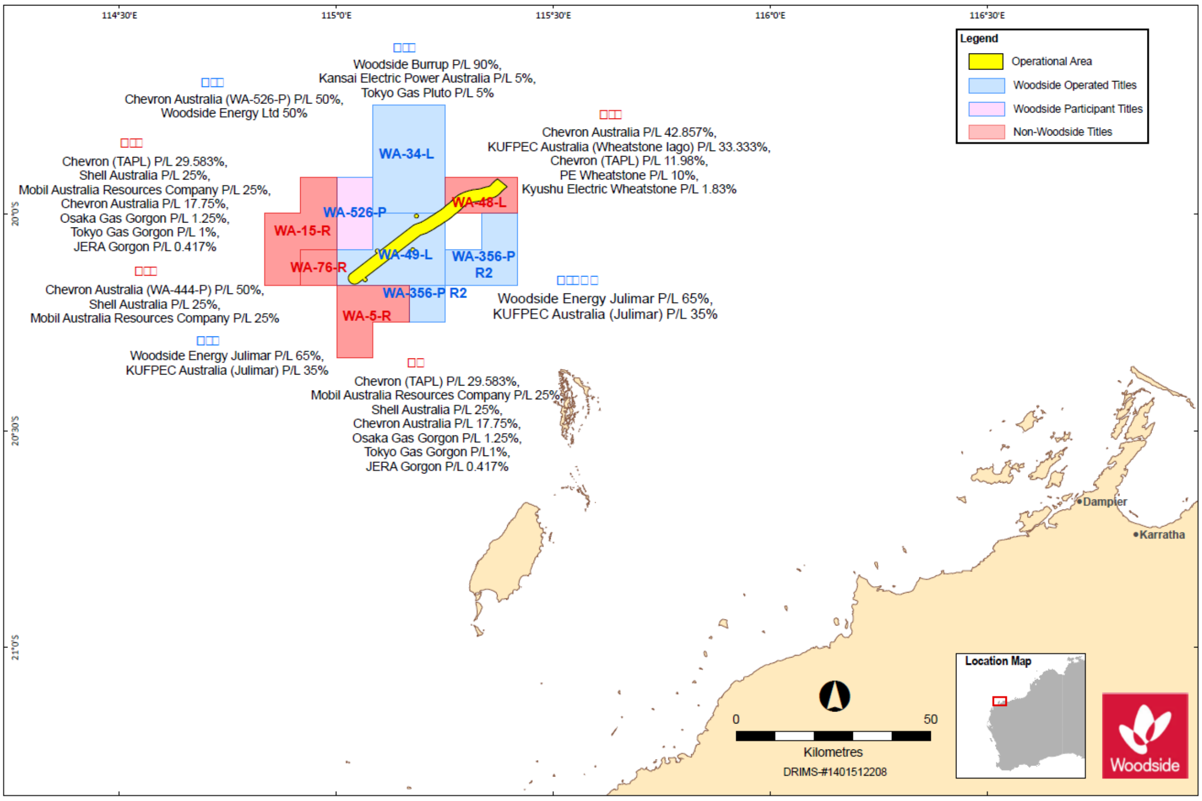
Please provide your views by 27 January 2021.

Regards,

[Redacted]
Graduate | Corporate Affairs

Woodside Energy Ltd

1.34 Updated Titles map sent to adjacent titleholder, Chevron (6 January 2021)



1.35 Email sent to Department of Defence (7 January 2021)

Dear Department of Defence

Woodside is consulting stakeholders on the revised scope of the Julimar Operations Environment Plan which now includes the inspection, monitoring, maintenance and repair of five temporarily abandoned exploration wells. Decommissioning of the exploration wells will be subject to a separate Environment Plan.

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Feedback:
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Feedback@woodside.com.au or [redacted]

Your feedback and our response will be included in our Environment Plans which will be submitted to 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.

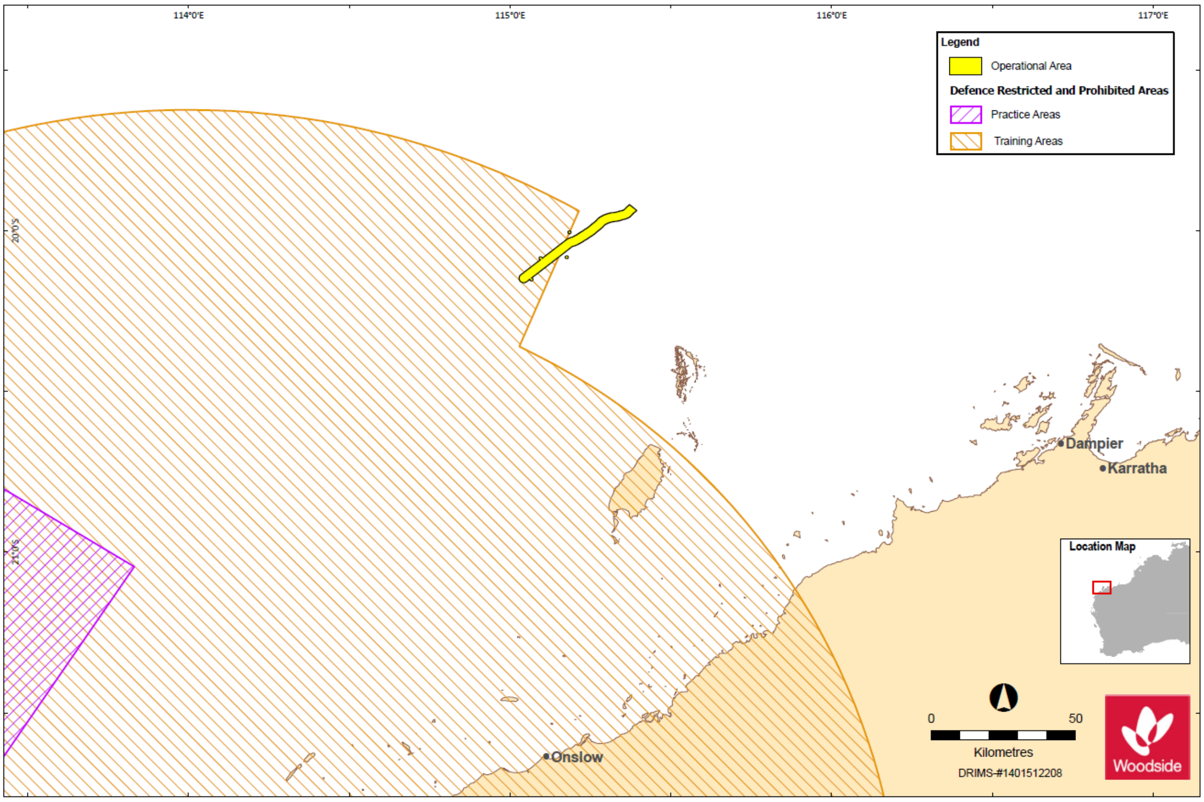
Please provide your views by 27 January 2021.

Regards,

[Redacted]

Graduate | Corporate Affairs
Woodside Energy Ltd

1.36 Updated defence areas map sent to Department of Defence (7 January 2021)



APPENDIX G DEPARTMENT OF PLANNING LAND, HERITAGE AND ABORIGINAL ENQUIRY SYSTEM RESULTS

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

1 Registered Aboriginal Sites in Shapefile - EMBA Rev0/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.

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

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

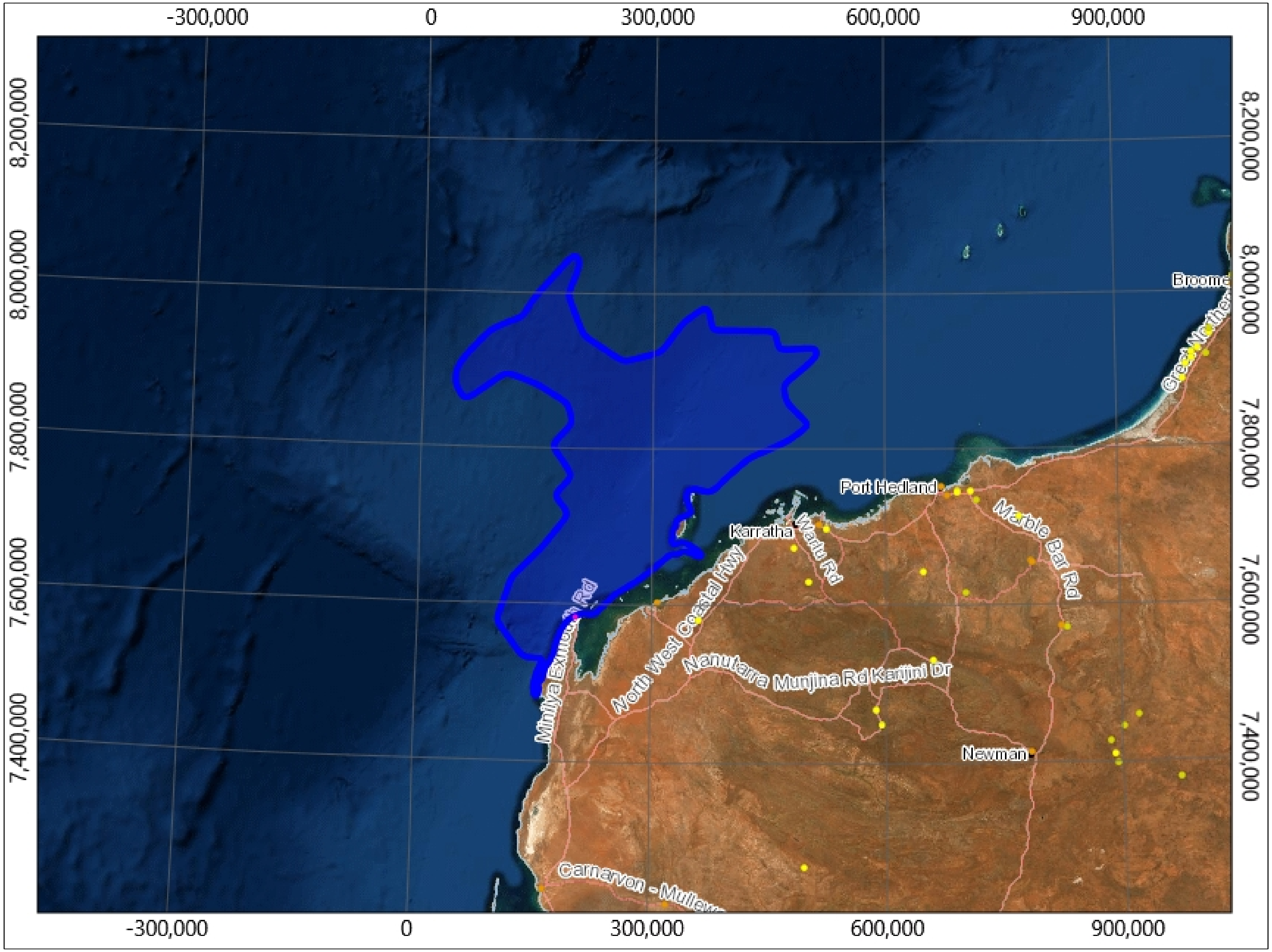
Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

For further important information on using this information please see the Department of Planning, Lands and Heritage's Disclaimer statement at https://www.dplh.wa.gov.au/about-this-website



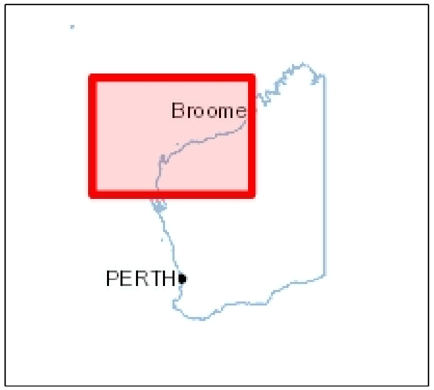
Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

262.27 kilometres

Map Scale 1 : 7,950,000

MGA Zone 50 (GDA94)



Map created: 10/07/2020 4:19:28 PM by: GIS_NET_USER

Identifier: 462586

APPENDIX H FIRST STRIKE PLAN

Julimar Operations Oil Pollution First Strike Plan

Security & Emergency Management

Hydrocarbon Spill Preparedness

January 2021
Revision: 6a

TABLE OF CONTENTS

JULIMAR OPERATIONS OIL POLLUTION FIRST STRIKE PLAN

FOR ALL OIL SPILL INCIDENTS FROM JULIMAR SUBSEA INFRASTRUCTURE, WOODSIDE (WEL) IS THE CONTROL AGENCY, HOWEVER CHEVRON (CAPL) IS INCIDENT CONTROLLER (IC) IN THE FIRST INSTANCE AND UNDERTAKE INITIAL ACTIONS UNTIL HANDOVER TO WOODSIDE (SEE TRANSFER OF CONTROL ARRANGEMENTS ON PAGE 7 FOR FURTHER DETAIL). INITIAL ACTIONS TO BE UNDERTAKEN BY CAPL MAY INCLUDE DEPLOYMENT OF A TRACKER BUOY AND OPPORTUNISTIC VISUAL OBSERVATIONS.

SPILL FROM FACILITY INCLUDING SUBSEA INFRASTRUCTURE

(Note: Pipe laying and accommodation vessels are considered a "FACILITY" under Australian Regs).

THE CHEVRON OIM IS INCIDENT CONTROLLER UNTIL CONTROL IS FORMALLY HANDED TO WOODSIDE.

LEVEL 1

CONTROL AGENCY:	**WOODSIDE**
INCIDENT CONTROLLER	**Wheatstone Offshore Installation Manager (OIM) (initially), then CICC DUTY MANAGER (DM)**

LEVEL 2 & 3

CONTROL AGENCY:	**WOODSIDE**
INCIDENT CONTROLLER:	**CICC DUTY MANAGER**

SPILL FROM VESSEL

(Note: SOPEP should be implemented in conjunction with this document)

LEVEL 1

CONTROL AGENCY:	**AMSA**
INCIDENT CONTROLLER:	**VESSEL MASTER (with response assistance from Woodside)**

LEVEL 2 & 3

CONTROL AGENCY:	**AMSA**
INCIDENT CONTROLLER:	**AMSA (with response assistance from Woodside)**

JULIMAR OPERATIONS OIL POLLUTION FIRST STRIKE PLAN

FOR ALL OIL SPILL INCIDENTS FROM JULIMAR SUBSEA INFRASTRUCTURE, WOODSIDE (WEL) IS THE CONTROL AGENCY, HOWEVER CHEVRON (CAPL) IS INCIDENT CONTROLLER (IC) IN THE FIRST INSTANCE AND UNDERTAKE INITIAL ACTIONS UNTIL HANDOVER TO WOODSIDE (SEE TRANSFER OF CONTROL ARRANGEMENTS ON PAGE 7 FOR FURTHER DETAIL). INITIAL ACTIONS TO BE UNDERTAKEN BY CAPL MAY INCLUDE DEPLOYMENT OF A TRACKER BUOY AND OPPORTUNISTIC VISUAL OBSERVATIONS.

SPILL FROM FACILITY ENTERING STATE WATERS

THE CHEVRON OIM IS INCIDENT CONTROLLER UNTIL CONTROL IS FORMALLY HANDED TO WOODSIDE

LEVEL 1

CONTROL AGENCY:	**WOODSIDE**
INCIDENT CONTROLLER:	**Wheatstone Offshore Installation Manager (OIM) (initially), then CICC DUTY MANAGER (DM)**

LEVEL 2 & 3

CONTROL AGENCY:	**WA DoT**
INCIDENT CONTROLLER:	**WA DoT**

Well Names Chevron and Woodside

Production Manifold Well Slot Number (CVX)	Borehole (WEL)
BRU 1C	BruA-2
BRU 1E	BruA-3
BRU 1F	BruA-4
BRU 1B	BruA-5
BRU 1G	BruA-6
JUA1A	JULA-01
JUA1D	JULA-02
JUA1B	JULA-04

Transfer of Control Arrangements

For all oil spill incidents from Julimar subsea infrastructure, Woodside (WEL) is the Control Agency, however Chevron (CAPL) is Incident Controller (IC) in the first instance and undertake initial actions until handover to Woodside (see Transfer of Control Arrangements on page 7 for further detail). Initial actions to be undertaken by CAPL may include deployment of a tracker buoy and opportunistic visual observations.

As detailed in the Julimar Development Emergency Response Interface Plan [redacted], if any emergency occurs, including the unplanned release of hydrocarbon, the Wheatstone Platform Operator (Chevron Australia Pty Ltd (CAPL)) shall promptly take such action as is necessary to remedy or alleviate such emergency.

With regards to an emergency that is determined to be attributable to the Julimar Brunello Pipeline System that will require a long-term response (i.e. > 12 hours); a decision may be taken for WEL to take over the coordination of the emergency response and manage the long term resolution. Such a decision must be agreed between the CAPL Perth Emergency Management Team (PEMT) and Woodside's Crisis Management Team (WEL CMT) and communicated to the key stakeholders outlined in the Julimar Development Emergency Response Interface Plan [redacted]. To the extent required, the appropriate regulatory agency(s) must also approve the transfer of control of the response operations to Woodside as the Field Operator. Er interface doc

Guidance to Oil Spill Incident Levels

The most significant characteristic of the below guidance should be considered when determining level or escalation potential.

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) activated. Use of ICC support may be required.	Handover of Control from Onsite IC Corporate Incident Coordination Center (CICC) Duty Manager (DM) in Peth.	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. 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.
Volumes	0-10 m^3	10-1,000 m^3	>1,000 m^3

For guidance on credible spill scenarios and hydrocarbon characteristics refer to Appendix A.

For Spills Entering State Waters

In the event of a spill where Woodside is the responsible party and the spill may impact State waters/shorelines, Woodside will notify the Western Australian Department of Transport (DoT).

If the spill impacts State waters/shorelines and is a Level 1, Woodside will remain the Control Agency. If the spill is a Level 2/3 then DoT will become the Control Agency for the response in State waters/shorelines only. DoT will appoint an Incident Controller and form a separate Incident Management Team to manage the State waters/shorelines response only. The coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/shorelines is shown in Appendix E.

Initially Woodside will 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 for Level 2 and 3 spills in 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 G.

Response Process Overview

Use the below to determine actions required and which parts of this plan are relevant to the incident.

For guidance on credible scenarios and hydrocarbon characteristics, refer to Appendix A.

<table>
<tr><td rowspan="2">ALL INCIDENTS</td><td colspan="2">Notify the Woodside Communication Centre (WCC) on:
[redacted]</td></tr>
<tr><td colspan="2">Incident Controller or delegate to make relevant notifications in Table 1-1 (pages 10-14) of this Oil Pollution First Strike Plan.</td></tr>
<tr><td rowspan="3">LEVEL 1</td><td>SUBSEA INCIDENT</td><td>VESSEL INCIDENT</td></tr>
<tr><td>Initially (CAPL is IC): WEL to provide support to the IC.
If WEL become IC: coordinate pre-identified tactics in Table 2-1 (pages 16-17) of this Oil Pollution First Strike Plan.
Remember to download each Operational Plan.</td><td>Upon agreement with AMSA: coordinate pre-identified tactics in Table 2-1 (pages 16-17) of this Oil Pollution First Strike Plan.
Remember to download each Operational Plan.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td rowspan="4">LEVEL 2/3</td><td>SUBSEA INCIDENT</td><td>VESSEL INCIDENT</td></tr>
<tr><td>If CAPL is IC: provide support through CICC.
If WEL is IC: stand-up CICC</td><td>Handover control to AMSA and stand up CICC to assist.</td></tr>
<tr><td>If CAPL is IC: refer to Wheatstone Upstream Emergency Response Plan (ERP) (Chevron [redacted]

If WEL is IC: in consultation with CAPL, undertake quick revalidation of the recommended strategies on Table 3-1 (pages 19-22) taking into consideration seasonal sensitivities and current situational awareness.

Undertake validated strategies.</td><td>If requested by AMSA:
Undertake quick revalidation of the recommended strategies on Table 3-1 (pages 19-22) taking into consideration seasonal sensitivities and current situational awareness.

Undertake validated strategies.</td></tr>
<tr><td>In consultation with CAPL (as necessary), create an Incident Action Plan (IAP) for all ongoing operational periods (Link).
<u>The content of the IAP should reflect CAPL handover of control and the selected response strategies based on current situational awareness.</u>

For the full detailed pre-operational Net Environmental Benefit Analysis (NEBA) (Link)</td><td>If requested by AMSA:
Create an IAP for all ongoing operational periods (Link).
<u>The content of the IAP should reflect the selected response strategies based on current situational awareness.</u>

For the full detailed pre-operational NEBA (Link)</td></tr>
</table>

1. NOTIFICATIONS (ALL LEVELS)

The Incident Controller or delegate must ensure the below notifications (**Table 1-1**) are completed within the designated timeframes.

As per the Julimar Development Emergency Response Interface Plan ([redacted]), Chevron will notify Woodside IMMEDIATELY (within 2 hours) upon detection of spills from, or suspected to be from, Brunello and/or Julimar fields and/or hydrocarbon system via the WCC, as per table below, and will notify of key incident details, including:

- *Time of incident*
- *Whether the release is controlled, or continuing to spill*
- *Weather, tide and current details*
- *Apparent trajectory of the spill*

For other environmental notifications required refer to the Julimar Operations Environment Plan (Link)

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 WEL representative).*							
Immediately	Offshore Installation Manager (OIM) or Vessel Master	Chevron Australia Pty Ltd	Chevron Perth Security Operations Centre	[redacted]	Verbally notify Security Operations Centre of event and estimated volume and hydrocarbon lost	Verbal	
Immediately	OIM or Chevron Perth Security Operations Centre	Woodside Communication Centre (WCC)	Duty Manager	[redacted]	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
Within 2 hours	OIM or 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, CICC DM or Delegate				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS) NOPSEMA: submissions@nopsema.gov.au NOPTA: resources@nopta.gov.au DMIRS: petreps@dmirs.wa.gov.au	App B Form 2	
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	CICC DM or Delegate	Department of Agriculture, Water and the Environment (Director of National Parks)	Marine Park Compliance Duty Officer	[redacted]	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. The notification should include: • titleholder details	Verbal	

[1] Notification to NOPSEMA must be from a Woodside Representative.

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					• time and location of the incident • proposed response arrangements and locations as per the OPEP • contact details for the response coordinator.		
Additional notifications to be made ONLY if spill is from a vessel							
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	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 and CMT Leader** to formally activate AMOSC. Determine what resources are required consistent with the AMOSPlan 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. Send the notification form to OSRL as soon as practicable.	Notification: App B Form 6a Mobilisation: App B Form 6b	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable.		
As soon as practicable or if spill is likely to extend into WA State waters.	CICC DM or Delegate	WA Department of Transport	DOT Duty Manager	[redacted]	Marine Duty Manager to verbally notify DoT that a spill has occurred and request use of equipment stored in the Karratha supply shed (which is the closest DoT stockpile for this activity). 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 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	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
As soon as practicable	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

Implement this section of the plan if:

- *Chevron is Incident Controller and Woodside is requested to support the response acting under direction of the IC; or*
- *if Woodside is Incident Controller.*

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 Julimar Operations Environment Plan (Link) Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment for Julimar Operations).

Table 2-1: Level 1 Response Summary

Response Techniques	Hydrocarbon Type: Marine Diesel Oil	Hydrocarbon Type: Crude	Hydrocarbon Type: Cond	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
Monitor and evaluate – tracking buoy (OM02)	Yes	N/A	Yes	Coordinate deployment of satellite tracking buoy immediately from Wheatstone Platform and/or a support vessel. 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 King Bay Supply Base (KBSB) Stockpile. If a surface sheen is visible from the facility, deploy the satellite tracking buoy within two hours.	OIM/ 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 (Link). Deploy tracking buoy in accordance with Appendix D - Tracking Buoy Deployment Instructions
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	N/A	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).	Intelligence or Environment	**Day 1:** Initial modelling to be available within six hours using the Rapid Assessment Tool		Predictive Modelling of Hydrocarbons to Assess Resources at Risk - OM01 of The Operational Monitoring Operational Plan (Link). *Planning to download immediately and follow steps*
Monitor and evaluate – predictive modelling (OM01)	Yes	N/A	Yes	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B Form 7) to RPS APASA response team (email rpsresponse@rpsgroup.com) and call RPS Response Duty Officer Phone [redacted]	Intelligence			
Monitor and evaluate – aerial	Yes	N/A	Yes	Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in Appendix B Form 8.	Logistics - Aviation	**Day 1:** Two trained aerial observers		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk - OM02 of

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
surveillance (OM02)						One aircraft available Report made available to the IMT within two hours of landing after each sortie		The Operational Monitoring Operational Plan (Link). *Planning to download immediately and follow steps*
Monitor and evaluate – satellite tracking (OM02)	Yes	N/A	Yes	The Intelligence duty manager should be instructed to stand up KSAT to provide satellite imagery of the spill. emergency@ksat.no [redacted]	Intelligence	**Day 1:** Service provider will confirm initial acquisition within two hours Data received to be uploaded into Woodside Common Operation Picture daily		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	N/A	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 to 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 (Link).
Monitor and evaluate – pre-emptive assessment of receptors at risk (OM04)	Yes	N/A	Yes	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 impact predicted by OM01/02/03, and in agreement with WA DoT (for Level 2/3 incidents), deployment of 2 specialists from		Pre-emptive Assessment of Sensitive Receptors at Risk (OM04 of The Operational Monitoring Operational Plan).

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
						resource pool in establishing the status of sensitive receptors.		
Monitor and evaluate – shoreline assessment (OM05)	Yes	N/A	Yes	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	10 days prior to any impact predicted by OM01/02/03, and in agreement with WA DoT (for Level 2/3 incidents), deployment of 1 specialist(s) in SCAT for each RPA.		Monitoring of contaminated resources (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 Julimar Operations Environment Plan (Link) Appendix D (Woodside’s Oil Spill Preparedness and Response Mitigation Assessment for Julimar Operations).

Table 3-1: Level 2/3 Response Summary

Response Techniques	Hydrocarbon Type: Marine Diesel Oil	Hydrocarbon Type: Crude	Hydrocarbon Type: Cond	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
Monitor and evaluate – predictive modelling (OM01)	Yes	N/A	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).	Intelligence or Environment	**DAY 1:** Initial modelling to be available within six hours using the Rapid Assessment Tool Detailed modelling within four hours of APASA receiving information from Woodside.		Predictive Modelling of Hydrocarbons to Assess Resources at Risk - OM01 of The Operational Monitoring Operational Plan (Link).
	Yes	N/A	Yes	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B Form 7) to RPS APASA (rpsresponse@rpsgroup.com).	Intelligence	**DAY 1:** Detailed modelling within four hours of APASA receiving information from Woodside.		
Monitor and evaluate – tracking buoy (OM02)	Yes	N/A	Yes	Coordinate deployment of satellite tracking buoy immediately from Wheatstone Platform and/or a support vessel 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 King Bay Supply Base (KBSB) Stockpile. If a surface sheen is visible from the facility, deploy the satellite tracking buoy within two hours	OIM/ 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 (Link). Deploy tracking buoy in accordance with Appendix D - Tracking Buoy Deployment Instructions

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
Monitor and evaluate – aerial surveillance (OM02)	Yes	N/A	Yes	Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in Appendix B Form 8.	Logistics - Aviation	**DAY 1:** Two trained aerial observers One aircraft available Report made available to the IMT within two hours of landing after each sortie		
Monitor and evaluate – satellite tracking (OM02)	Yes	N/A	Yes	The Intelligence duty manager should be instructed to stand up Kongsberg Satellite Services (KSAT) to provide satellite imagery of the spill. [redacted]	Intelligence	**DAY 1:** Service provider will confirm initial acquisition within two hours Data received to be uploaded into Woodside Common Operation Picture daily		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	N/A	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 to 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 (Link).
Monitor and evaluate – pre-emptive assessment	Yes	N/A	Yes	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 impact predicted by OM01/02/03, and in agreement with WA DoT (for Level 2/3		Pre-emptive Assessment of Sensitive Receptors at Risk (OM04 of The Operational Monitoring Operational Plan).

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
of receptors at risk (OM04)						incidents), deployment of 2 specialists from resource pool in establishing the status of sensitive receptors.		
Monitor and evaluate – shoreline assessment (OM05)	Yes	N/A	Yes	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	10 days prior to any impact predicted by OM01/02/03, and in agreement with WA DoT (for Level 2/3 incidents), deployment of 1 specialist(s) in SCAT for each RPA.		Monitoring of contaminated resources (OM05 of The Operational Monitoring Operational Plan).
Source Control – Remote Intervention	N/A	N/A	Yes	Only for Credible Scenario 2 (subsea infrastructure loss of containment). Following notice of reduced flow at Wheatstone Platform, remotely shut in wells and isolate flowlines (Wheatstone Upstream Platform Operational Performance Standard Emergency Shutdown [redacted])	Operations (Wheatstone Platform)			Wheatstone Upstream Platform Operational Performance Standard Emergency Shutdown [redacted] Julimar Development Emergency Response Interface Plan [redacted]
Surface Dispersant	No	N/A	No	Potential spill volumes and hydrocarbon properties for spill scenarios not suited to surface dispersant	Operations, Logistics and Planning			
Mechanical Dispersion	No	N/A	No	This response strategy is not recommended.	N/A			
Containment and Recovery	No	N/A	No	Potential spill volumes and hydrocarbon properties for spill scenarios not suited to containment and recovery	Logistics and Planning			

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
In-situ Burning	No	N/A	No	This strategy is not recommended.	N/A			
Shoreline Protection and Deflection	No	N/A	No	No shoreline contact is predicted	Logistics and Planning			
Shoreline Clean Up	No	N/A	No	No shoreline contact is predicted	Logistics and Planning			
Oiled Wildlife Response	Yes	N/A	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 (Link).
Scientific Monitoring (Type II)	Yes	N/A	Yes	Notify Woodside science team of spill event.	Environment			Oil Spill Scientific Monitoring Programme – Operational Plan (Link)
For well integrity event, the following strategies apply:								
Subsea First Response Toolkit	N/A	N/A	Yes	Mobilise SFRT from AMOSC stockpiles (Perth).	Operations and Logistics	**DAY 11:** AMOSC Subsea First Response Toolkit equipment Deployed.		Subsea First Response Toolkit (SFRT) and Capping Stack Operational Plan (Link).
Subsea Dispersant	N/A	N/A	No	Potential spill volumes and hydrocarbon properties for spill scenarios not suited to surface dispersant	Logistics and Planning			

Response Techniques	Hydrocarbon Type			Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
	Marine Diesel Oil	Crude	Cond					
Capping Stack	N/A	N/A	Yes	Technical assessment has been undertaken and determined installation of capping stack to be inappropriate (refer to Link). This should be reassessed on the day.	Operations (Source Control Unit)	**DAY 16:** Capping stack deployed by a chartered construction vessel.		
Relief Well	N/A	N/A	Yes	As per the D&C Relief Well Planning Procedure (Link).	Operations (Source Control Unit)	**DAY 1:** Identify source control vessel availability within 24 hours. ROV on MODU ready for deployment within 48 hours. Mobile offshore Drilling Unit (MODU) mobilised to location		D&C Relief Well Planning Procedure (Link).

4. PRIORITY RECEPTORS

Note: DoT is the Control Agency to respond to all the sites listed below in a Level 2/3 spill into State waters/shorelines.

Based on hydrocarbon spill risk modelling results, no sensitive receptors are predicted to be contacted above the threshold levels outlined in **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

Figure 4-1 illustrates the location of regional sensitive receptors in relation to the Julimar operational area and identifies priority protection areas.

Consideration should be given to other stakeholders (including mariners) in the vicinity of the spill location. **Table 4-2** indicates the assets within the vicinity of the Julimar Operations operational area.

Table 4-2: Assets in the vicinity of the Julimar Operations operational area.

Asset	Distance and Direction from Julimar Operations Operational Area	Operator
Pluto A Platform	~4 km ESE Pluto subsea infrastructure intersects lines	Woodside
Wheatstone Platform	Within Operational Area	Chevron
Goodwyn Alpha Platform	~65 km NE	Woodside
North Rankin Platforms	~88 km NE	Woodside
Armada Claire Facility	~4 km SW	Woodside
Campbell Platform	~66 km SE	Quadrant Energy (Abandoned)
Wonnich Facility	~54 km SSE	Quadrant Energy

[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 statutory authorities e.g. WA DoT or AMSA.

[3] At 50g/m^2 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 displaying the spread of surface oil.

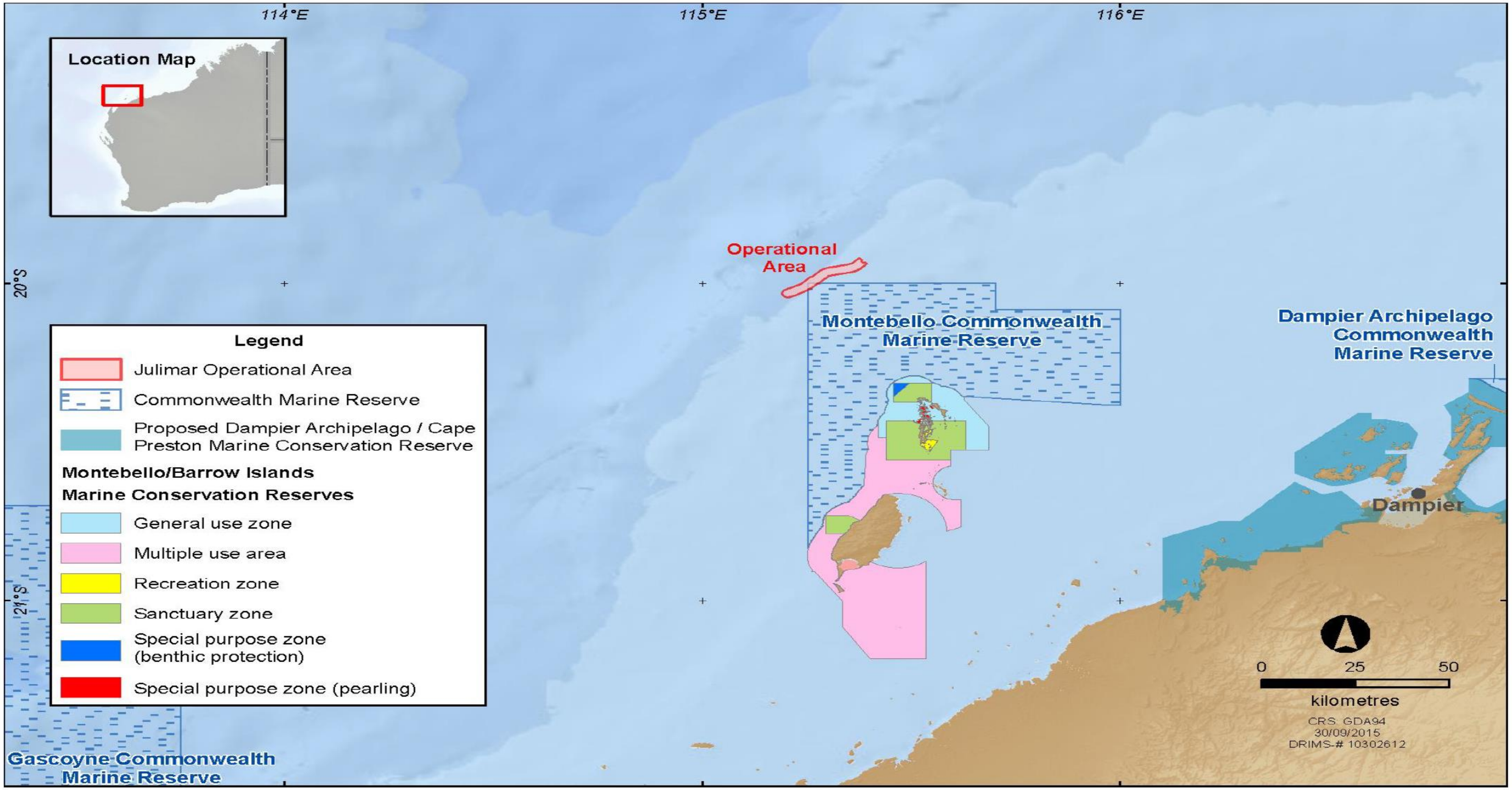


Figure 4-1 Regional Sensitive Receptors – Julimar Operations operational area (no receptors to be contacted above threshold levels)

5. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in Appendix D of the Julimar Operations Environment Plan (Link).

APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

For more detailed hydrocarbon information see the Hydrocarbon Data Directory (Link)

Credible Spill Scenarios

Scenario	Product	Maximum Volumes	Suggested ADIOS2 Analogue*
Well loss of containment	Brunello Condensate	~742 m^3/day for 75 days (55,647 m^3)	NWS Condensate (AMSA) APII of 54.3
Subsea loss of containment	Brunello Condensate	1062 m^3 over 5.2 hours	NWS Condensate (AMSA) APII of 54.3
Vessel Collision	Marine Diesel	Activity vessel - 250 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.

Brunello Condensate (Group 1 Oil, API 49.8)

Weathering processes under realistic variable wind conditions are illustrated in the example mass balance weathering graph for an instantaneous release at the surface (**Figure A-1**). The graph demonstrates that approximately 83% of the released condensate would be expected to evaporate within the first 24 hours. Due to the influence of strong winds, the majority of floating hydrocarbons will become entrained within the first 36 hours from release.

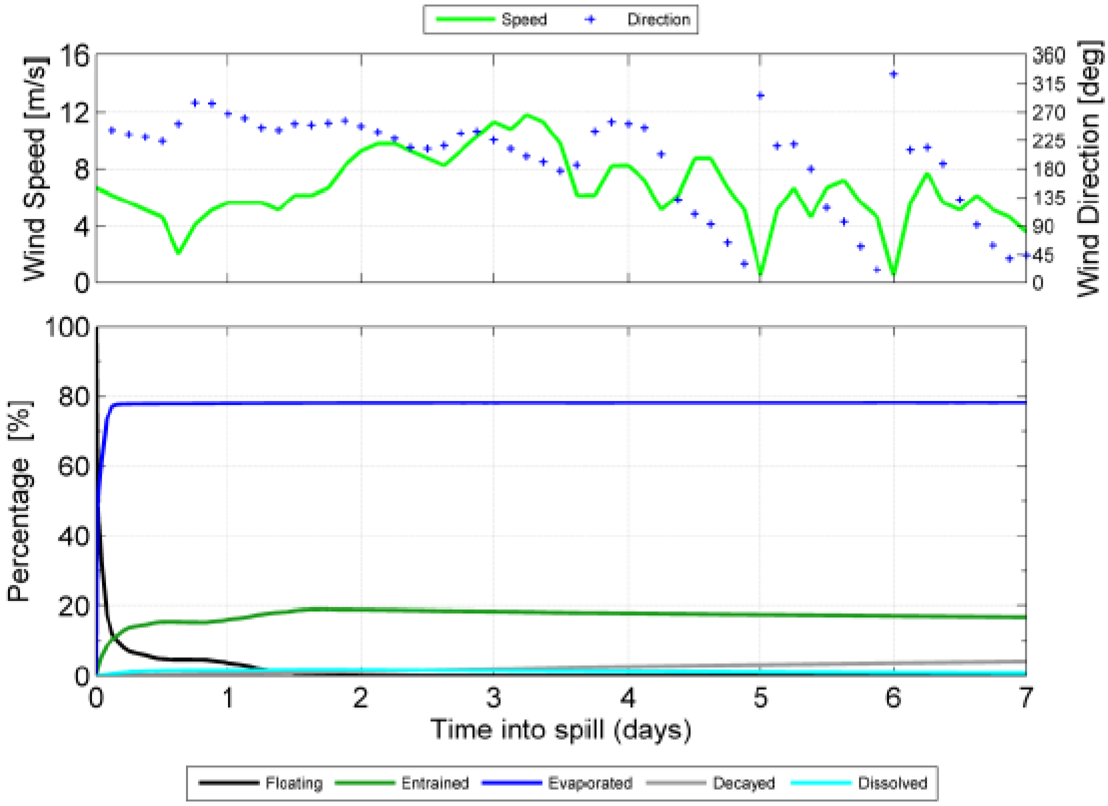


Figure A-1 Proportional mass balance plot representing the weathering of Brunello Condensate spilled onto the water surface as a one-off instantaneous release and subject to variable wind at 27 °C water temperature and 25 °C air temperature.

Source: Data available from Julimar Operations Quantitative Spill Risk Assessment, 2020. NOTE: This information is provided as guidance only. Spill event oil spill trajectory modelling (OSTM) should be sought.

Marine Diesel (Group 2 Oil)

Marine diesel is a mixture of volatile and persistent hydrocarbons, with approximately 40-50% by mass predicted to evaporate over the first day or two, depending upon the prevailing conditions, with further evaporation slowing over time (**Figure A-2**). The heavier components of diesel have a strong tendency to entrain into the upper water column due to wind waves, but can re-float to the surface if wind waves abate.

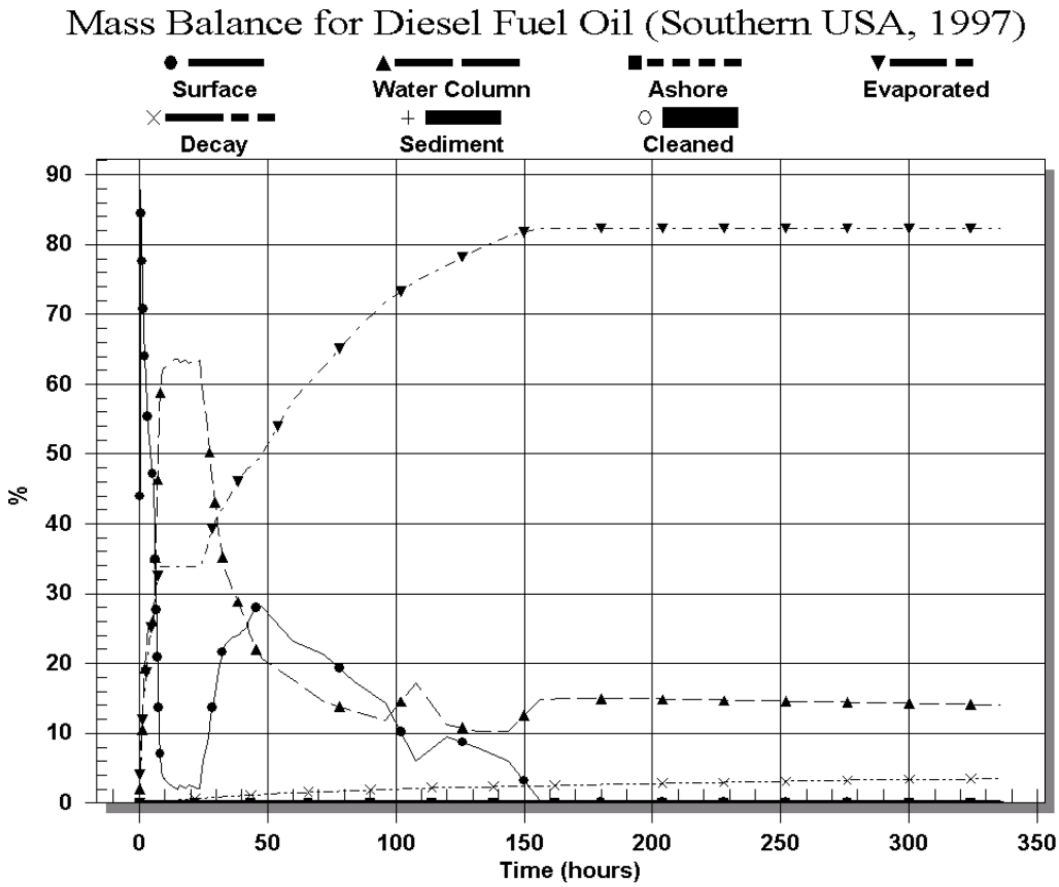


Figure A-2 Predictions for the partitioning of oil mass over time through weathering processes for diesel fuel oil. Predictions are based on sample environmental conditions.

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	Link
2	NOPSEMA Notification Template	Link
3	Marine Pollution Report (POLREP – AMSA)	Link
4	AMOSC Service Contract Note	Link
5	Marine Pollution Report (POLREP – DoT)	Link
6a	OSRL Initial Notification Form	Link
6b	OSRL Mobilisation Activation Form	Link
7	APASA Oil Spill Trajectory Modelling Request	Link
8	Aerial Surveillance Observer Log	Link

FORM 1

Record of initial verbal notification to NOPSEMA

Woodside

____

(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** **submissions@nopsema.gov.au**
2. **NOPTA** **resources@nopta.gov.au**
3. **DMIRS** **petroleum.environment@dmirs.wa.gov.au**

FORM 2

[insert NOPSEMA Notification Template when printing]

Link

FORM 3

[insert Marine Pollution Report (POLREP – AMSA) when printing]

Link

FORM 4

[insert AMOSC Service Contract note when printing]

Link

FORM 5

[insert Marine Pollution Report (POLREP – DoT) when printing]

Link

FORM 6a

[insert OSRL Initial Notification Form when printing]
Link

FORM 6b

[insert OSRL Mobilisation Activation Form when printing]
Link

FORM 7

[insert APASA Oil Spill Trajectory Modelling Request form when printing]
Link

FORM 8

[insert Aerial Surveillance Observer Log when printing]
Link

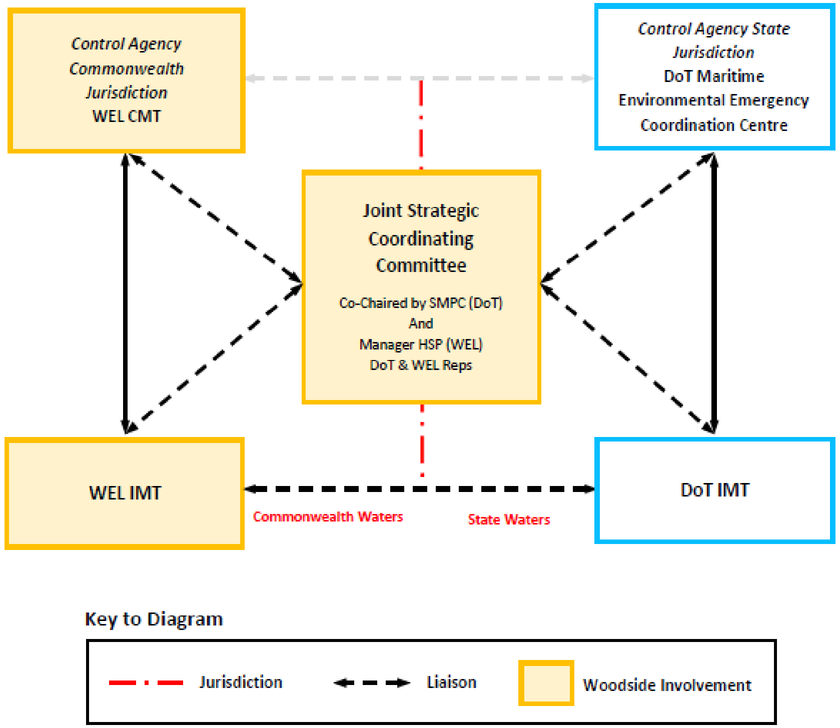
APPENDIX C – 7 QUESTIONS OF SPILL ASSESSMENT

WHAT IS IT? **Oil Type/name** **Oil properties** **Specific gravity / viscosity / pour point / asphphaltines / 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 Link when printing)

APPENDIX E – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/SHORELINES[4]



The Control Agency for a Level 1 hydrocarbon spill in Commonwealth waters resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder).

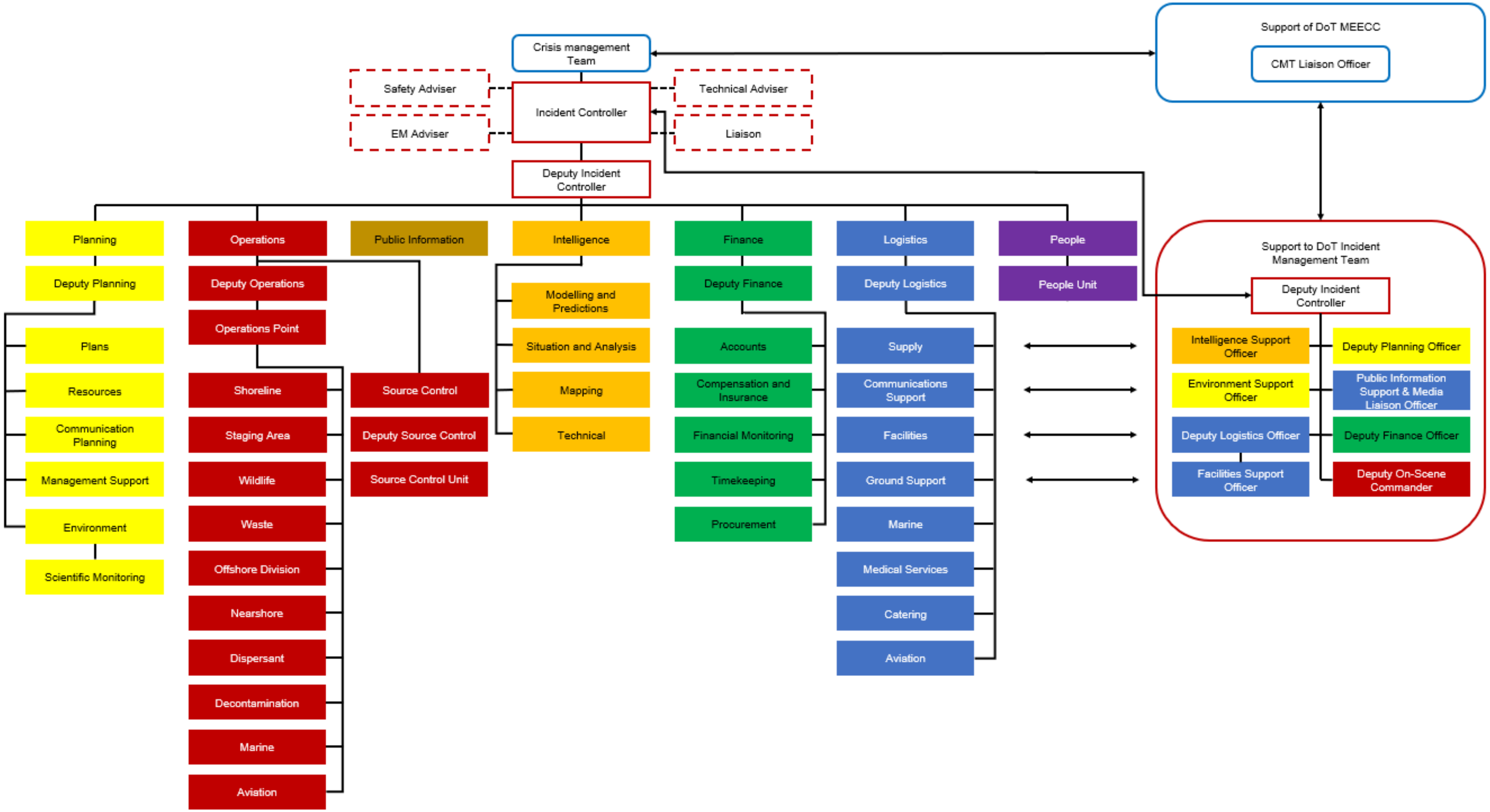
The Control Agency for a Level 2/3 hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident

[4] 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.

Controller and form a separate IMT to only manage the spill within State waters/shorelines.

APPENDIX F – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside Incident Management Structure for Hydrocarbon Spill (including Woodside Liaison Officers Command Structure within DoT IMT if required).



APPENDIX G – WOODSIDE LIAISON 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[5]:	Key Duties	#
DoT MEECC	CMT Liaison Officer	CMT Duty Managers Roster	• Provide a direct liaison between the CMT and the MEECC. • Facilitate effective communications and coordination between the CMT and SMEEC. • Offer advice to SMEEC on matters pertaining to PT crisis management policies and procedures.	1
DoT IMT Incident Control	WEL Deputy Incident Controller	CICC Duty Managers 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

[5] See Combined CICC, KICC, CMT roster & Preparedness Schedule Link / AMOSC Service Contract Link

Area	WEL Liaison Role	Personnel Sourced from[5]:	Key Duties	#
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. • Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT. **(Note this individual must have intimate knowledge of the relevant PT OPEP and planning process)**	1
DoT IMT Public Information-Media/ Community Engagement	Public Information Support & Media Liaison Officer/ Deputy Public Information Officer	CMT 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 & 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	CMT 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

Area	WEL Liaison Role	Personnel Sourced from[5]:	Key Duties	#
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. • 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.	1
DoT IMT Operations - Waste Management	Facilities Support Officer/ Deputy Waste Management Coordinator	CMT 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	AMOSC Core Group	• Provide a direct liaison between the PT FOB and DoT FOB. • Facilitate effective communications and coordination between the PT FOB Operations Commander and the DoT FOB Operations Commander. • Offer advice to the DoT FOB Operations Commander on matters pertaining to PT incident response policies and procedures. • Assist the Senior Safety Officer deployed in the FOB in the performance of their duties, particularly as they relate to PT employees or contractors. • Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to PT safety policies and procedures.	1
			Total Woodside Personnel Initial Requirement to 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 SMEEC / 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 wrnings 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